Golden West College

EXECUTIVE OFFICE

Student Services Center

tBP Project No. 21182.00
DSA #04 - 124889 File # 30-C3
Bid No:

Coast Community College District
Costa Mesa, California

PROJECT MANUAL

Divisions 00 - 28
January 2026

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

GOLDEN WEST COLLEGE EXECUTIVE OFFICE

DISTRICT

COAST COMMUNITY COLLEGE DISTRICT

1370 ADAMS AVENUE, COSTA MESA, CA 92626

PROJECT LOCATION

GOLDEN WEST COLLGE

15744 GOLDENWEST STREET

HUNTINGTON BEACH, CALIFORNIA 92647

PREPARED BY:

ARCHITECT

TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach, CA 92660

949.673.0300

www.tbparchitecture.com

Architect's Project Number: 21182.00.

END OF PROJECT TITLE PAGE

SECTION 00 01 02
PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

A. Project Name: Golden West College Executive Office.

B. Architect's Project Number: 21182.00.

Golden West College.

15744 Goldenwest Street.

Huntington Beach, California 92647.

C. The Owner, hereinafter referred to as District:

Coast Community College District

1370 Adams Avenue, Costa Mesa, CA 92626

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 office space.

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

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 04-124889 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 03/04/2026

SECTION 00 01 07
SEALS PAGE

ARCHITECT OF RECORD (AOR)

TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach CA 92660

Hung Cheng C-34187

01/29/2026

STRUCTURAL ENGINEER OF RECORD (SEOR)

VCA ENGINEERS

2401 E. Katella Ave., Anaheim, CA 92806

Young-Keun Nam S-4029

01/29/2026

MECHANICAL ENGINEER OF RECORD (MEOR)

P2S, INC.

5000 East Springs Street, Long Beach, California

James Lafond M40511

01/29/2026

ELECTRICAL ENGINEER OF RECORD (EEOR)

P2S, INC.

5000 East Springs Street, Long Beach, California

Mohammad Wasif E22296

01/29/2026

FIRE ALARM ENGINEER OF RECORD (EEOR)

P2S, INC.

5000 East Springs Street, Long Beach, California

Mohammad Wasif E22296

01/29/2026

FIRE PROTECTION ENGINEER OF RECORD (FPEOR)

P2S, INC.

5000 East Springs Street, Long Beach, California

Andres Jimenez FP2202

01/29/2026

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: GOLDEN WEST COLLEEGE EXECUTIVE OFFICE PROJECT NO.: 21182.00

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: GOLDEN WEST COLLEEGE EXECUTIVE OFFICE

PROJECT NUMBER: 21182.00

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: GOLDEN WEST COLLEEGE EXECUTIVE OFFICE

PROJECT NUMBER: 21182.00

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: _____

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Golden West Colleege Executive Office

B. District's Name: Coast Community College District.

C. Architect's Name: tBP/Architecture.

D. The Project consists of the alteration of Interior remodel of existing office space.

1.02 CONTRACT DESCRIPTION

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

1.03 CONTRACT DOCUMENTS

A. Contract Requirements:

1. General Conditions of the Contract with the District are separate from Division 01 - General Requirements in the Project Manual.
    a. Such "General Conditions" documents are how the Contractor works with the District, not Specifications.
2. Division 01 - General Requirements describes the relationship of how the Architect works with the Contractor through the District and governing agencies (Division of the State Architect).
3. Specifications are found in the various 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. Intent: These drawings and specifications are the work scope of the alteration, rehabilitation, or reconstruction to be in accordance with Title 24, CCR. Should any existing conditions such as deterioration or non-complying construction be discovered which is not covered by the contract documents wherein the finished work will not comply with Title 24 CCR, a construction change document (CCD) or a separate set of plans and specifications detailing and specifying the required work shall be submitted to and approved by DSA before proceeding with the work (Section 4-317(c), Part 1, Title 24 CCR).

B. Scope of alterations work is indicated on drawings.

C. HVAC: 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.

E. Fire Suppression Sprinklers: Alter existing system and add new construction, keeping existing in operation.

F. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.

G. Telephone: Alter existing system and add new construction, keeping existing in operation.

H. Security System: Alter existing system and add new construction, keeping existing in operation.

1.05 WORK BY DISTRICT

A. Concurrent Work Under Separate Contracts:

1. Work Under Separate Contracts: District may award separate contracts for products and installation for 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 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 Substantial Completion. Some items include:

1. Movable cabinets.
2. Furnishings.
3. Small equipment.
4. 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).

D. Relationship to Work Under the Contract:

1. Work under the Contract includes all provisions necessary to fully incorporate such products into the Work, including, as necessary.

a. Fasteners.
b. Backing,.
c. Supports.
d. Piping.
e. Conduit.
f. Conductors.
g. Other such provisions from point of service to point of connection, for a complete installation.
h. Field finishing, as shown on Drawings and specified herein.

2. See Section 01 30 00 - Administrative Requirements for additional requirements.

1.06 OWNER OCCUPANCY

A. District intends to continue to occupy adjacent portions of the existing site and/or building 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.

1.07 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.

C. Provide access to and from site as required by law and by District:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
2. Site Access:
    a. Limit access to site to indicated routes and access points as indicated.
    b. If routes and access points are not indicated, access shall be as approved by District.
    c. Do not restrict access to adjacent properties and do not restrict access for those performing work under separate contracts for the District.
3. Do not obstruct roadways, sidewalks, or other public ways without permit.
4. Construction Limit:
    a. Limit construction activities to areas indicated on Drawings as Project Area or, if not indicated, to areas within the parcel as described in the legal description on the Drawings.
    b. Refer also to Section 01 50 00 - Temporary Construction Facilities and Controls for additional requirements.

D. Existing building spaces may not be used for storage.

E. Time Restrictions:

1. Limit conduct of especially noisy, malodorous, and dusty exterior work to the hours of those required by local statute or the Agreement.

F. Utility Outages and Shutdown:

1. Limit disruption of utility services to hours the building 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.

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

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

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: 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 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. Project 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, each area of work and areas adjacent to construction limits 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 1600 by 1200 ("2 megapixel"), in JPG format; provide files unaltered by photo editing software.

1. Delivery Medium: Via email.
2. File Naming: Include project identification, date and time of view, and view identification.
3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.
4. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
5. 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: GOLDEN WEST COLLEEGE EXECUTIVE OFFICE

PROJECT NO.: 21182.00

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 31 14
FACILITY SERVICES COORDINATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Services of a coordinator for facility services construction.

1. Bi-Weekly BIM coordination meetings.

B. Coordination documents.

1. BIM Coordination drawings for the various appropriate trades of this project.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Responsibilities of separate contractors.

1. Various types of Work to be coordinated, including Owner-Furnished / Contractor-Installed products.

B. Section 01 30 00 - Administrative Requirements: Additional requirements for coordination.

C. Section 01 60 00 - Product Requirements: Spare parts and maintenance materials.

1. Coordination of products, especially general requirements for system completeness and product substitutions.

D. Section 01 70 00 - Execution and Closeout Requirements: Starting of Systems. Systems Demonstration.

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

1.03 MECHANICAL AND ELECTRICAL COORDINATOR

A. Employ and pay for services of a person, technically qualified and administratively experienced in field coordination of the type of work required to be coordinated, for the duration of the Work.

1. This designated individual may serve a dual role on the project team.

1.04 SUBMITTALS

A. Submit name, address, and telephone number of coordinator and name of principal officer for review.

B. Submit coordination drawings and schedules prior to submitting shop drawings, product data, and samples.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 COORDINATION REQUIRED

A. Coordinate the Work as stated in the Conditions of the Contract.

1. Coordinate Work under the Contract with work under separate contracts by District.
2. Preinstallation Meetings: Coordinate and document work between trades. See Section 01 70 00 - Execution and Closeout Requirements.
3. Cooperate with District, Owner Representative, and others as directed by District in scheduling and sequencing the incorporation into the Work of Owner Furnished / Contractor Installed (OFCI) products identified in the Contract Drawings and Specifications.

B. Relationship of Documents:
1. Drawings, Specifications and other Contract Documents in the Project Manual are intended to be complementary.
2. What is required by one shall be as if required by all.
3. What is shown or required, or may be reasonably inferred to be required, or which is usually and customarily provided for similar work, shall be included in the Work.

C. Discrepancies:
1. Error, omission, ambiguity or conflict in Drawings or Specifications shall be brought to Architect's attention during the bidding period, for Architect's determination and direction in accordance with provisions of the Conditions of the Contract.

D. Construction Interfacing and Coordination: Layout, scheduling and sequencing of Work shall be solely the Contractor's responsibility.
1. Contractor shall verify, confirm and coordinate field measurements so that new construction correctly and accurately interfaces with conditions existing prior to construction.

E. Contractor shall bring together the various parts, components, systems and assemblies as required for the correct interfacing and interpretation of all elements of the Work.
1. All work required to provide complete and fully operational systems shall be included in the contract price.
2. Contractor shall coordinate Work to correctly and accurately connect abutting, adjoining, overlapping and related elements, including work under separate contracts by District, utility agencies and companies.

F. Coordinate the work listed below:
1. Structural: Division 03, Division 04, Division 05, and Division 06.
2. Architectural: Division 7, Division 8, Division 9, and Divison 12.
3. Specialties: Division 10.
4. Equipment: Division 11.
    a. Specialty Equipment.
5. Special Construction: Division 13.
6. Fire Suppression: Division 21.
7. Plumbing: Division 22.
8. Heating, Ventilating, and Air Conditioning: Division 23.
9. Electrical: Division 26.

10. Communications: Division 27.
11. Electronic Safety and Security: Division 28.
12. Site Utilities: Division 33.

G. Coordinate progress schedules, including dates for submittals and for delivery of products.

H. Conduct meetings among subcontractors and others concerned, to establish and maintain coordination and schedules, and to resolve coordination matters in dispute.

I. Participate in progress meetings. Report on progress of work to be adjusted under coordination requirements, and any required changes in schedules. Transmit minutes of meetings and reports to concerned parties.

J. Coordination of subcontracts and separate contracts

1. Superintendence of Work:
    a. Contractor shall appoint a field superintendent and a project manager, who shall directly and full time supervise and coordinate all Work of the Contract.
2. Subcontractors, Trades and Materials Suppliers:
    a. Require all subcontractors, trades, crafts and suppliers to coordinate their portions of Work with the Contractor's field superintendent to prevent scheduling, sequencing, dimensional and other conflicts and omissions.
3. Coordination with Work Under Separate Contracts:
    a. Coordinate and schedule Work under the Contract with work being performed for Project under separate contracts by District, serving utilities and public agencies.
    b. Make and facilitate direct contacts with parties responsible for work of the Project under separate contracts, in order to provide timely notifications and to facilitate information exchanges.

3.02 COORDINATION DOCUMENTS

A. Prepare coordination drawings to organize installation of products for efficient use of available space, for proper sequence of installation, and to identify potential conflicts.

1. Produce BIM Drawings with clash detection for the proposed installation and the placement of pipes, conduits, other materials, and the locations, size and reinforcement of penetrations in the building structure to conform to the structural Drawing and Specifications.
2. Structural requirements take precedence when the requirements of the Mechanical, Electrical or other items are in conflict with structural.
3. Take all precautions prior to coring into an existing building structure.
4. Notify the structural engineer and obtain written approval prior to completing any structural penetrations if the structural integrity of an existing or new building structure may be compromised. Refer to Section 01 70 00 - Execution and Closeout Requirements for cutting and patching.
5. Review limitations in available space for installation or service.
    a. Overlay plans of each trade and verify space requirements and conflicts between trades.

b. Minor changes and adjustments that do not affect design intent may be made by Contractor and highlighted for Architect's review prior to purchase and installation.

6. Incompatibility between items provided under different trades.
7. Inconsistencies between drawings, specifications and codes (between trades and within each trade).
8. Items required for existing facilities construction projects are designed and prepared from available as-built drawings that are verified through non-invasive and non-destructive, visual observation only.
    a. Field verify actual existing conditions during and upon completion of demolition work and incorporate findings into preparation of coordination drawings.
    b. Minor changes and adjustments that do not affect design intent may be made by Contractor and highlighted for Owner Representative and Architect's review prior to purchase and installation.

B. Prepare a master schedule identifying responsibilities for activities that directly relate to this work, including submittals and temporary utilities; organize by specification section.

C. Verify that utility, and other building system requirement characteristics of operating equipment are compatible with provided utilities, and other building systems.
    1. Coordinate work of various trades having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Identify electrical power characteristics and control wiring required for each item of equipment.

E. Maintain documents for the duration of the work, recording changes due to site instructions, modifications or adjustments.

F. After Architect review of original and revised documents, reproduce and distribute copies to concerned parties.

3.03 COORDINATION DRAWINGS / BIM MODEL

A. Building Information Modeling (BIM) is required for this Project, such as 3-D Clash Coordination. Submit a BIM Project Execution Plan for Program Project Manager and Design Professional review. The plan shall at minimum include the following items.
    1. Project Goals/ BIM uses and Objectives: Clear objective and goals. Align objectives with Construction Documents and Agreement.
    2. Project Information: Provide key project contacts including project name, contract type, delivery method, project description, project schedule, phases, and milestones.
        a. Key Project Contacts:
            1) Project Managers.
            2) BIM Manager.
            3) Trade BIM Managers.
            4) Superintendents and other major project roles.
        b. BIM and Trade BIM Managers must have at least two years of BIM experience of similar size projects.

c. Organizational Roles and Staffing: Define roles in each organization and specific responsibilities.

3. BIM Information Exchanges:
   a. Identify the information exchanges created as part of the planning process in the BIM Project Execution Plan.
   b. Information exchanges are to illustrate the model elements by discipline, level of detail, and any specific attributes important to the project.
4. Collaboration Procedures:
   a. Develop Team electronic and activity collaboration procedures.
   b. Includes model management and standard meeting actions and agendas.
5. Quality Control: Project teams should determine and document their overall strategy for quality control of the model.
6. Model Structure: The team must identify the methods to ensure model accuracy and comprehensiveness.
7. Project Deliverables: Identify project deliverables as required by Owner Representative.
8. Field Execution of final BIM product: Outline how the final BIM deliverables will be executed to reduce construction errors, change orders, and trade scheduling issues.

3.04 COORDINATION OF SUBMITTALS

A. Review shop drawings, product data, and samples for compliance with Contract Documents and for coordination with related work. Transmit copies of reviewed documents to Architect.

B. Check field dimensions and clearances and relationship to available space and anchors.

C. Check compatibility with equipment and work of other sections, electrical characteristics, and operational control requirements.

D. Check motor voltages and control characteristics.

E. Coordinate controls, interlocks, wiring of switches, and relays.

F. Coordinate wiring and control diagrams.

G. When changes in the work are made, review their effect on other work.

H. Verify information and coordinate maintenance of record documents.

3.05 COORDINATION OF SUBSTITUTIONS AND MODIFICATIONS

A. Review proposals and requests for substitution prior to submission to Architect.

B. Verify compliance with Contract Documents and for compatibility with work of other sections.

C. Submit with recommendation for action.

3.06 OBSERVATION OF WORK

A. Observe work for compliance with Contract Documents.

B. Maintain a list of observed deficiencies and defects; promptly submit.

3.07 DOCUMENTATION

A. Observe and maintain a record of tests. Record:

1. Specification section number and product name.
2. Name of Contractor, subcontractorand special inspector.
3. Name of testing agency and name of inspector.
4. Name of manufacturer's representative present.
5. Date, time, and duration of tests.
6. Type of test, and results.
7. Retesting required.

B. Assemble background documentation for dispute and claim settlement.

C. Submit copies of documentation to Architect upon request.

3.08 EQUIPMENT START-UP

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

B. Observe start-up and adjustments, test run, record time and date of start-up, and results.

C. Observe equipment demonstrations made to District; record times and additional information required for operation and maintenance manuals.

3.09 INSPECTION AND ACCEPTANCE OF EQUIPMENT

A. Prior to inspection, verify that equipment is tested, operational, clean, and ready for operation.

B. Assist Architect with review. Prepare list of items to be completed and corrected.

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contractor Quality assurance submittals.

B. Quality assurance.

C. 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

A. For products and 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. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

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 - 2025 California Administrative Code.
2. Part 2, Title 24 CCR - 2022 California Building Code (CBC); Volumes 1 and 2.
    a. 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. 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 72 - National Fire Alarm and Signaling Code (CA Amended); 2022, as amended in 2022 CBC Ch.35 Referenced Standards.
    3. 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 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.

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. 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-250: Special Inspection(s).
      2) DSA-291: Laboratory Verified Report.
      3) DSA-292: Special Inspection(s) Verified Report(s).
   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. Fabricated items.

2. Seismic resistance.

3.02 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).

3.03 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.

3.04 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, Seismic Force-Resisting System, Designated Seismic System, and Seismic Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and District prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.

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. ADA Standards - 2010 ADA Standards for Accessible Design.

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

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

D. CBC - California Building Code.

1.04 REGULATORY REQUIREMENTS

A. Construction Support Facilities: Comply wiht CBC Section 11B-201.4 and ADA Standards

1. "11B-201.4 Construction Support Facilities

a. These requirements shall apply to temporary or permanent construction support facilities for uses and activities not directly associated with the actual processes of construction, including but not limited to offices, meeting rooms, plan rooms, other administrative or support functions.

b. When provided, toilet and bathing facilities serving construction support facilities shall comply with Section 11B-213. When toilet and bathing facilities serving construction support facilities are provided by portable units, at least one of each type shall be accessible and connected to the construction support facilities it serves by an accessible route.

c. *Exception*: During construction an accessible route shall not be required between site arrival points or the boundary of the area of construction and the entrance to the construction support facilities if the only means of access between them is a vehicular way not providing pedestrian access."

1.05 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.

1.06 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.

1.07 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.

1.08 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.

1.09 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.

1.10 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. STC rating of 35 in accordance with ASTM E90.
2. Maximum flame spread rating of 75 in accordance with ASTM E84.

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

E. Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC): Testing HVAC systems for proper air flow rates, adjustment of dampers and registers, and settings for equipment.

F. Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC): Cleaning air ducts, equipment, and terminal units.

1.04 REFERENCE STANDARDS

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

B. ASHRAE Std 129 - Measuring Air-Change Effectiveness.

C. ASTM D5197 - Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology).

D. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.

E. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers 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 58 13
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project identification sign.

B. Project informational signs.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Responsibility to provide signs.

B. Section 01 50 00 - Temporary Facilities and Controls: Temporary wood barriers and enclosures.

C. Section 06 10 53 - Miscellaneous Rough Carpentry: General requirements for structural and non-structural rough carpentry Work.

1.03 REFERENCE STANDARDS

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

1.04 QUALITY ASSURANCE

A. Design sign and structure to withstand 80 miles/hr wind velocity.

B. Sign Painter: Experienced as a professional sign painter for minimum three years.

1. Sign painter shall be regularly engaged and specializing in the design, execution, construction and installation of exterior signage of equivalent type, size and complexity as those required for Project.

C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.05 SUBMITTALS

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

B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: New, wood, structurally adequate to support sign panel and suitable for specified finish.

B. Sign Surfaces: Exterior grade plywood with medium or high density phenolic sheet overlay, minimum 3/4 inch thick, standard large sizes to minimize joints. Provide sheet thickness as required to span across framing members and provide even, smooth surface without waves or buckles.

C. Rough Hardware: Galvanized steel, as specified in Section 05 50 00 - Metal Fabrications..

D. Sign Face Paint and Primers: Exterior quality, primer, two gloss enamel finish coats; sign background of color as selected. Provide paint type as customarily used for sign painting, adequate to resist weathering and fading for the scheduled construction period.

E. Sign Structure Paint and Primers: Exterior quality, primer, one gloss enamel finish coats; color as selected. Provide paint type as customarily used for sign painting, adequate to resist weathering and fading for the scheduled construction period.

F. Lettering: Exterior quality paint, colors as selected.

2.02 PROJECT IDENTIFICATION SIGN

A. One painted sign, 48 sq ft area, bottom 6 feet above ground.

B. Content:

1. Project number, title, logo and name of District as indicated on Contract Documents.
2. Include organizational logos of parties identified on sign.
3. Names and titles of authorities.
4. Names and titles of Architect and Consultants.
5. Name of Prime Contractor and major Subcontractors.

C. Graphic Design, Colors, Style of Lettering: Designated by Architect.

1. Sign Painting: Sign panels shall be shop painted and field installed.
    a. Sign painting shall be performed by professional sign painters. Silk screen method is recommended in order to accurately depict graphics.
    b. Paint back and edges of sign panels for complete weather resistance and finished appearance.

D. Project Address Signs: Provide Project name and street address signs, minimum of 4 feet wide, to identify Project to facilitate deliveries.

1. Graphic design and colors shall match Project Identification Sign.
2. Text shall be as directed.

E. Lettering: Standard Alphabet Series C, as specified in FHWA (SHS).

2.03 PROJECT INFORMATIONAL SIGNS

A. Restrictions: Signs other than Project Identification Sign specified above and Project Informational Signs specified below shall not be displayed without approval of Architect.

B. Project Informational Signs: Informational signs, necessary for conduct of construction activities or required by governmental authorities having jurisdiction may be displayed when in conformance to sign construction and graphic requirements specified in this Section.

1. Architect may review such signs. If so, review will be for sign construction, and graphic designs only.
2. Adequacy of signage for safety and conformance to requirements of authorities having jurisdiction and trade practices shall be solely Contractor's responsibility.

C. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot distance.

1. Colors shall be as required by authorities having jurisdiction and, if not otherwise required, of colors consistent with Project graphics.
2. Informational signage shall be produced by professional sign painters and be of size and lettering style consistent with use.

D. Provide at each field office, storage shed , and directional signs to direct traffic into and within site. Relocate as Work progress requires.

E. Provide municipal traffic agency directional traffic signs to and within site.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install project identification sign within 30 days after date fixed by Notice to Proceed.

B. Erect at location of high public visibility adjacent to main entrance to site.

C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.

D. Install sign surface plumb and level, with butt joints. Anchor securely.

E. Paint exposed surfaces and edges of sign, supports, and framing for a finished appearance.

F. Project Identification Sign Installation

1. Construction: Construct sign support structure and install panels in durable manner, to resist high winds.
2. Installation: Erect Sign on site at a lighted location of high public visibility, adjacent to the main entrance to the site, as approved by Architect.
    a. Install sign at height for optimum visibility, on ground-mounted poles or attached to portable structure on skids.
    b. Portable structure shall resist overturning force of wind.
3. Street Address Signs: Locate and install signs at each access point from public streets.

G. Project Informational Signs Installation:

1. Construction: Construct sign support structure and install panels in durable manner, to resist high winds.
2. Project Informational Signs Installation:
    a. Locate signs as necessary for construction activities and as required by authorities having jurisdiction.
    b. Install informational signs for optimum visibility, on ground-mounted posts or temporarily attached to surfaces of structures.
    c. Attachment methods shall leave no permanent disfiguration or discoloration on completed Work.

3.02 MAINTENANCE

A. Maintain signs and supports neat clean condition. Repair all deterioration, weathering and damage to structure framing, and signage.

B. Sign Relocation: Relocate signs as required by progress of the Work.

3.03 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of Project and restore the area prior to Final Inspection review.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.
   1. System Completeness.
   2. Installation of Products.
B. 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. ISO 14025 - Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.
D. 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

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

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Drawings and Specifications:

1. If a conflict exists between the Drawings and the Specifications (Project Manual), then the Contractor is to submit a Request for Interpretation from the Architect.
    a. As noted in the General Conditions, the more stringent requirements govern, including cost of materials and/or installation.
2. If a specific product is indicated on the Drawings for use, then that product is to be used without exception in the location identified.
3. If the Contractor proposes the use of another "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 40 00 - Quality Requirements 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: Golden West Colleege Executive Office

B. Project No.: 21182.00

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. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

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

H. 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 prior to the start of work, 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 , 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 signed off by the Architect 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 71 23
FIELD ENGINEERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Field engineering services by Contractor.

B. Construction surveying by Contractor.

C. Support and bracing.

1.02 DESCRIPTION OF SERVICES

A. Specific services listed in this section are in addition to, and do not supersede, general Execution and Closeout Requirements.

B. Sole responsibility for establishing all locations, dimensions and levels of items of work.

C. Sole responsibility for provision of all materials required to establish and maintain benchmarks and control points, including batter boards, grade stakes, structure elevation stakes, and other items.

D. Having a skilled instrument person(s) available on short notice when necessary for laying out the work.

E. Keeping a transit, theodolite, or TST (total station theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the project site at all times.

F. Provision of facilities and assistance necessary for Architect to check lines and grade points placed by Contractor.

1. Performance of excavation or embankment work until after all cross-sectioning necessary for determining payment quantities for Unit Price work have been completed and accepted by Architect.

G. Preparation and maintenance of daily reports of activity on the work. Submission of reports containing key progress indicators and job conditions to Architect.

1. Number of employees at the Site.
2. Number employees at the Site for each of Contractor's subcontractors.
3. Breakdown of employees by trades.
4. Major equipment and materials installed as part of the work.
5. Major construction equipment utilized.
6. Location of areas in which construction was performed.
7. Materials and equipment received.
8. Work performed, including field quality control measures and testing.
9. Weather conditions.
10. Safety.

11. Delays encountered, amount of delay incurred, and the reasons for the delay.
12. Instructions received from Architect or District, if any.

H. Preparation and maintenance of professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the work.

I. Prior to backfilling operations, surveying - locating, and recording on a copy of Contract Documents - an accurate representation of buried work and Underground Facilities encountered.

1.03 REFERENCE STANDARDS

A. State Plane Coordinate System for California.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

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

B. Submit in addition to items required in Section 01 70 00 - Execution and Closeout Requirements.

C. Informational Submittals: Submit the following:

1. Field Engineering: Submit daily reports, with content as indicated in this section.
    a. When requested by Architect, submit for Record documentation verifying accuracy of field engineering including, but not limited to, Contractor's survey notes and field notes.
2. Final property survey.

1.06 QUALITY ASSURANCE

A. Field Engineer's Qualifications: As established in Section 01 70 00 - Execution and Closeout Requirements.

B. Use adequate number of skilled and thoroughly-trained workers to perform the work of this section in a timely and comprehensive manner.

C. Minimum accuracy for required work is as follows:

1. Grade: Horizontal Tolerance: Plus or minus 0.5 feet, Vertical Tolerance: Plus or minus 0.05 feet.
2. Culverts and ditches: Horizontal Tolerance: Plus or minus 0.5 feet, Vertical Tolerance: Plus or minus 0.05 feet.
3. Structures: Horizontal Tolerance: Plus or minus 0.5 feet (location), Vertical Tolerance: Plus or minus 0.05 feet.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify layout information shown on drawings in relation to property survey and existing benchmarks.

B. Notify District's representative and Architect of discrepancies immediately in writing before proceeding to lay out work.

C. Locate and protect existing benchmarks, base lines, and demarcations. Preserve permanent reference points during construction.

D. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify existing conditions.

3.02 FIELD ENGINEERING

A. Maintain field office files, drawings, specifications, and record documents.

B. Coordinate field engineering services with Contractor's subcontractors, installers, and suppliers as appropriate.

C. Prepare layout and coordination drawings for construction operations.

D. Check and coordinate the work for conflicts and interferences, and immediately advise Architect and District of all discrepancies of which Contractor is aware.

E. Cooperate as required with Architect and District in observing the work and performing field inspections.

F. Review and coordinate work on a regular basis with shop drawings and Contractor's other submittals.

G. In general, match existing adjacent grades and maintain existing flow lines.

H. Check the location, line and grade of every major element as the work progresses. Notify the Architect when deviations from required lines or grades exceed allowable tolerances. Include in such notifications a thorough explanation of the problem, and a proposed plan and schedule for remedying the deviation. Do not proceed with remedial work without District's concurrence of the remediation plan.

3.03 CONSTRUCTION SURVEYING

A. General: Perform surveying as applicable to specific items necessary for proper execution of work.

1. Alignment Staking: Provide alignment stakes at 50 foot intervals on tangent, and at 25 foot intervals on curves.

2. Slope Staking: Provide slope staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. Re-stake at every ten-foot difference in elevation.

3. Pipelines: Stake out pipelines including elevations, and check prior to and during construction.

4. Site Utilities: Stake out utility lines including elevations, and check prior to and during construction.
5. Road: Stake out roadway elevations at 50 foot50-foot intervals on tangent, and at 25 foot intervals on curves.
6. Cross-sections: Provide original, intermediate, and final staking as required, for site work and other locations as necessary for quantity surveys.
7. Easement Staking: Provide easement staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. If required by project conditions, provide wooden laths with flagging at 100 foot intervals.
8. Record Staking: Provide permanent stake at each blind flange and each utility cap is provided for future connections. Use stakes for record staking of material(s) acceptable to Architect.

B. Surveying to Determine Quantities for Payment.
1. For each application for progress payment, perform such surveys and computations necessary to determine quantities of work performed or placed. Perform surveys necessary for Architect to determine final quantities of work in place.

C. Record Log: Maintain a log of layout control work. Record any deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used.

D. Use by the Architect: The Architect may at any time use line and grade points and markers established by the Contractor. The Contractor's surveys are a part of the work and may be checked by the Architect at any time.

E. Accuracy:
1. Establish Contractor's temporary survey references points for Contractor's use to at least second-order accuracy (e.g., 1:10000). Set construction staking used as a guide for the work to at least third-order accuracy (e.g., 1:5000). Provide the absolute margin for error specified below on the basis established by such orders.
a. Horizontal Accuracy of Easement Staking: Plus/minus 0.1 foot.
b. Accuracy of Other Staking: Plus/minus 0.04 foot horizontally and plus/minus 0.02 foot vertically.
c. Include an error analysis sufficient to demonstrate required accuracy in survey calculations.
2. District reserves the right to check the Contractor's survey, measurements, and calculations. The requirement for accuracy will not be waived, whether this right is exercised or not.

3.04 SUPPORT AND BRACING

A. General requirements: Design all support and bracing systems, if required. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design systems to not overstress the building structure.

B. Seismic Bracing: Design where required by authorities having jurisdiction.
1. Design and install all support systems to comply with the seismic requirements of the Construction Code of California.

2. Design and install seismic bracing so as not to defeat the operation on any required vibration isolation or sound isolation devices.

3.05 REPORTS

A. Submit two copies of Contractor's daily reports at Architect's field office (or electronically) by 9:00 AM the next working day after the day covered in the associated report. Daily report shall be signed by responsible member of Contractor's staff, such as project manager or superintendent, or foreman designated by Contractor as having authority to sign daily reports.

3.06 RECORDS

A. Maintain at the Site a complete and accurate log of control and survey work as it progresses.

1. Organize and record survey data in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in California. Record Contractor's surveyor's original field notes, computations, and other surveying data in Contractor-furnished hard-bound field books. Contractor is solely responsible for completeness and accuracy of survey work, and completeness and accuracy of survey records, including field books. Survey records,(including field books) may be rejected by District due to failure to organize and maintain survey records in a manner that allows reasonable and independent verification of calculations, and/or allows identification of elevations, dimensions, and grades of the work.
2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by Architect.

B. Submit three copies of final property survey to District. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey. Include the following information:

1. Structure locations from property lines, and distances to adjacent buildings.
2. Dimensions and locations of drives, walks, walls, underground utilities, appurtenances, and major site features.
3. Location of easements.
4. Final grading topographic survey.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

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 017839: 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 017839.

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 Golden West Colleege Executive Office 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 Golden West Colleege Executive Office 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 013550 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.

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. Building demolition .
   1. Hazardous materials are covered by separate documents prepared by others.

B. 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.

C. Selective demolition of building elements for alteration purposes.

D. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

A. Section 00 31 00 - Available Project Information: Existing building survey conducted by District; information about known hazardous materials.

B. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

C. Section 01 10 00 - Summary: Description of items to be removed by District.

D. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

E. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

F. Section 01 57 13 - Temporary Erosion and Sediment Control.

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

H. 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.

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

J. Section 31 22 00 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

K. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

L. Section 32 93 00 - Plants: Relocation of existing trees, shrubs, and other plants.

M. Section 32 93 00 - Plants: Pruning of existing trees to remain.

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 Coast Community College 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. Vegetation to be protected.
2. Areas for temporary construction and field offices.
3. 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 the entire building as indicated on Architectural Demolition Site Plan A1.01.

1. Demolish buildings completely and remove from the site. Use methods required to complete Work within limitations of governing regulations:

a. Locate demolition equipment throughout the building and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

b. Demolish concrete and masonry in sizes that will be suitable for acceptance at recycling or disposal facilities.

c. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

d. Break up and remove concrete slabs on grade in small sizes, suitable for acceptance at recycling or disposal facilities, unless otherwise shown to remain.

e. Remove all disconnected, abandoned utilities on site.

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

C. Remove all other paving and curbs within construction limits indicated on drawings.

D. 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.

E. Remove concrete slabs on grade within construction limits indicated on drawings.

F. Remove manholes and manhole covers, curb inlets and catch basins.

G. Remove fences and gates.

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

I. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 22 00.

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.

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. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

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

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to District.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to District.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

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

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

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 01 00
MAINTENANCE OF CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cleaning of existing concrete surfaces.

B. Repair of exposed structural, shrinkage, and settlement cracks.

C. Resurfacing of concrete surfaces having spalled areas and other damage.

D. Repair of deteriorated concrete.

E. Scope of Work: As indicated on the drawings and as required as work progresses for hidden conditions after consultation with the Architect.

1.02 RELATED REQUIREMENTS

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

1.03 REFERENCE STANDARDS

A. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

B. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens).

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

D. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.

E. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.

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

G. ASTM C928/C928M - Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs.

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

I. ASTM D3039/D3039M - Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials.

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

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

L. ICC-ES AC178 - Acceptance Criteria for Inspection and Verification of Concrete and Reinforced and Unreinforced Masonry Strengthening Using Fiber-Reinforced Polymer (FRP) or Steel-Reinforced Polymer (SRP) Composite Systems.

M. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

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

B. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

C. Field quality control submittals.

D. Manufacturer's qualification statement.

E. Cleaner's qualification statement.

F. Installer's qualification statement.

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

H. Project Record Documents: Accurately record actual locations of structural reinforcement repairs and type of repair.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Cleaner Qualifications: Company specializing in, and with minimum of 3 years of experience in, the type of cleaning specified.

C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum of 3 years of documented experience.

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

1.07 MOCK-UPS

A. Test each type of maintenance procedure required on each type of existing construction, to determine the most appropriate procedures to use and as a record of expected results.

B. Crack Injection: Prepare one sample of each type of injection.

C. Horizontal Surface Repair: Total of 10 foot square area, demonstrating each type of repair.

D. Vertical Surface Repair: Total of 10 foot square area, demonstrating each type of repair.

E. Where color or texture matching is required, first prepare a small size sample on cementitious board.

F. Locate mock-up(s) where directed.

G. Re-work mock-up(s) until satisfactory to Architect.

H. Re-work mock-up(s) until satisfactory to District.

I. Satisfactory mock-up(s) may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 CLEANING MATERIALS

A. Degreaser:
   1. Manufacturers:
      a. Euclid Chemical Company; Euco Clean and Strip: www.euclidchemical.com/#sle.
      b. LATICRETE International, Inc; CITREX: www.laticrete.com/#sle.
      c. Nox-Crete, Inc; Bio-Clean Plus: www.nox-crete.com/#sle.
      d. SpecChem, LLC; Orange Peel-Citrus Cleaner: www.specchemllc.com/#sle.
      e. W.R. Meadows, Inc: www.wrmeadows.com.
      f. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

B. Detergent: Non-ionic detergent.

2.02 CEMENTITIOUS PATCHING AND REPAIR MATERIALS

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

B. Bonding Slurry: Water-based latex admixture; comply with ASTM C1059/C1059M, combined with Portland cement and sand in accordance with admixture manufacturer's instructions.
   1. Admixture Manufacturers:
      a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
      b. Euclid Chemical Company; AKKRO-7T: www.euclidchemical.com/#sle.
      c. Mapei Corporation; Planibond 3C: www.mapei.com/#sle.
      d. The QUIKRETE Companies; QUIKRETE® Concrete Bonding Adhesive: www.quikrete.com/#sle.
      e. SpecChem, LLC; Strong Bond - Acrylic Bonder: www.specchemllc.com/#sle.
      f. W. R. Meadows, Inc; Acry-lok: www.wrmeadows.com/#sle.

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

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

1. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
2. Recommended Thickness: Feather edge to 1/8 inch.
3. Color: Gray.
4. Manufacturers:
   a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
   b. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
   c. Euclid Chemical Company; THIN TOP SUPREME: www.euclidchemical.com/#sle.
   d. The QUIKRETE Companies; QUIKRETE® Concrete Resurfacer: www.quikrete.com/#sle.
   e. Master Builders Solutions; MasterEmaco T 1061: www.master-builders-solutions.com/en-us/#sle.
   f. SpecChem, LLC: Duo Patch: www.specchemllc.com/#sle.
   g. SpecChem, LLC: Final Finish: www.specchemllc.com/#sle.
   h. W. R. Meadows, Inc; Meadow-Patch T2: www.wrmeadows.com/#sle.
   i. Substitutions: See Section 01 60 00 - Product Requirements.

D. Cementitious Repair Mortar, Trowel Grade: One- or two-component, factory-mixed, polymer-modified cementitious mortar.

1. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
2. Manufacturers:
   a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
   b. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
   c. Five Star Products, Inc; Five Star Structural Concrete V/O: www.fivestarproducts.com/#sle.
   d. Koster American Corporation: www.kosterusa.com/#sle.
   e. Master Builders Solutions; MasterEmaco T 1060: www.master-builders-solutions.com/en-us/#sle.
   f. The QUIKRETE Companies; QUIKRETE® FastSet Repair Mortar: www.quikrete.com/#sle.
   g. SpecChem, LLC; RepCon V/O: www.specchemllc.com/#sle.
   h. SpecChem, LLC; Duo Patch: www.specchemllc.com/#sle.
   i. W. R. Meadows, Inc; Meadow-Crete GPS: www.wrmeadows.com/#sle.
   j. Substitutions: See Section 01 60 00 - Product Requirements.

E. Cementitious Repair Mortar, Form and Pour/Pump Grade: Flowable, one- or two-component, factory-mixed, polymer-modified cementitious mortar; in-place material resistant to freezing conditions.

1. Mixed with water in proportions as recommended by manufacturer.
2. Integral corrosion inhibitor.
3. Manufacturers:
    a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
    b. Euclid Chemical Company; EUCOCRETE: www.euclidchemical.com/#sle.
    c. Five Star Products, Inc; Five Star Structural Concrete: www.fivestarproducts.com/#sle.
    d. Mapei Corporation; Planitop 15: www.mapei.com/#sle.
    e. SpecChem, LLC; Duo Patch; www.specchemllc.com/#sle.
    f. SpecChem, LLC; RepCon H-350; www.specchemllc.com/#sle.
    g. W. R. Meadows, Inc; Meadow-Crete FNP: www.wrmeadows.com/#sle.
    h. Substitutions: See Section 01 60 00 - Product Requirements.

F. Cementitious Pavement Repair Mortar: Fast hardening, flowable; composed of cement, sand, and additives; capable of setting in cold weather conditions without the aid of chloride- or gypsum-based accelerators; in-place material resistant to freezing conditions.

1. Dry Material: Complies with ASTM C928/C928M.
2. Time To Open To Traffic: 6 hours, maximum.
3. Time to Top-Coating: 4 hours, maximum.
4. Manufacturers:
    a. ARDEX Engineered Cements; ARDEX B 24: www.ardexamericas.com/#sle.
    b. ARDEX Engineered Cements; ARDEX CD: www.ardexamericas.com/#sle.
    c. ARDEX Engineered Cements; ARDEX Fine CD: www.ardexamericas.com/#sle.
    d. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
    e. Prospec; Premium Patch 100: www.prospec.com.
    f. Prospec; Premium Patch 200: www.prospec.com.
    g. SpecChem, LLC; RepCon 928: www.specchemllc.com/#sle.
    h. SpecChem, LLC; RepCon 928 FS: www.specchemllc.com/#sle.
    i. Or Equal Substitutions: See Section 01 60 00 - Product Requirements.

G. Cementitious Hydraulic Waterstop: Very fast setting, low slump, hand formable, and capable of stopping active water leaks; in-place material resistant to freezing conditions.

1. Manufacturers:
    a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
    b. Euclid Chemical Company; SPEED PLUG: www.euclidchemical.com/#sle.
    c. Kaufman Products Inc; SurePlug - regular set: www.kaufmanproducts.net/#sle.
    d. SpecChem, LLC; SpecPlug or Super SpecPlug; www.specchemllc.com/#sle.

e. W. R. Meadows, Inc; Meadow-Plug or Meadow-Patch 5: www.wrmeadows.com/#sle.

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

H. Exterior Self-Leveling Concrete Topping: Portland cement-based; suitable as wear surface topping in exterior and wet locations as well as underlayment for applied materials.

1. Compressive Strength: 4,300 psi, minimum, at 28 days, when tested in accordance with ASTM C109/C109M, air cured.

2. Flexural Strength: 1,000 psi, minimum, at 28 days, when tested in accordance with ASTM C348.

3. Manufacturers:

a. ARDEX Engineered Cements; ARDEX K301: www.ardexamericas.com/#sle.

b. Kaufman Products Inc; SureFlow 042: www.kaufmanproducts.net/#sle.

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

2.03 EPOXY PATCHING AND REPAIR MATERIALS

A. Manufacturers:

1. Dayton Superior Corporation: www.daytonsuperior.com/#sle.

2. Euclid Chemical Company: www.euclidchemical.com/#sle.

3. Hi-Tech Systems: hitechpolyurea.com

4. SpecChem, LLC: www.specchemllc.com/#sle.

5. W. R. Meadows, Inc; _____: www.wrmeadows.com/#sle.

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

B. Epoxy Repair Mortar: Epoxy resin mixed with aggregate and other materials in accordance with manufacturer's instructions for purpose intended; comply with pot life and workability limits.

1. Manufacturers:

a. ARDEX Engineered Cements; ARDEX BACA: www.ardexamericas.com/#sle.

b. Dayton Superior Corporation: www.daytonsuperior.com/#sle.

c. Euclid Chemical Company; DURALFLEX FASTPATCH: www.euclidchemical.com/#sle.

d. Mapei Corporation; Planibond AE: www.mapei.com/#sle.

e. SpecChem, LLC; SpecPoxy 1000, SpecPoxy 2000, SpecPoxy 3000 or SpecPoxy 3000 FS: www.specchemllc.com/#sle.

f. W. R. Meadows, Inc; Rezi-Weld Gel Paste, Rezi-Weld Gel Paste State, Rezi-Weld 1000, Rezi-Weld LV, or Rezi-Weld LV State: www.wrmeadows.com/#sle.

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

C. Epoxy Injection Adhesive:

1. Manufacturers:

a. Adhesives Technology Corporation; CRACKBOND LR-321 LV: www.atcepoxy.com/#sle.

b. Dayton Superior Corporation: www.daytonsuperior.com/#sle.

c. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com/#sle.

d. SpecChem, LLC; SpecPoxy 1000; www.specchemllc.com/#sle.

e. W. R. Meadows, Inc; Rezi-Weld LV, Rezi-Weld LV State, Rezi-Weld (IP), or Rezi-Weld Gel Paste: www.wrmeadows.com/#sle.

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

D. Epoxy Bonding Adhesive: Non-sag, two-component, 100 percent solids; recommended by manufacturer for purpose and conditions under which used.

1. Non-Load-Bearing Applications: ASTM C881/C881M, Type I, II, III, IV, or V, whichever is appropriate to application.

2. Load-Bearing Applications: ASTM C881/C881M, Type IV or V, whichever is appropriate to application.

3. Other Applications: ASTM C881/C881M, Type as appropriate to application.

4. Manufacturers:

a. Adhesives Technology Corporation; CRACKBOND 2100 MV: www.atcepoxy.com/#sle.

b. ARDEX Engineered Cements; ARDEX BACA: www.ardexamericas.com/#sle.

c. Dayton Superior Corporation: www.daytonsuperior.com/#sle.

d. Euclid Chemical Company; DURALFLEX GEL: www.euclidchemical.com/#sle.

e. SpecChem, LLC; SpecPoxy 2000: www.specchemllc.com/#sle.

f. SpecChem, LLC; SpecPoxy 3000: www.specchemllc.com/#sle.

g. SpecChem, LLC; SpecPoxy 3000 FS: www.specchemllc.com/#sle.

h. W. R. Meadows, Inc; Rezi-Weld Gel Paste: www.wrmeadows.com/#sle.

i. W. R. Meadows, Inc; Rezi-Weld Gel Paste State: www.wrmeadows.com/#sle.

j. W. R. Meadows, Inc; Rezi-Weld 1000: www.wrmeadows.com/#sle.

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

2.04 URETHANE PATCHING AND REPAIR MATERIALS

A. Polyurethane Repair Gel: Rapid setting, two-component; use with or without aggregate to repair cracks and spalls in concrete surfaces.

1. Manufacturers:

a. ARDEX Engineered Cements; ARDEX ArdiFix: www.ardexamericas.com/#sle.

b. Dayton Superior Corporation: www.daytonsuperior.com/#sle.

c. Euclid Chemical Company; EUCO QWIKstitch: www.euclidchemical.com/#sle.

d. Hi-Tech Systems; Spall TX3: www.hitechpolyurea.com/#sle.

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

2.05 ACCESSORIES

A. Anchoring Adhesive: Self-leveling or non-sag as applicable.

1. Self-Leveling Polyester-Based Products:
    a. W. R. Meadows, Inc; Poly-Grip: www.wrmeadows.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.
2. Self-Leveling Epoxy Products:
    a. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com/#sle.
    b. SpecChem, LLC; SpecPoxy 2000; www.specchemllc.com/#sle.
    c. Substitutions: See Section 01 60 00 - Product Requirements.
3. Non-Sag Epoxy Products:
    a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
    b. Euclid Chemical Company; DURAL FAST SET GEL: www.euclidchemical.com/#sle.
    c. SpecChem, LLC; SpecPoxy 3000 or SpecPoxy 3000 FS: www.specchemllc.com/#sle.
    d. W. R. Meadows, Inc; Rezi-Weld Gel Paste or Rezi-Weld Gel Paste State: www.wrmeadows.com/#sle.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

B. Portland Cement: ASTM C150/C150M, Type I, grey.

C. Sand: ASTM C33/C33M or ASTM C404; uniformly graded, clean.

D. Water: Clean and potable.

E. Reinforcing Steel: ASTM A615/A615M Grade 60 (60,000 psi) billet-steel deformed bars, unfinished.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

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

3.03 CLEANING EXISTING CONCRETE

A. Provide enclosures, barricades, and other temporary construction as required to protect adjacent work from damage.

B. Clean concrete surfaces of dirt or other contamination using the gentlest method that is effective.
    1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
    2. Clean out cracks and voids using same methods.

C. The following are acceptable cleaning methods, in order from gentlest to less gentle:
    1. Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with natural or synthetic bristles.

2. Increasing the water washing pressure to maximum of 400 psi.
3. Adding detergent to washing water; with final water rinse to remove residual detergent.
4. Steam-generated low-pressure hot-water washing.

D. Do not use any of the following cleaning methods, unless otherwise indicated:
1. Brushes with wire bristles, grinding with abrasives, solvents, hydrochloric or muriatic acid, sodium hydroxide, caustic soda, or lye.
2. Soap or detergent that is not non-ionic.
3. Alkaline cleaning agents.
4. Acidic cleaning agents.
5. Abrasive blasting.

3.04 CRACK REPAIR USING EPOXY ADHESIVE INJECTION

A. Repair exposed cracks.

B. Follow epoxy adhesive manufacturer's written installation instructions.

C. Provide temporary entry ports spaced to accomplish movement of fluids between ports; no deeper than the depth of the crack to be filled or port size diameter no greater than the thickness of the crack. Provide temporary seal at concrete surface to prevent leakage of adhesive.

D. Inject adhesive into ports under pressure using equipment appropriate for particular application.

E. Begin injection at lower entry port and continue until adhesive appears in adjacent entry port. Continue from port to port until entire crack is filled.

F. Remove temporary seal and excess adhesive.

G. Clean surfaces adjacent to repair and blend finish.

3.05 CONCRETE SURFACE REPAIR USING CEMENTITIOUS MATERIALS

A. Clean concrete surfaces, cracks, and joints of dirt, laitance, corrosion, and other contamination using method(s) specified above and allow to dry.

B. Follow bonding agent and repair mortar manufacturer's written installation instructions.

C. Apply coating of bonding agent to entire concrete surface to be repaired.

D. Fill voids with cementitious mortar flush with surface.

E. Apply repair mortar by steel trowel to a minimum thickness of 1/4 inch over entire surface, terminating at a vertical change in plane on all sides.

F. Trowel finish to match adjacent concrete surfaces.

G. Damp cure for four days.

3.06 FIELD QUALITY CONTROL

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

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

2. Field Quality Control for CFRP:
    a. Inspect installation and test for compliance with ICC-ES AC178.
    b. Inspect for voids, bubbles, and delaminations by performing a visual and acoustic tap test of layered surface after 24 hours of initial resin saturant cure.
    c. Test for material properties of CFRP in accordance with ASTM D3039/D3039M.
    d. Coordination of Other Tests and Inspections: Provide access; accommodate tests and inspections by independent testing agency employed by District.
    e. Nonconforming Work: Repair defective work after minimum cure time for CFRP laminates.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

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

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Paint finish.

B. Divisions 10 - Specialties, 21 - Fire Suppression, 23 - Heating, Ventilating, and Air-Conditioning (HVAC), 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 207 - Standard for Certification Programs.

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 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 207, 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 C 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 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.

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. 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. Fit and shop assemble items in largest practical sections, for delivery to site.

C. Fabricate items with joints tightly fitted and secured.

D. 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.

E. Continuously seal joined members by intermittent welds and plastic filler.

F. Joints Exposed to Weather or Water: Fabricate to keep water out, or provide adequate drainage of water that penetrates.

G. Steel Tubing and Piping Fabrication: Unless otherwise indicated, close ends with plate stock so no exposed ends of tubing and piping. Grind all edges.

H. 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.

I. 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.

J. 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.

K. 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.

L. 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:

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:

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.

D. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

E. Prime Painting: One coat.

F. Galvanizing of Non-structural Items: Galvanize all exterior steel 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.

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 06 10 53
MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTIONS INCLUDES

A. Fire-retardant-treated wood materials.

B. Communications and electrical room mounting boards.

1.02 REFERENCE STANDARDS

A. APA E30 - Engineered Wood Construction Guide.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

C. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

D. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing.

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

F. AWPA U1 - Use Category System: User Specification for Treated Wood.

G. ITS (DIR) - Directory of Listed Products.

H. PS 1 - Structural Plywood.

I. PS 20 - American Softwood Lumber Standard.

J. UL (DIR) - Online Certifications Directory.

1.03 SUBMITTALS

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

B. Product Data:

1. Fire-retardant treatment.

1.04 DELIVERY, STORAGE, AND HANDLING

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

B. Fire-Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

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. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org), and that provides grading service for species and grade specified. Provide lumber stamped with grade mark unless otherwise indicated.

2.02 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1, A-D plywood; 3/4 inch thick; fire-retardant treated.

1. Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.03 FIRE-RETARDANT TREATMENT (FRT)

A. Factory-treat wood members in accordance with AWPA U1 and use category indicated.

B. Fire-Retardant Treatment: Interior Type A, Use Category UCFA (LT), Low-Temperature (low hygroscopic).

1. Treat electrical and communications panel backer boards.

C. Kiln-dry after treatment (KDAT) to maximum moisture content of 19 percent for sawn material and 15 percent for plywood.

D. Fabrication of FRT Wood:

1. Ripping or milling of boards, lumber, and timber after treatment is not permitted.
2. Field cutting to length and drilling of holes in boards, lumber, and timber are permitted without additional treatment.
3. Field cutting and drilling of holes in plywood are permitted.

E. Label or brand FRT wood with classification mark of UL (DIR) or ITS (DIR) or other approved inspection agency, the treatment plant, name of treatment, species of wood, flame spread and smoke-developed indexes, method of drying after treatment, and treating standard.

2.04 ACCESSORIES

A. Metal and Finish of Fasteners:

1. Fire-Retardant-Treated Wood:
   a. Nails, timber rivets, wood screws, and lag screws: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.
2. Untreated Wood: Unfinished steel.

B. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.

PART 3 EXECUTION

3.01 PREPARATION

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

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to greatest extent possible; clearly separate scrap for use on-site as accessory components, including shims, bracing, and blocking.

3.03 INSTALLATION OF CONSTRUCTION PANELS

A. Construction Panels - General: Install in accordance with APA E30.

B. Communications and Electrical Room Mounting Boards: Secure with screws to studs; space fasteners at maximum 24 inches on center.

1. At fire-rated walls, install board over wallboard indicated as part of 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.

3.04 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 ground or buried in fill.

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

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Hardware.

C. Shop finishing.

1.02 RELATED REQUIREMENTS

A. Section 06 41 00 - Architectural Wood Casework: Cabinet hardware.

B. Section 09 91 23 - Interior Painting.

C. Section 09 93 00 - Staining and Transparent Finishing.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard.

B. ANSI A208.1 - American National Standard for Particleboard.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.

E. BHMA A156.9 - Cabinet Hardware.

F. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.

G. NEMA LD 3 - High-Pressure Decorative Laminates.

H. PS 1 - Structural Plywood.

I. WI (MCP) - Monitored Compliance Program (MCP).

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.

2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:

1. Comply with WI (MCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section www.woodworkinstitute.com/#sle.

2. Provide labels or certificates indicating that the work complies with AWMAC/WI (NAAWS) requirements for grade or grades specified.

3. Provide designated labels on shop drawings as required by certification program.

4. Provide designated labels on installed products as required by certification program.

5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

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

B. Protect from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWMAC/WI (NAAWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Interior Woodwork Items:

1. Moldings, Bases, Casings, and Miscellaneous Trim: Match existing; prepare for stained transparent or paint finish, asindicated on Draw.

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 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3, HGS; color as selected by Architect; textured, low gloss finish.

B. Laminate Backing Sheet: NEMA LD 3, BKL; undecorated plastic laminate.

C. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

2.05 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Adhesive for factory-fabricated units: Manufacturer's recommended adhesive for application.

C. 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. Aluminum Edge Trim: Extruded convex shape; smooth surface finish; self locking serrated tongue; of width to match component thickness; bronze anodized finish.

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

2.07 HARDWARE

A. Hardware: Comply with BHMA A156.9.

2.08 SITE-FINISHING MATERIALS

A. Site Finishing: See Sections 09 91 23 and 09 93 00.

2.09 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Cap exposed plastic laminate finish edges with aluminum trim.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. 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.

E. Apply laminate backing sheet to reverse face of plastic laminate finished surfaces.

2.10 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

1. Transparent:
    a. System - 12, Polyurethane, Water-based.
    b. Stain: As selected by Architect.
    c. Sheen: 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.

E. Install hardware in accordance with manufacturer's instructions.

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. Wood casework with laminate cladding.

B. Cabinet hardware.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies.

B. Section 12 36 00 - Countertops.

1.03 ABBREVIATIONS AND ACRONYMS

A. CCP: Certified Compliance Program.

B. CSIP: Certified Seismic Installation Program.

C. HPDL: High-pressure decorative laminate.

D. MCP: Monitored Compliance Program.

E. MDF: Medium-density fiberboard.

F. MDO: Medium-density overlay.

G. WI: Woodwork Institute.

1.04 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.

C. ASTM D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.

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. BHMA A156.18 - Standard for Materials and Finishes.

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

I. CBC - California Building Code.

J. CBC Ch. 11B - California Building Code-Chapter 11B.

K. GANA (GM) - GANA Glazing Manual.

L. ISO 4586-3 - High-Pressure Decorative Laminates (HPL, HPDL) – Sheets Based on Thermosetting Resins (Usually Called Laminates) – Part 3: Classification and Specifications for Laminates Less than 2 mm Thick and Intended for Bonding to Supporting Substrates.

M. PS 1 - Structural Plywood.

N. PS 20 - American Softwood Lumber Standard.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate schedule of climate-controlled rooms with schedule of storage of wood and wood-based materials requiring climate-controlled environments.
2. Coordinate work of this section with installation of metal strapping and other anchorage that provides casework backing and structural support.
3. Coordinate work of this section with rough-in electrical integrally-related with casework.

B. Preinstallation Meeting: Convene preinstallation meeting not less than one week prior to completion of framing behind casework; require attendance of contractor, framing contractor, and casework fabricator.

1. Review locations of casework backing and structural support.
2. Review backing attachment method to wall framing as indicated on drawings.

1.06 SUBMITTALS

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

B. WI Quality Certification Submittal Requirements: Comply with AWMAC/WI (NAAWS)

C. Product Data: Submit manufacturer's published, product descriptive data.

1. Panel Cores for HPDL Panels: For each type, include thickness.
2. HPDL Laminates: For each type, indicate description, thickness, and color.
3. Hardware: For each type of cabinet hardware.
4. Locks: For each type of cabinet lock.
5. Accessory Components: For each type of glass and grommet.

D. Shop Drawings:

1. General: Each sheet sequentially numbered and dated.
   a. Sheet Size: 11 by 17 inches.
   b. Contents: Indicate project name and project address.
2. WI Quality Certification Programs Requirements for Shop Drawings:
   a. Comply with AWMAC/WI (NAAWS).
3. Reference Plans: Casework locations in relative context of building floor plans.
   a. Drawing Scale: 1/4 inch = 1 foot, minimum.
4. Plans and Elevations: Plan and elevation views of each assembly type.
   a. Include rough opening dimensions, casework assembly dimensions, locations and sizes of cutouts, door locations, door swings, and hinge locations
   b. Drawing Scale: 3/8 inch = 1 foot, minimum.
5. Detailed Section: Dimensioned section views of each casework configuration.
   a. Include appropriate locations for casework wall anchorage.

b. Drawing Scale: 1-1/2 inch = 1 foot, minimum.

6. Details: Dimensioned casework assembly details with material thicknesses.
   a. Include laminate-clad panels, panel cores, and concealed casework components.
   b. Drawing Scale: 3 inches = 1 foot, minimum.

E. Samples:
   1. WI Quality Certification Requirements for Samples: Comply with AWMAC/WI (NAAWS).
   2. Samples, Laminate-Clad Panels: For each laminate-clad type, submit two, laminate-clad sample panels; size: 8 by 8 inches; thickness: 3/4 inch.
   3. Samples for Initial Selection:
      a. HPDL Edgebanding: For each edgebanding type, submit two manufacturer's standard palettes, indicating full range of colors.
   4. Samples, Edgebanding:
      a. HPDL Edgebanding: For each edgebanding type, submit two sample strips, 6 inches long, minimum.
   5. Samples, Laminates: For each laminate type, submit two samples for each specified color.
   6. Samples, Hardware: For each hinge, pull, catch, latch, shelf rest, and cabinet lock type, submit one sample, full-size, indicating specified finish.
   7. Samples, Hardware: For each adjustable shelf standard type, submit one sample, indicating specified finish; size: 6 inches.

F. Certificates, WI Certification of Products: Before product delivery to site, provide three Woodwork Institute Certified Compliance Certificates indicating products to be delivered meet requirements of AWMAC/WI (NAAWS) for grades specified.

G. Certificates, WI Certification of Products and Installation: At completion of installation, provide three Woodwork Institute Certified Compliance Certificates indicating products installed and casework installation complies with AWMAC/WI (NAAWS) for grades specified.

H. Certificates, WI Monitored Compliance: After installation is completed, provide three Woodwork Institute (WI) Monitored Compliance Certificates indicating acceptance by WI Director of Architectural Services.

I. Certificates, WI CSIP Certification: After installation, provide three Woodwork Institute (WI) Certified Installation Program (CSIP) certificates identifying work covered and certifying that installation complies with WI CSIP attachment details and schedules.

J. Fabricator's Instructions: Provide fabricator's installation instructions for shop-fabricated units.

K. WI Seismic Installation Program Reports: Provide Woodwork Institute Certified Seismic Installation Program (CSIP) report regarding casework backing; identify locations where backing is missing or improperly installed.

L. Fabricator's qualification statement.

M. Installer's qualification statement.

N. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: WI-accredited millwork company.

B. Installer Qualifications: WI QCP-accredited installer.

C. Fabricator/Installer Qualifications: Firm specializing in fabricating and installing products specified in this section with minimum five years of documented experience; with qualifications indicating ability to comply with requirements of this section.

1. Woodworking company with at least one project in past five years with value of casework within 20 percent of casework cost for this project.

2. Single Source Responsibility: Provide fabrication and installation from single woodworking company.

D. Woodwork Institute (WI) Certification Programs:

1. Monitored Compliance Program (MCP):

a. Provide casework in accordance with Woodwork Institute (WI) Monitored Compliance Program (MCP); program includes monitoring of casework products and installation by WI Director of Architectural Services; program monitors for compliance with contract documents; program compliance is documented by compliance certificates.

b. At completion of installation, provide Monitored Compliance Certificate confirming installation complies with AWMAC/WI (NAAWS) for grades specified.

2. Certified Seismic Installation Program (CSIP):

a. Before partitions are closed, provide Woodwork Institute (WI) Certified Installation Program (CSIP) report confirming backing is provided at casework locations, or identifying locations where backing is missing or improperly located.

b. After installation, provide Certified Seismic Installation Program (CSIP) certificate certifying installation complies with WI CSIP attachment details and schedules.

E. Regulatory Requirements:

1. 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.

a. Comply with HCIA (OHSPD) Pre-Approval OPM-0092.

2. 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.

a. Operable parts for all accessible casework shall comply with CBC Ch. 11B-309 Operable Parts.

b. Pull hardware shall be U-shaped wire pulls or equally accessible at all accessible casework; CBC Ch. 11B-811.4 Operable Parts.

1.08 MOCK-UPS

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

B. Provide one base cabinet mock-up with materials, finish, and hardware for specified cabinet finish type and for grade specified.

1. Components: Provide two doors.
2. Shelves: Provide one shelf.
3. Size: 32 inches wide, 33 inches high, 24 inches deep.
4. Countertop Over Base Cabinet: See Section 12 36 00 for countertops.

C. Locate where directed.

D. Mock-up may remain as part of the work.

1.09 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver products in original packaging materials bearing product identification.

C. Store products prior to installation on flat, level, clean surfaces; elevate products above floors and protect from sunlight.

D. Store products in interior rooms with completed wet work and overhead work.

E. Relative Humidity Conditions for Storing Wood and Wood-Based Core Products:

1. Maintain relative humidity between 25 and 45 percent.

F. Store non-wood-based products under cover and elevated above grade.

1. Protect from excessive moisture and standing water.

G. For products other than wood and wood-based products, store and handle in accordance with fabricator's documented instructions.

H. Handle materials and products to prevent damage to edges, ends, or surfaces.

I. Handle wood products with clean hands or gloves; protect from marks or damage.

1.10 FIELD CONDITIONS

A. Ambient Conditions for Acclimation, Installation, and Post-Installation of Wood-Based Products:

1. Acclimation Period inside Installation Environments: 72 hours, minimum prior to installation.
2. Maintain temperature between 60 degrees F and 90 degrees F.
3. Relative Humidity Conditions During Installation and Post-Installation: Maintain relative humidity between 25 and 55 percent.
4. Maximum Sustained Time outside Specified Temperature Range: 24 hours.

PART 2 PRODUCTS

2.01 ARCHITECTURAL WOOD CASEWORK

A. Casework Finish: Wood casework with laminate cladding.

B. Provide casework and casework components in sizes and profiles as indicated on drawings.

1. Interior Clearances: Comply with specified performance requirements.

C. Adjustable Shelves, Number of Shelves Per Cabinet Unit:

1. Base Cabinets: One shelf for each cabinet unit.
2. Wall Cabinets: Two shelves for each cabinet unit.

D. Scribed Fillers:

1. Finish and Materials: Same materials and finish as exposed surfaces.
2. Material thickness: Comply with specified performance requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Woodwork Institute (WI) Performance Requirements:

1. Comply with AWMAC/WI (NAAWS) general casework requirements, specified architectural wood casework finish or cladding type, and for specified grade indicated below.
2. Grade: Custom.

2.03 WOOD CASEWORK WITH LAMINATE CLADDING

A. Casework Construction:

1. Frameless Cabinet and Door Interface: Flush overlay.
2. Door and Drawer Front Profile: Flush.
3. Reveal Dimensions: Comply with performance requirements.

B. Custom Grade - Laminate-Clad Wood Casework:

1. Exposed Exterior Surfaces, Panels to Receive Laminate Cladding:
   a. HPDL Panels; Surface Finish: As indicated on drawings.
2. Exposed Interior Surfaces at Door and Drawer Fronts:
   a. Same laminate materials and thicknesses as exposed exterior surfaces.
      1) Color to match exposed interior or face.
3. Exposed Interior Surfaces Except Door and Drawer Front Surfaces:
   a. Comply with specified performance requirements.
4. Semi-Exposed Surfaces; Panels to Receive Laminate Cladding:
   a. Comply with specified performance requirements.

C. Edgebanding Applications for Laminate-Clad Wood Casework:

D. Edgebanding Materials for Laminate-Clad Wood Casework:

1. Thickness: 0.02 inch minimum; 0.12 inch maximum.
2. PVC: Well-matched to exposed face; radiused and beveled on edges and corners if thickness is greater than 0.039 inch.

2.04 EDGE TREATMENT APPLICATIONS

A. Front Edges of Frameless Cabinets:

1. Comply with specified performance requirements.

B. Top Edges of Cabinets:

1. Comply with specified performance requirements.

C. Bottom Edges of Wall Cabinet Ends and Light Valances:
    1. Provide edgebanding materials and color to match exposed exterior surfaces.
D. Bottom Edges of Aprons:
    1. Provide edgebanding.
E. Hinged Door Edges:
    1. Provide edgebanding on all four edges except for solid wood doors.
    2. Provide edgebanding at back-beveled door edges.
    3. Miter wood edgebanding with thicknesses equal to or greater than 1/4 inch.
F. Adjustable Shelf Edges, Semi-Exposed Surfaces:
    1. Provide edgebanding that matches exposed either exterior or interior surfaces at option of fabricator.
G. Edges of Cut-Outs:
    1. Comply with specified performance requirements.

2.05 SOLID WOOD COMPONENTS

A. Description: Components fabricated from solid wood; types include profiled components and flat panels.
B. Comply with specified performance requirements.

2.06 HPDL-CLAD PANELS

A. Description: Panels consisting of High-Pressure Decorative Laminate (HPDL) faces applied to cores; panel layup with face ply, back ply, and core of either single ply or odd number of inner plies, to produce balanced construction panel.
    1. Panels subject to size limitations, minimum thickness requirements, and fabrication tolerances of specified grade in accordance with AWMAC/WI (NAAWS) requirements including successful casework integrity testing.
B. Flame Retardance: Provide flame-retardant-grade laminates where indicated on drawings.
    1. 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.
        a. Class C Flame spread rating 76-200, smoke developed 0-450 per ASTM E84.
C. High-Pressure Decorative Laminate (HPDL): Sheet consisting of fibrous material impregnated with thermosetting resins; bonded by high-pressure process.
D. HPDL Laminates Less than 0.08 inch Thick: Comply with ISO 4586-3.
    1. Horizontal Grades:
        a. HPDL HGS; for Horizontal Surfaces applications.
    2. Vertical Grades:
        a. HPDL VGS; for Vertical Surfaces applications.
    3. Postformable Grades:
        a. HPDL HGP; for Post-Formed Horizontal Surfaces applications.

4. Exposed Backer Materials:
    a. Same materials, thickness and color as laminate face.
5. Concealed Backer Materials:
    a. Laminate materials as required for balanced construction panel and recommended by laminate manufacturer for application.
6. Products:
    a. Basis of Design Product: Indicated on Drawings as manufactured by Wilsonart, or approved equal.
    b. Arborite: www.arborite.com/#sle.
        1) Exposed Exterior Surfaces, Color, Pattern, and Finish: As indicated on drawings.
    c. Formica Corporation: www.formica.com/#sle.
        1) Exposed Exterior Surfaces, Color, Pattern, and Finish: As indicated on drawings.
    d. Panolam Industries International, Inc: www.panolam.com/#sle.
        1) Exposed Exterior Surfaces, Color, Pattern, and Finish: As indicated on drawings.
    e. Wilsonart LLC: www.wilsonart.com/#sle.
        1) Exposed Exterior Surfaces, Color, Pattern, and Finish: As indicated on drawings.
    f. Lamin-Art: www.laminart.com.
        1) Exposed Exterior Surfaces, Color, Pattern, and Finish: As indicated on drawings.
    g. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 PANEL CORES

A. Medium Density Fiberboard (MDF):
1. Description: Composite panel composed of cellulosic fibers, additives, and bonding system cured under heat and pressure; comply with ANSI A208.2.
2. Grade: 130.
    a. Comply with NAAWS, Grade 150 minimum, where required by CSIP.
3. Panel Thickness: 3/4 inch.
4. Moisture Resistance: MR10; color-tinted to indicate moisture-resistance core.
5. No-Added Formaldehyde Based (NAUF) Resins: Comply with CARB (ATCM).
6. Products:
    a. Basis of Design Material: Combination Core, PureBond Classic Core, www.columbiaforestproducts.com, or approved equal.
    b. Roseburg Forest Products: www.roseburg.com/#sle.
    c. Timber Products; Pro Core MDF: www.timberproducts.com.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Medium Density Overlay (MDO):
1. Description: General plywood with thermosetting phenolic resin impregnated cellulose-fiber sheets bonded to both working faces for balanced construction; comply with PS 1 for MDO General.

2. Performance Category: As required to meet performance requirements for specified applications.
3. Panel Grade: MDO General; B-B.
4. Products:
    a. Roseburg Forest Products: www.roseburg.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 CONCEALED CABINET BASE COMPONENTS

A. Cabinet Base Toe-Kick Subfronts:
    1. Materials: Moisture-resistant wood boards.
    2. Height Above Subfloor: 4 inches.
    3. Finished Face of Toe Kick Subfronts: As indicated on drawings.
B. Cabinet Base Blocking and Stretchers:
    1. Materials: Fabricator's option.
    2. Size: As indicated on drawings.
C. Cabinet Base Sleepers:
    1. Materials: Wood boards.
    2. Height Above Subfloor: 4 inches.
    3. Size: As indicated on drawings.

2.09 WOOD AND WOOD-BASED MATERIALS

A. AWMAC/WI (NAAWS) Wood Moisture Content Requirements:
    1. Dry Southwestern US: Between 4 and 9 percent.
B. AWMAC/WI (NAAWS) General Requirements for Wood:
    1. Provide wood that is sound, free of decay, shake, pith, wane, and warp.
    2. Comply with AWMAC/WI (NAAWS) and with specified performance requirements.
C. Plywood: Comply with PS 1.
    1. Structural I, Grade C-D, Exposure I.
    2. Performance Category: 3/4 minimum.
D. Wood Boards: Comply with PS 20.
    1. Thickness: As specified with applicable casework components.
E. Moisture-Resistant Wood: Where moisture-resistant wood is specified or indicated on drawings for cabinet base components, provide wood with thickness swelling of not more than 5 percent when tested in accordance with ASTM D1037.
F. Wood Anchoring Strips:
    1. Materials: Wood boards.
    2. Size: As indicated on drawings.
    3. Application: As indicated on drawings.

2.10 CABINET AND DRAWER HARDWARE

A. Hinges, Number of Hinges for Each Cabinet Door:
   1. Door Heights Under 48 inches: Not less than two hinges per door.
   2. Door Heights Between 48 inches and 84 inches: Not less than three hinges per door.
   3. Door Heights Greater than 84 inches: Not less than four hinges per door.

B. Hinges, Self-Closing, Integrated Damper Hinges:
   1. Description: Self-closing hinges with integrated damper mechanisms.
   2. Comply with BHMA A156.9, B01712.
   3. Features: Provide soft-closing integrated damper hinges.
   4. Opening Range: Between 115 to 150 to degrees.
   5. Material and Finish: Steel with polished finish.
   6. Products:
      a. Blum, Inc: www.blum.com/#sle.
      b. Grass America Inc: www.grassusa.com/#sle.
      c. Hafele America Co.; : www.hafele.com.
      d. Hettich America, LP: www.hettich.com/#sle.
      e. Stanley Hardware Div.: www.stanleycommercialhardware.com.
      f. Substitutions: See Section 01 60 00 - Product Requirements.

C. Cabinet Door Pulls: Provide one at each door.
   1. Comply with CBC 11B-811.4.
   2. Description: Back-mounted pulls.
   3. Comply with BHMA A156.9, B02011.
   4. Design: U-shape wire pulls.
   5. Center-to-Center Mounting Dimension: 4 inches.
   6. Material and Finish: Steel with polished finish.
   7. Products:
      a. Doug Mockett & Company, Inc: www.mockett.com/#sle.
      b. Amerock: BP76312-G10, 4 inch Pull, Allison Value Hardware
      c. Rockler: Satin Nickel 4 inch Wire Pull.
      d. Top Knob: M338 - Wire Pull 4 inch - Brushed Satin Nickel - Somerset Collection.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

D. Cabinet Magnetic Catches:
   1. Description: Fastening devices with magnetic holding capacities that keep cabinet doors closed until pulling actions release doors for opening.
   2. Provide one catch for each swinging door 48 inches and less in height.
   3. Provide two catches for each swinging door over 48 inches in height.
   4. Magnetic Catches for Under Overlay Doors:

a. Comply with specified performance requirements.

5. Material and Finish: BHMA A156.18, 626 or 652 satin chromium.
6. Products:
    a. Ives, an Allegion brand: www.allegion.com/us/#sle.
    b. Knape & Vogt Manufacturing Company: www.knapeandvogt.com/#sle.
    c. Sugatsune America, Inc: www.sugatsune.com/#sle.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

E. Cabinet Latches:
1. Description: Fastening devices with holding capacities that keep cabinet doors closed until specific actions release doors for opening; some latches release doors by push-to-open actuation.
2. Comply with specified performance requirements.
3. Comply with BHMA A156.18.
4. Latches: Touch latches.
5. Material and Finish: BHMA A156.18, 626 or 652 satin chromium.
6. Products:
    a. Knape & Vogt Manufacturing Company: www.knapeandvogt.com/#sle.
    b. Sugatsune America, Inc: www.sugatsune.com/#sle.
    c. Substitutions: See Section 01 60 00 - Product Requirements.

F. Shelf Rests:
1. Description: Shelf rests for installation into prepared holes in substrate.
2. Comply with specified performance requirements.
3. Comply with BHMA A156.9, B04013.
4. Products:
    a. Locking 3/4-inch plastic shelf supports for 5 mm hole diameter: Knape & Vogt Manufacturing Company; No. 339: www.knapeandvogt.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

G. Adjustable Shelf Support Systems, Standards and Shelf Rests: Provide where indicated on drawings.
1. Description: Slotted vertical standards with shelf rests for supporting shelves; standards mounted in evenly spaced, cleanly bored holes.
2. Load Capacity: Comply with with specified structural performance duty level.
3. Adjustment Increment: 1-1/4 inches.
4. Standard Length: As indicated on drawings.
5. Surface-Mounted Standards: Comply with BHMA A156.9, B04063.
6. Material and Finish: Satin chromium-plated nickel.
7. Products:
    a. Knape & Vogt Manufacturing Company: www.knapeandvogt.com/#sle.

b. Sugatsune America, Inc: www.sugatsune.com/#sle.

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

H. Standards and Shelf Support Brackets: Provide where indicated on drawings.

1. Description: Single-slotted vertical standards and shelf-support brackets.
2. Comply with specified performance requirements.
3. Adjustment Increment: 1-1/4 inches.
4. Standards: Comply with BHMA A156.9, B04103.
5. Shelf Brackets: Comply with BHMA A156.9, B04112.
6. Material and Finish: Satin chromium-plated nickel.
7. Products:
   a. Knape & Vogt Manufacturing Company: www.knapeandvogt.com/#sle.
   b. Sugatsune America, Inc: www.sugatsune.com/#sle.
   c. Substitutions: See Section 01 60 00 - Product Requirements.

I. Cabinet Door and Drawer Silencers:

1. Description: Self-adhesive rubber silencers.
2. Doors, Quantity: One silencer at top and bottom of closing edge of each door.
3. Size: 1/4 inch diameter; 1/8 inch projection.
4. Color: As selected from manufacturer's standards.
5. Products:
   a. Ives, an Allegion brand: www.allegion.com/us/#sle.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

2.11 CASEWORK ACCESSORY COMPONENTS

A. Edgebanding: ABS or PVC, flat, matte finish; width to match component thickness.

1. Color: As selected by Architect from manufacturers' standard range.

B. Aluminum Trim and Mouldings: Extruded, alloy 6063 T5.

1. Type: Profile as selected from manufacturer's standard range.
2. Depth: 3/4 inch.
3. Finish: Clear anodized.
4. Products:
   a. BM-1 Basis of Design Product: Millwork Trims indicated on Drawings as manufactured by Fry Reglet, fryreglet.com, or equal.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Grommets: Plastic, with matching slotted caps; round.

1. Applications: Where indicated on drawings.
2. Shape: Round.
3. Basis of Design Product: TG Flip-Top® Series as manufactured by Doug Mocket & Company, Inc., or approved equal.

a. Application: desk, countertop, or worksurface grommets.

b. Hole Diameter: 3 inches.

c. Type: Flip Top.

d. Color as selected by Architect.

e. Location as directed by Architect or District. Final location and color to be indicated on shop drawing submittal.

4. Products:

a. Basis of Design Product: As indicated on Drawings as manufactured by Doug Mockett & Company, Inc, or equal.

b. Doug Mockett & Company, Inc: www.mockett.com/#sle.

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

2.12 ACCESSORIES

A. Fasteners: Size and type to suit application.

B. Concealed Joint Fasteners: Threaded steel.

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. Adhesives: Type recommended by fabricator to suit application.

1. Products:

a. Franklin International, Inc; TiteBond Original Wood Glue: www.titebond.com/#sle.

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

2.13 FABRICATION

A. Shop-fabricate casework to dimensions, profiles, and details indicated on drawings.

1. Fabricate to maximum extents plausible, including doors and hardware; fabricate units in sizes transportable through building openings.

B. When necessary to cut and fit on site, provide materials with sufficient allowance for cutting.

C. Wood Casework with Laminate Cladding: Apply laminates in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.

D. Provide cutouts for outlet boxes, inserts, similar items, and hardware; verify locations of cutouts from on-site dimensions. Sand and seal cut edges.

E. Edgebanding: Apply where specified; do not use more than one piece for any single length.

F. Hardware: Install hardware in accordance with hardware manufacturer's written instructions; use fasteners supplied by hardware manufacturer.

G. Glazing: Install glass products with dry glazing method using soft, closed-cell gaskets in accordance with GANA (GM).

1. Polish and grind exposed glass edges.

H. WI Certified Compliance Labels: Indicate compliance with WI Certified Compliance Program by applying WI Certified Compliance Labels on each casework elevation.

I. Fabrication Tolerances: Comply with specified performance requirements.

2.14 SOURCE QUALITY CONTROL

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

B. Inspection Services: Provide WI QCP fabrication inspection services.

1. Inspect for compliance with contract documents; on subjects that contract documents are silent, inspect for compliance with specified AWI grade.

2. Provide report of inspection results first to architectural woodwork fabricator. After ten days, provide updated report to Architect, District, and Contractor.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify casework and materials required for installation have been delivered, handled and stored as specified.

B. Verify cold-formed backing components that provide backing and structural support for casework are installed as indicated on drawings.

C. Verify location and sizes of rough-in electrical associated with work of this section.

D. Verify location and sizes of cutouts for special equipment to be mounted in or adjacent to casework.

3.02 PREPARATION

A. Acclimate casework to environments indicated for installation.

3.03 INSTALLATION

A. Install and secure work of this section in accordance with specified performance requirements.

B. Install work of this section rigid, plumb, and level and in accordance with fabricator's documented instructions; secure casework as indicated on drawings.

1. Align and secure adjoining cabinet units with fasteners in concealed locations.

C. Base and Wall Cabinet Anchorage Support Construction:

1. See Section 09 21 16 - Gypsum Board Assemblies for non-load-bearing steel stud framing providing backing for casework.

D. Install cabinet hardware in accordance with hardware manufacturer's documented instructions using hardware manufacturer's furnished fasteners.

E. Install scribe fillers to close gaps between casework and adjacent walls.

3.04 TOLERANCES

A. Comply with specified performance requirements for tolerances.

3.05 FIELD QUALITY CONTROL

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

B. WI Inspection Services: Provide WI Seismic Installation Services; inspect casework backing for compliance with project-specific seismic requirements.

3.06 ADJUSTING

A. Adjust hardware for smooth operation in accordance with hardware manufacturer's documented instructions.

3.07 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean exposed surfaces of casework, shelving, and hardware.

3.08 PROTECTION

A. Protect installed casework from subsequent construction operations.

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 Other trades.

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. Hardware Sets:

LEGEND:
LINK TO CATALOG CUT SHEET
ELECTRIFIED OPENING

HARDWARE GROUP NO. 01
FOR USE ON DOOR #(S):

205

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
2	EA	POWER TRANSFER	EPT10 CON			689	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-LC-QELX-PA-AX-9850WDC-EO-F-LBS-LBLAFL-CON-SNB			626	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-LC-QELX-PA-AX-9850WDC-L-F-06-LBL-CON-SNB			626	VON
1	EA	RIM CYLINDER	20-057 ICX			626	SCH
1	EA	FSIC CORE	23-030 X KEYWAY PER BLD STD			ORG	SCH
1	EA	SURF. AUTO OPERATOR	9560 REG2 AS REQ 'D (120/240 VAC)			ANCLR	LCN
2	EA	ACTUATOR, TOUCH	8310-852T				LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS			630	IVE
1	EA	GASKETING	188SGY PSA OR BY FRAME MFG.			Gy	ZER
1	SET	MEETING STILE	326AA-S (OR BY DOOR MFG./ SUPPLIER)			AA	ZER
2	EA	AUTO DOOR BOTTOM	369AA			AA	ZER
1	EA	THRESHOLD	410A			AA	NGP
2	EA	WIRE HARNESS (DOOR)	CON-XX/CON-XXP-RACEWAY LENGTH				SCH
2	EA	WIRE HARNESS (FRAME)	CON-6W				SCH
2	EA	DOOR CONTACT	679 (OR BY DIV 28)			BLK	SCE
1	EA	POWER SUPPLY	PS904 900-4RL 120/240 VAC				VON
1	EA	CREDENTIAL/ CARD READER	BY SECURITY CONTRACTOR			TBD	B/O

-COORDINATION: ACCESS CONTROL, WIRING, CONDUIT AND POWER (AS REQ'D) WITH SECURITY CONTRACTOR.
OPERATION DESCRIPTION:
DOOR NORMALLY CLOSED AND LOCKED.
DOOR ACCESS: THROUGH VALID CREDENTIAL/ CARD READER OR BY KEY OVER-RIDE.
EXTERIOR ACTUATOR WIRED IN SERIES THROUGH ACCESS CONTROL SYSTEM RELAY SUCH THAT UPON VALID CARD OR TIME ZONE CONTROL ACTUATOR CAN BE PRESSED TO START OPENING CYCLE.
DOOR EGRESS: DOOR ALWAYS FREE FOR IMMEDIATE EGRESS.
INTERIOR ACTUATOR TO START OPENING CYCLE (UNLESS ADO IS POWERED OFF)
UPON LOSS OF POWER, DOOR IS CLOSED AND LOCKED.

HARDWARE GROUP NO. 02
FOR USE ON DOOR #(S):
208
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	POWER TRANSFER	EPT10 CON		689	VON
1	EA	FIRE EXIT HARDWARE	PA-AX-98-EO W/CYL HOLE-F		626	VON
1	EA	ELEC EXIT DEVICE TRIM-50-OFFICE/CLASSROOM FUNCTION	AD-300-993R-50-MT-RHO-J-LHR 12/24 VDC		626	SCE
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	FSIC CORE	23-030 X KEYWAY PER BLD STD		ORG	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA WMS		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS436/ FS438 (AS REQ'D)		626	IVE
1	EA	GASKETING	188SGY PSA OR BY FRAME MFG.		Gy	ZER
1	EA	AUTO DOOR BOTTOM	369AA		AA	ZER
1	EA	THRESHOLD	410A		AA	NGP
1	EA	WIRE HARNESS (DOOR)	CON-XX/CON-XXP-RACEWAY LENGTH			SCH
1	EA	WIRE HARNESS (FRAME)	CON-6W			SCH
1	EA	DOOR CONTACT	679 (OR BY DIV 28)		BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC			VON

-COORDINATION: ACCESS CONTROL, WIRING, CONDUIT AND POWER (AS REQ'D) WITH SECURITY CONTRACTOR.
OPERATION DESCRIPTION:
DOOR NORMALLY CLOSED AND LOCKED.
DOOR ACCESS: THROUGH VALID CREDENTIALS/ KEY, OR ACCESS CONTROL SCHEDULE,
UPON POWER INTERRUPTION THE DOOR IS CLOSED AND LOCKED.
DOOR EGRESS: ALWAYS FREE FOR IMMEDIATE EGRESS THROUGH EXIT DEVICE.

Ordering Information

Available through one of our GSA schedule 84 approved distributions. BAA options available

AD	-	300	-	CY	-	70	-	MG	-	SPA	-	626	-	P6	-	S123	-	RH	-	13-247	-	10-025	-	134
Series		Class		Chassis		Function		Reader		Lever Style		Finish		Key Cylinder		Keyway		Handing		Backset & Latch or Armored Front		Strike		Door Thickness
1		2		3		4		5		6		7		8		9		10		11		12		13

Standard options are indicated with a dot. See price book for specific configuration options.

3 Chassis

CY	Cylindrical
MS	Mortise
MD	Mortise deadbolt
993R	Exit trim – Rim/CVC/CVR
993S	Exit trim – SVR
993M	Exit trim – mortise
993DT	Non-functioning dummy trim for exit

4 Function

40	Privacy
50	Office/classroom
60	Apartment
70	Storeroom

Lock function capabilities are determined by users access control system.

5 Reader

• KP	Keypad
MG	Magnetic stripe (insertion)
MGK	Magnetic stripe + keypad (insertion)
MS	Magnetic stripe (swipe)
MSK	Magnetic stripe + keypad (swipe)
MT	Multi-technology (125 kHz, 13.56 MHz, NFC)
MTK	Multi-technology + keypad (125 kHz, 13.56 MHz, NFC)
FMK	FIPS 201-1 compliant multi-technology + keypad (125 kHz and 13.56 MHz)
Si	HID support
SiK	HID support + keypad
DT	Dummy trim

6 Lever

ATH	Athens
BRK	Boardwalk
BRW	Broadway
LAT	Latitude
LON	Longitude
RHO	Rhodes
SPA	Sparta
TLR	Tubular

Available with tactile warning options.

7 Finish

605	Bright Brass
606	Satin Brass
612	Satin Bronze
619	Satin Nickel
625	Bright Chrome
• 626	Satin Chrome
626AM	Satin Chrome Antimicrobial
643e	Aged Bronze

8 Key Cylinder

• P6	Schlage 6-pin conventional key-in-lever cylinder

See price book for other SFIC, FSIC and less cylinder options available. Compatible with Schlage®, Sargent®, Corbin Russwin, Medeco® and Yale®.

9 Keyway

• S123	Everest 29

See price book for other available keyway options including restricted keyways in Primus XP high security cylinders and master keying.

10 Handing

• RH	Right handed
LH	Left handed

Field reversible.

11 Backset & Latch or Armored Front

• 13-247	Cylindrical: 2-3/4" backset deadlatch, square corner, 1-1/8" x 2-1/4"
• 09-663	Mortise: Armor front, 1-1/4" wide, square corner

See price book for mortise deadbolt and other backset and latch options or armor front options.

12 Strike

• 10-025	Cylindrical: 1-3/16" lip, ANSI, no box, 1-1/4" x 4-7/8"
• 10-072	Mortise: 1-3/16" lip, 1-1/4" x 4-7/8" square corner, box

See price book for other available strikes.

13 Door Thickness

• 134	1-3/4"

Other thicknesses available between 1-3/8" and 2-3/4" See price book for details.

Lever Styles

Conventional cylinders shown, SFIC and FSIC also available.


Athens


Boardwalk


Broadway


Latitude


Longitude


Rhodes


Sparta


Tubular

Finishes

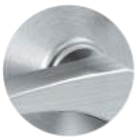

605
Bright Brass

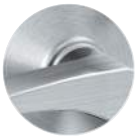

606
Satin Brass


612
Satin Bronze


619
Satin Nickel


625
Bright Chrome


626
Satin Chrome


626AM
Satin Chrome Antimicrobial


643e
Aged Bronze

004448, Rev. 01/24

HARDWARE GROUP NO. 03
FOR USE ON DOOR #(S):
201 202 203 204
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	POWER TRANSFER	EPT10 CON		689	VON
1	EA	ELEC -50-OFFICE/CLASSROOM FUNCTION LOCK	AD-300-CY-50-MT-RHO-J 12/24 VDC		626	SCE
1	EA	FSIC CORE	23-030 X KEYWAY PER BLD STD		ORG	SCH
1	EA	SURFACE CLOSER	4040XP REG WMS		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS436/ FS438 (AS REQ'D)		626	IVE
1	EA	GASKETING	188SGY PSA OR BY FRAME MFG.		Gy	ZER
1	EA	AUTO DOOR BOTTOM	369AA		AA	ZER
1	EA	THRESHOLD	410A		AA	NGP
1	EA	WIRE HARNESS (DOOR)	CON-XX/CON-XXP-RACEWAY LENGTH			SCH
1	EA	WIRE HARNESS (FRAME)	CON-6W			SCH
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		TBD	B/O

-COORDINATION: ACCESS CONTROL, WIRING, CONDUIT AND POWER (AS REQ'D) WITH SECURITY CONTRACTOR.
-AD-300 LOCKSET LISTED FOR TEMPLATING PURPOSES ONLY. LOCKSET TO BE SUPPLIED BY DIV. 28

OPERATION DESCRIPTION:
DOOR NORMALLY CLOSED AND LOCKED.
DOOR ACCESS: THROUGH VALID CREDENTIALS/ KEY, OR ACCESS CONTROL SCHEDULE,
UPON POWER INTERRUPTION THE DOOR IS CLOSED AND LOCKED.
DOOR ALWAYS FREE FOR IMMEDIATE EGRESS.

HARDWARE GROUP NO. 04
FOR USE ON DOOR #(S):
210
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	POWER TRANSFER	EPT10 CON		689	VON
1	EA	ELEC -50-OFFICE/CLASSROOM FUNCTION LOCK	AD-300-CY-50-MT-RHO-J 12/24 VDC		626	SCE
1	EA	FSIC CORE	23-030 X KEYWAY PER BLD STD		ORG	SCH
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	4040XP REG WMS		689	LCN
1	EA	MOUNTING PLATE	4040XP-18 SRT (AS REQ'D)		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	188SGY PSA OR BY FRAME MFG.		Gy	ZER
1	EA	AUTO DOOR BOTTOM	369AA		AA	ZER
1	EA	THRESHOLD	410A		AA	NGP
1	EA	WIRE HARNESS (DOOR)	CON-XX/CON-XXP-RACEWAY LENGTH			SCH
1	EA	WIRE HARNESS (FRAME)	CON-6W			SCH
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		TBD	B/O

-COORDINATION: ACCESS CONTROL, WIRING, CONDUIT AND POWER (AS REQ'D) WITH SECURITY CONTRACTOR.
-AD-300 LOCKSET LISTED FOR TEMPLATING PURPOSES ONLY. LOCKSET TO BE SUPPLIED BY DIV. 28

OPERATION DESCRIPTION:
DOOR NORMALLY CLOSED AND LOCKED.
DOOR ACCESS: THROUGH VALID CREDENTIALS/ KEY, OR ACCESS CONTROL SCHEDULE,
UPON POWER INTERRUPTION THE DOOR IS CLOSED AND LOCKED.
DOOR ALWAYS FREE FOR IMMEDIATE EGRESS.

HARDWARE GROUP NO. 05
FOR USE ON DOOR #(S):

206

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	POWER TRANSFER	EPT10 CON		689	VON
1	EA	ELEC -50-OFFICE/CLASSROOM FUNCTION LOCK	AD-300-CY-50-MT-RHO-J 12/24 VDC		626	SCE
1	EA	FSIC CORE	23-030 X KEYWAY PER BLD STD		ORG	SCH
1	EA	SURFACE CLOSER	4040XP CUSH/ SCUSH (AS REQ'D) WMS		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS436/ FS438 (AS REQ'D)		626	IVE
1	EA	GASKETING	188SGY PSA OR BY FRAME MFG.		Gy	ZER
1	EA	AUTO DOOR BOTTOM	369AA		AA	ZER
1	EA	WIRE HARNESS (DOOR)	CON-XX/CON-XXP-RACEWAY LENGTH			SCH
1	EA	WIRE HARNESS (FRAME)	CON-6W			SCH
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		TBD	B/O

-COORDINATION: ACCESS CONTROL, WIRING, CONDUIT AND POWER (AS REQ'D) WITH SECURITY CONTRACTOR.
-AD-300 LOCKSET LISTED FOR TEMPLATING PURPOSES ONLY. LOCKSET TO BE SUPPLIED BY DIV. 28

OPERATION DESCRIPTION:
DOOR NORMALLY CLOSED AND LOCKED.
DOOR ACCESS: THROUGH VALID CREDENTIALS/ KEY, OR ACCESS CONTROL SCHEDULE,
UPON POWER INTERRUPTION THE DOOR IS CLOSED AND LOCKED.
DOOR ALWAYS FREE FOR IMMEDIATE EGRESS.

HARDWARE GROUP NO. 06
FOR USE ON DOOR #(S):
207

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	L9010 06A		626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS436/ FS438 (AS REQ'D)		626	IVE
1	EA	GASKETING	188SGY PSA OR BY FRAME MFG.		Gy	ZER
1	EA	AUTO DOOR BOTTOM	369AA		AA	ZER

HARDWARE GROUP NO. 07
FOR USE ON DOOR #(S):
209A 209B

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	L9010 06A		626	SCH
1	EA	SURFACE CLOSER	4040XP CUSH/ SCUSH (AS REQ'D) WMS		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	188SGY PSA OR BY FRAME MFG.		Gy	ZER
1	EA	AUTO DOOR BOTTOM	369AA		AA	ZER

EXISTING DOOR HARDWARE. FOR REFERENCE ONLY. NOT IN CONTRACT

HARDWARE GROUP NO. E01

FOR USE ON MARK #(S):

101 102 108 109

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	CDSI-AX-9849-NL-OP-110MD-249-LBL-PA	626	VON
1	EA	PANIC HARDWARE	CDSI-AX-9949-EO-249-LBL-PA	626	VON
3	EA	MORTISE IC CYLINDER	MATCH TYPE & KEYWAY OF C-R CYLINDER	626	C-R
1	EA	RIM IC CYLINDER	MATCH TYPE & KEYWAY OF C-R CYLINDER	626	C-R
4	EA	PERMANENT IC CORE	MATCH TYPE & KEYWAY OF C-R CYLINDER	626	C-R
2	EA	90 DEG OFFSET PULL	8190HD 10" 0	630	IVE
2	EA	AUTO OPERATOR	AUTO OPERATOR & ACTUATORS BY OTHERS		
1	EA	THRESHOLD	68A X 678A X 69A WELDED MSLA-4	AL	ZER
1	EA	KEY SWITCH	653-NS SERIES	626	SCE
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

PANIC HARDWARE IS TO BE MANUALLY DOGGED AND UN-DOGGED EVERY DAY TO INTERFACE WITH AUTOMATIC OPERATORS.

KEY SWITCH TO SHUNT AUTO OPERATOR & ACTUATORS FOR AFTER HOURS

HARDWARE GROUP NO. E02

FOR USE ON MARK #(S):

103

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	3CB1HW SH 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	AX-99-L-NL-06 - PA	626	VON
1	EA	RIM IC CYLINDER	MATCH TYPE & KEYWAY OF C-R CYLINDER	626	C-R
1	EA	PERMANENT IC CORE	MATCH TYPE & KEYWAY OF C-R CYLINDER	626	C-R
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	SURFACE CLOSER	4111 AVB EDA SRI	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	SET	SEALS	328AA X JAMBS	AL	ZER
1	EA	HEAD SEAL	429A	AL	ZER
1	EA	DOOR SWEEP	*39A*	AL	ZER
1	EA	THRESHOLD	68A X 678A X 69A WELDED MSLA-4	AL	ZER

HARDWARE GROUP NO. E09
FOR USE ON MARK #(S):
2041 2042

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM DEADLOCK	DL4117 WITH LEVER-TYPE THUMBTURN	626	C-R
1	EA	MORTISE IC CYLINDER	MATCH TYPE & KEYWAY OF C-R CYLINDER	626	C-R
1	EA	CYLINDER T/T	ILCO ADA7201TK1	626	KAB
1	EA	PERMANENT IC CORE	MATCH TYPE & KEYWAY OF C-R CYLINDER	626	C-R
1	EA	PUSH PLATE	8200 4" X 16" CFC	630	IVE
1	EA	PULL PLATE	8305 8" 4" X 16" CFT	630	IVE
1	EA	SURFACE CLOSER	4011 DEL	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS438	626	IVE
1	EA	STONE THRESHOLD	BY OTHERS		
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 11
FOR USE ON MARK #:
200

QTY	EA	DESCRIPT|ON	CATALOG NUMBER	FINISH	MFR
2		CONT. HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	CDSI-AX-9849-NL-OP-110MD-249-LBL	626	VON
1	EA	PANIC HARDWARE	CDSI-AX-9949-EO-249-LBL-PA	626	VON
3	EA	MORTISE IC CYLINDER	MATCH TYPE & KEYWAY OF C-R CYLINDER	626	C-R
1	EA	RIM IC CYLINDER	MATCH TYPE & KEYWAY OF C-R CYLINDER	626	C-R
4	EA	PERMANENT IC CORE	MATCH TYPE & KEYWAY OF C-R CYLINDER	626	C-R
2	EA	90 DEG OFFSET PULL	8190HD 10" 0	630	IVE
2	EA	AUTO OPERATOR	AUTO OPERATOR & ACTUATORS BY		
1	EA	THRESHOLD	OTHERS	AL	ZER
1	EA	KEY SWITCH	68A X 678A X 69A WELDED MSLA-4 653-NS SERIES	626	SCE
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

PANIC HARDWARE IS TO BE MANUALLY DOGGED AND UN-DOGGED EVERY DAY TO INTERFACE WITH AUTOMATIC OPERATORS.
KEY SWITCH TO SHUNT AUTO OPERATOR & ACTUATORS FOR AFTER HOURS

HARDWARE GROUP NO. 13
FOR USE ON MARK #:
1080

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	I\/}FR
3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	CYLINDRICAL	CL3310 NZD	626	C-R
1	EA	LATCHSET SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS438	626	IVE
2	SET	SEALS	328AA X JAMBS	AL	ZER
1	EA	HEAD SEAL	429A	AL	ZER
1	EA	DOOR BOTTOM	350A6	A	ZER
1	EA	THRESHOLD	69A X 672A INVERTED X WELDED X MSLA-4	AL	ZER

HARDWARE GROUP NO. E14
FOR USE ON MARK #:
2080

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	AX-99-L-BE-F-06-PA	626	VON
1	EA	KICK PLATE	8402 10"X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS438	626	IVE
1	SET	SEALS	328AA 1/36" 2/84"	AL	ZER
1	EA	DOOR BOTTOM	350A6	A	ZER
1	EA	THRESHOLD	69A X 672A INVERTED X WELDED X MSLA-4	AL	ZER

HARDWARE GROUP NO. E34
FOR USE ON MARK #(S):
2040

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HW HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	EA	PANIC HARDWARE	AX-9927-EO-LBR	626	VON
1	EA	PANIC HARDWARE	AX-9927-L-BE-LBR-06	626	VON
2	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7850	689	LCN
1	EA	GASKETING	188S-BK	S-BK	ZER

SMOKE DETECTORS BY OTHERS AND TO INTERFACE WITH MAG HOLD OPENS AND THE FIRE ALARM SYSTEM

HARDWARE GROUP NO. E38
FOR USE ON MARK #:
2002

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HW HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	AX-9447-EO-F-LBR	626	VON
1	EA	FIRE EXIT HARDWARE	AX-9447-L-F-LBR-06	626	VON
1	EA	RIM IC CYLINDER	MATCH TYPE & KEYWAY OF C-R CYLINDER	626	C-R
1	EA	PERMANENT IC CORE	MATCH TYPE & KEYWAY OF C-R CYLINDER	626	C-R
2	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	KICK PLATE	8402 10" X 1" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7850	689	LCN
1	EA	GASKETING	188S-BK	S-BK	ZER
2	EA	ASTRAGAL	328AA	AA	ZER
1	EA	THRESHOLD	672A-MSLA-10	A	ZER

SMOKE DETECTORS BY OTHERS AND TO INTERFACE WITH MAG HOLD OPENS AND THE FIRE ALARM SYSTEM

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.

1. Provide information as required by AWMAC/WI (NAAWS).
2. Include certification program label.

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.

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.

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.

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 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Infill panels of glass.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Steel attachment devices.

B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 08 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 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum.

D. AAMA 611 - Specification for Anodized Architectural Aluminum.

E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

F. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

I. 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.

J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

K. CBC - California Building Code.

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

M. 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. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. 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.

D. Samples: Submit two samples 2 x 3 inches in size illustrating finished aluminum surface, glass, glazing materials.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. 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. 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.

C. Single-Source Responsibility: All entrances and storefront framing and doors, including finish, shall be the product of one manufacturer.

1.07 MOCK-UPS

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

B. Construct in-place mock-up, 8 feet long by 8 feet wide, indicating finishes, application methods, and weathertight construction feet.

C. Locate where directed.

D. Mock-up may remain as part of work.

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. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.

1. Glazing Rabbet: For 1 and 1-3/16 inch insulating glazing.
2. Glazing Rabbet: For 1/4 inch monolithic glazing.
3. Glazing Position: Front-set.
4. Vertical Mullion Dimensions: As indicated on Drawings.
5. 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.
6. 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.
7. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
8. 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.
9. 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.
10. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
11. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
12. 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. 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.

2.04 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
    1. Framing members for interior applications need not be thermally broken.
    2. Glazing Stops: Flush.
    3. Cross-Section: As indicated on drawings.
B. Glazing: See Section 08 80 00.

2.05 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. Perimeter Sealant: As specified in Section 07 92 00 - Joint Sealants.
F. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.
G. Sealant for Setting Thresholds: Non-curing butyl type.
H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
I. Glazing Accessories: See Section 08 80 00.
J. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.
K. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.06 FINISHES

A. 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.

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. Coordinate attachment and seal of perimeter air and vapor barrier materials.

G. Install perimeter sealant in accordance with Section 07 92 00-Joint Sealants.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install glass using glazing method required to achieve performance criteria; see Section 08 80 00.

J. 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.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood doors.

B. Electrically operated and controlled hardware.

C. Lock cylinders for doors that hardware is specified in other sections.

D. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 06 41 00 - Architectural Wood Casework: Cabinet hardware.

B. Section 07 92 00 - Joint Sealants: Sealants for setting exterior door thresholds.

C. Section 08 06 71 - Door Hardware Schedule: Schedule of door hardware sets.

D. Section 08 14 16 - Flush Wood Doors.

E. Section 08 43 13 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.

F. 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 A156.8 - Door Controls - Overhead Stops and Holders.

J. BHMA A156.13 - Mortise Locks & Latches Series 1000.

K. BHMA A156.16 - Standard for Auxiliary Hardware.

L. BHMA A156.17 - Self Closing Hinges & Pivots.

M. BHMA A156.20 - Standard for Strap and Tee Hinges, and Hasps.

N. BHMA A156.22 - Standard for Gasketing.

O. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems.

P. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

Q. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel 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 WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors.

W. DSA BU 11-05 - Impact of AB 211 - Concerning Door Hardware.

X. DSA BU 19-05 - AB 3205 Door Hardware Requirements.

Y. DSA BU 24-04 - EDC 17586 (AB 2565, 2024) Interior Door Locking Requirements for K-12 Schools.

Z. NFPA 70 - National Electrical Code.

AA. UL (DIR) - Online Certifications Directory.

BB. UL 305 - Standard for Panic Hardware.

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. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

D. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
    1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
    2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
        a. Submit in vertical format; 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.

E. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
    1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
    2. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.

3. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.

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.
    a. Electrified Closers: Two years, minimum.
2. Mechanical Exit Devices: Three years, minimum.

a. Electrified Exit Devices: One year, 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.
   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, DSA BU 19-05, and DSA BU 24-04.

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 and 1010.2.9:

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, DSA BU 19-05, and DSA BU 24-04 ; CBC section 1010.2.8.2 and 1010.2.9.
   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.
   8. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
   9. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

E. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.

F. 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.

G. 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 expansion shields for concrete and masonry substrates.
   4. Coordinate With Doors: Ensure provision of proper blocking to support wood screws at wood doors and 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. Provide hinges on every swinging door.
4. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
5. Provide ball-bearing hinges at each door with closer.
6. Provide non-removable pins on exterior outswinging doors.
    a. Out-swinging exterior doors: Non-ferrous with non-removable (NRP) pins and security studs.
    b. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.
7. Provide non-removable pins on interior outswinging doors at locations as indicated in Door Hardware Schedule.
8. Provide power transfer hinges where electrified hardware is mounted in door leaf.
    a. Basis of Design: Scheduled Manufacturer: Von Duprin EPT-10.
    b. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.
    c. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.
9. Provide following quantity of butt hinges for each door:
    a. Doors up to 60 inches High: Two hinges.
    b. Doors From 60 inches High up to 90 inches High: Three hinges.
    c. Doors 90 inches High up to 120 inches High: Four hinges.

2.03 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.
    a. Mechanical Method: Von Duprin “AX-“ feature, where touchpad directly retracts the latchbolt with 5 lb or less of force. Provide testing lab certification confirming that the mechanical device is independent third-party tested to meet this 5 lb requirement.
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.
    a. Provide UL 305 listed; UL 10C listed or UL 305 listed for rated per CBC 1010.2.9.3.

2.04 LOCK CYLINDERS

A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.

1. Provide standard, electronic, 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.

2.05 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. Extra-Long-Lip Strikes: Provide for locks used on frames with applied wood casing trim.
    c. Aluminum-Frame Strike Box: Provide strike box fabricated for use with aluminum framing by framing manufacturer.
    d. Rabbet Front and Strike: Provide on locksets for use with rabbeted meeting rails.
    e. 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.

2.06 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 corridor entry doors, mount closer on room side of door.

2.07 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders (Door Checks): Comply with BHMA A156.8, Grade 1.

1. Provide stop for every swinging door, unless otherwise indicated.
2. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop, unless otherwise indicated.

2.08 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.

2.09 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.

2.10 FLOOR STOPS

A. Floor Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.

1. Provide floor stops when wall surface is not available; be cautious not to create a tripping hazard.
2. Type: Manual hold-open, with pencil floor stop.
3. Material: Aluminum housing with rubber insert.

2.11 WEATHERSTRIPPING AND GASKETING

A. Rigid Seals:

1. Weatherstripping and Gasketing: Comply with BHMA A156.22.
   a. Head and Jamb Type: Adjustable.
   b. Door Sweep Type: Encased in retainer.
   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. Door Sweep Type: Encased in retainer.
      c. Material: Aluminum, with brush weatherstripping.
      d. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.12 SIGNAGE

A. See Section 10 14 23 - Panel Signage for additional signage requirements.

2.13 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.

2.14 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."

2.15 POWER SUPPLY

A. Power Supply: Hard wired, with multiple zones providing eight (8) breakers for each output panel with individual control switches and LED's; UL (DIR) Class 2 listed.

1. Power: 12 VAC, 20 Amp; with 120 VAC power supply.

2. Operating Temperature: 32 to 110 degrees F.

3. Provide with emergency release terminals that release devices upon activation of fire alarm system.

2.16 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. Verify that electric power is available to power operated devices and of correct characteristics.

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. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
    c. 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. Use templates provided by hardware item manufacturer.

C. Do not install surface mounted items until application of finishes to substrate are fully completed.

D. 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 Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
3. Flush Wood Doors: See Section 08 14 16.
4. 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 to top.
    e. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware when compliant with codes.

E. Locate floor stops no more that 4 inches (maximum outside dimension) from walls and not within paths of travel. See Article "Hinges" in Part 2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.

F. Locate overhead stops for minimum 90 degrees at rest and for maximum allowable degree of swing.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01 40 00 - Quality Requirements.

B. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.04 ADJUSTING

A. Adjust work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

1. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.

a. Hardware damaged by improper installation or adjustment methods: repair or replace to District's satisfaction.

b. Adjust doors to fully latch with no more than 1 pound of pressure.

c. Adjust 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 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.

3.06 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.

3.07 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.

3.08 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

B. No hardware shall be ordered until Finish Hardware has been reviewed and approved by Architect's hardware consultant.

C. Provide Factory order numbers for all products supplied on this project as part of close out documents for Owner's warranty records.

D. See schedule in Section 08 06 71 - Door Hardware Schedule.

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glazing units.

B. Plastic films.

C. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers.

B. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.

C. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

D. 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. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

E. ASTM C1036 - Standard Specification for Flat Glass.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants.

H. CBC - California Building Code.

I. GANA (GM) - GANA Glazing Manual.

J. GANA (SM) - GANA Sealant Manual.

K. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.

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

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

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
5. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class A, or 16 CFR 1201 - Category II criteria. CBC 2406.2.
6. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.04 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.

2.05 PLASTIC FILMS

A. Decorative Plastic Film: Polyester type.

1. Application: Locations as indicated on drawings.
2. Series Type: Specialty.
3. Color: As selected by Architect.
4. Thickness Without Liner: 0.002 inch.
5. Width: 36 inch.
6. Manufacturers:
   a. 3M Window Film; scotchcal translucent film series 3630: www.3m.com/windowfilm.
   b. Avery Dennison; DS Matte i: www.averydennison.com/#sle.
   c. Flexvue Films: www.flexvuefilms.com.
   d. LLumar, an Eastman Chemical Company; Decorative Window Film, Llumar: www.llumar.com/#sle.
   e. Madico, Inc: www.madico.com.
   f. Solyx Films LLC: www.solyxfilms.
   g. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 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.

2.07 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.

2.08 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 INSTALLATION - PLASTIC FILM

A. Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.

B. Place without air bubbles, creases or visible distortion.

C. Install film tight to perimeter of glass and carefully trim film with razor sharp knife. Provide 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required. Do not score the glass.

3.06 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.

3.07 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.

3.08 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
      a. Moisture vapor seal is required at all locations to receive resilient flooring regardless of moisture test.
   2. Broadloom carpet.
   3. Carpet tile.
      a. Moisture vapor seal is required at all locations to receive adhesive-applied flooring regardless of moisture test.
   4. Thin-set ceramic tile and stone tile.
   5. Fluid-Applied flooring
      a. Moisture vapor seal is required at all locations to receive fluid-applied flooring regardless of moisture test.

B. Removal of existing floor coverings.

C. Preparation of new 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.

H. Preparation of new and existing wood-based floors and subfloors for installation of new floor coverings.

1.02 RELATED REQUIREMENTS

A. Section 01 40 00 - Quality Requirements: Additional requirements relating to testing agencies and testing.

B. Section 01 74 19 - Construction Waste Management and Disposal: Handling of existing floor coverings removed.

C. Section 03 30 00 - Cast-in-Place Concrete: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.

D. Section 03 30 00 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 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 to Architect.
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 shall be performed by an independent testing agency employed and paid by Contractor.

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 Architect when specified ambient conditions have been achieved and when testing will start.

E. Floor Moisture Testing Technician Qualifications: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician Certification- Grade I.

F. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:

1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
4. Products:
    a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
    b. Floor Seal Technology, Inc: 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, Two-Component: Single-layer coating resistant to water vapor transmission meeting flooring manufacturer's emission limits, resistant to alkalinity (pH) level found, and suitable for flooring adhesion without further treatment.

1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
2. Products:
    a. ARDEX Engineered Cements; ARDEX MC RAPID: 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. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Acoustic insulation.

D. Gypsum wallboard.

E. Joint treatment and accessories.

F. Acoustic (sound-dampening) wall and ceiling board.

G. Noise barriers in gypsum board assemblies.

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. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.

B. AISI S201 - North American Standard for Cold-Formed Steel Framing - Product Data.

C. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing.

D. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing.

E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

G. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

H. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

I. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.

J. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

K. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

L. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.

M. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

N. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

O. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

P. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

Q. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

R. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

S. ASTM C1396/C1396M - Standard Specification for Gypsum Board.

T. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

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

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

W. ASTM E413 - Classification for Rating Sound Insulation.

X. GA-216 - Application and Finishing of Gypsum Panel Products.

Y. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems.

Z. 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 metal framing, gypsum board, accessories, and joint finishing system.

a. Joint Treatment Materials: Submit manufacturer's product data, indicating VOC content.

2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

C. Shop Drawings: Indicate special details associated with acoustic seals.

D. Steel Framing Industry Association (SFIA) Certification:

1. Submit documentation that metal studs and connectors used on project meet or exceed requirements of Building Code.

2. Submit current documentation of contractor and fabricator accreditation. Keep copies of each on-site during and after installation, and present upon request.

3. Studs and Tracks: Provide third party documentation that framing members' meet AISI S220 and CBC tolerance requirements including base steel thickness, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

a. Certification by the Steel Framing Industry Association (SFIA) program, "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members", meets these requirements.

4. Anchoring Clips: Provide third party documentation that vertical deflection clips and drift clips meet CBC requirements and stated design performance.

a. Certification by the Steel Framing Industry Association (SFIA), "Cold-Formed Connector Program", meets these requirements.

E. Test Reports: For stud framing products that do not comply with AISI S220 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

F. Evaluation Service Reports: Show compliance of grid suspension systems with specified requirements.

G. Installer's Qualification Statement.

1. Including contractor's recognition in the SFIA "Contractor Certification Program", or equal.

H. 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. SFIA Code Compliance Certification Program: www.CFSteel.org/#sle: Use metal studs and connectors certified for compliance with the Building Code.

or

B. Manufacturer Qualifications: Member of Steel Stud Manufacturers Association (SSMA): www.ssma.com/#sle.

or

C. Manufacturer Qualifications: Member of Supreme Steel Framing System Association (SSFSA): www.ssfsa.com/#sle.

D. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

E. 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.

F. 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 MOCK-UPS

A. After topping texture has been approved, construct a mock-up not less than 16 square feet in size.

B. Use workmen, equipment and techniques proposed for use on the project.

C. The panel may be constructed as a portion of the finished work, provided the approved panel is clearly identified for future reference.

D. The approved panel shall become the standard of comparison for interior gypsum board work for the project.

1.09 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.

E. Protect cold-formed metal framing from corrosion deformation, and other damage during delivery, storage and handling as required by AISI's "Code of Standard Practice."

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions in accordance with ASCE 7 for Seismic Design Category D, E, or F and complying with the following:

1. Local authorities having jurisdiction.

2.02 METAL FRAMING MATERIALS

A. Material and Product Requirements Criteria: AISI S201.

B. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
   1. Structural Grade: ST33H.
   2. Corrosion Protection Coating Designation: G60, or equivalent in accordance with AISI S220.

C. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. Cemco; ICC ESR-2012 and Viper-x Studs: IAPMO ER-0524, ICC ESR-2620: www.cemcosteel.com.
   2. ClarkDietrich; ICC ESR-1166P and Intertek CCRR-0205: www.clarkdietrich.com/#sle.
   3. Frametek Steel; ICC ESR 4205: www.frameteksteel.com.
   4. MarinoWARE; ICC ESR 4205 and Viper-x Stud: IAPMO ER-0524, ICC ESR-2620: www.marinoware.com/#sle.
   5. Steel Framing Industry Association (SFIA) member in compliance with SFIA Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Members.
      a. ICC ESR-4205.
   6. Steel Stud Manufacturers Assocation; ICC ESR-3064P.www.ssma.com.
      a. ICC ESR-3064P.

D. Nonstructural Framing System Components: AISI S220 and ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf for gypsum board and L/360 at 5 psf for tiling.
   1. Studs: C-shaped.
   2. Runners: U shaped, sized to match studs.
   3. Noise Barriers: Mass loaded vinyl interlayer in acoustical gypsum board assemblies as indicated on drawings.
      a. Roll Width: 54 inches.
      b. Roll Length: 30 feet.
      c. Products:
         1) NetWell Noise Control; dB-Bloc: www.controlnoise.com/#sle.
         2) Substitutions: See Section 01 60 00 - Product Requirements.

E. Area Separation Wall Studs and Accessories: AISI S220; galvanized sheet steel, of size and properties necessary to comply with specified performance requirements.
   1. Products:
      a. Phillips Manufacturing Co; Hemmed H-Stud: www.phillipsmfg.com/#sle.

F. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection and prevent rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.

2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.
3. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.

G. Non-structural Framing Accessories:
1. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.
a. Products:
1) ClarkDietrich; FastBridge Clip (FB33): www.clarkdietrich.com/#sle.
2) Substitutions: See Section 01 60 00 - Product Requirements.

2.03 BOARD MATERIALS

A. General: Gypsum board, joint treatment and finishing materials shall be manufactured from asbestos-free materials.

B. Recycled Content of Gypsum Panel products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 15 percent.
1. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 15 percent.
2. Recycled Content of High Abuse Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 85 percent.
3. Recycled Content of Water Resistant Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent.

C. 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.

D. 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.

E. Acoustical Sound Dampening Wall and Ceiling Board: Two layers of heavy paper-faced, high-density gypsum board separated by a viscoelastic polymer layer and capable of achieving STC rating of 50 or more in typical stud wall assemblies as calculated in accordance with ASTM E413 and when tested in accordance with ASTM E90.

1. Thickness: 5/8 inch.

2. Long Edges: Tapered.

3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

4. Products:

a. CertainTeed Corporation; SilentFX Quick Cut Gypsum Board: www.certainteed.com/#sle.

b. CertainTeed Corporation; SilentFX Quick Cut Type X Gypsum Board: www.certainteed.com/#sle.

c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond SoundBreak XP Wall Board: www.goldbondbuilding.com/#sle.

d. Pabco Gypsum; QUIETROCK® ES Type X Sound Damped Gypsum Panel: www.QuietRock.com

e. Pabco Gypsum; QUIETROCK® ES MR Type X Mold Resistant Sound Damped Gypsum Panel: www.QuietRock.com

f. Pabco Gypsum; QUIETROCK® 510 Regular Sound Damped Gypsum Panel: www.QuietRock.com

g. Pabco Gypsum; QUIETROCK® 530 Sound Damped Gypsum Panel: www.QuietRock.com

h. Pabco Gypsum; QUIETROCK® 530 RF Sound Damped Gypsum Panel: www.QuietRock.com

i. Pabco Gypsum; QUIETROCK® 545 Sound Damped Gypsum Panel: www.QuietRock.com

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

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness 2 inches.

1. Application:

a. Partitions with STC Rating:

1) Insulation fill at gypsum board partition stud framing.

2) Surround penetrations in gypsum board partitions.

b. Gypsum board ceilings adjacent to sound-rated partitions.

2. Surface Burning Characteristics as per ASTM E84: Flame Spread of 10; Smoke Developed of 10.

3. Products:

a. Owens-Corning; Sound Attenuation Batts: www.owenscorning.com.

b. CertainTeed; "NoiseReducer" Sound Attenuation Batts: www.certainteed.com.

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

B. Fire and Sound Attenuating Insulation: Sprayed cellulose fire-rated material for cavities in wall assemblies.

1. Surface Burning Characteristics: Provide assemblies with Class I rating, when tested in accordance with ASTM E84.

2. Sound Transmission Class (STC): 56, calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

3. Products:

a. International Cellulose Corporation; Celbar RL: www.spray-on.com/#sle.

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

C. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

1. Non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

2. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following acoustical sealants for concealed joints:

3. Products:

a. Franklin International, Inc; Titebond Acoustical Smoke & Sound Sealant: www.titebond.com/#sle.

b. Liquid Nails, a brand of PPG Architectural Coatings: www.liquidnails.com/#sle.

c. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.

d. Pecora Corp.; BA-98.

e. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: www.stifirestop.com/#sle.

f. Tremco, Inc.; Tremco Acoustical Sealant.

g. USG Corporation; USG Sheetrock Acoustical Sealant

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

D. Acoustic Foam Tape: 2 inch wide by 1/4 inch thick neoprene foam gasket/sealing tape.

1. SCE-41 Grade Neoprene sponge with a rubber based adhesive one side.

2. Adhesive to utilize a white Kraft paper liner.

E. Sound Barrier Mullion Trim Cap: Extruded aluminum trim for maintaining sound barriers at intersections between gypsum walls and glazing assemblies.

1. STC: 55.

2. Fire Rating: 1 hour when tested in accordance with UL 2079.

3. Gasket Thickness: 1/2 inch.

4. Finish: Match glazing assembly framing finish.

5. Products:

a. Mull-It-Over Products, Inc; Mull-It-Over 55 - Classic: mullitoverproducts.com/#sle.

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

F. Mullion Extension: Extruded aluminum transition assembly with expandable foam infill to fill void between glass wall mullion and remote partition.

1. Finish: Match glazing assembly framing finish.

2. Products:

a. Mull-It-Over Products, Inc; The ExpandaMull: mullitoverproducts.com/#sle.

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

G. 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. Architectural Reveal Beads:

a. Reveal Depth: 5/8 inch.

b. Shapes: As indicated on drawings.

c. Basis of Design Manufacturer: Fry Reglet: fryreglet.com.

1) Reveal molding: Molding to create a vertical or horizontal recessed reveal.

(a) Acceptable product: Number DRM.

2) "F" reveal molding: Trim reveal molding forming wall trim reveal where drywall terminates against sill, jamb, ceiling or other finish material in same plane.

(a) Acceptable product: Number DRMF.

(b) Dimensions: As indicated on drawings.

(c) Radius: As indicated on drawings.

3) Reveal Base: MWRB-50-400, 4 inches H x 1/2 inch D.
(a) Finish: Buffed satin stainless steel.
4) Materials and Finish:
(a) Interior Aluminum Surfaces: Extruded; Clear medium etched.

3. Expansion Joints:
a. Type: V-shaped metal with factory-installed protective tape.
b. Products:
1) Phillips Manufacturing Co; 093 Expansion Control Joint: www.phillipsmfg.com/#sle.
2) Trim-Tex, Inc: www.trim-tex.com/#sle.
3) Substitutions: See Section 01 60 00 - Product Requirements.

H. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

I. 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.

J. Abuse Resistant Finishes:
1. Acrylic, water-based, non-textured, high build, tintable primer and surfacer.

K. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

L. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

M. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

N. Adhesive for Attachment to Metal:
1. Do not use adhesive containing benzene, carbon tetrachloride, or trichloroethylene.
a. Adhesive shall contain a maximum VOC content of 50 grams per liter.
b. Adhesive must meet the requirements of low emitting materials credit.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

B. 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. Preset hollow metal frames
2. Piping.
3. Conduit.
4. Ductwork.

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. Scaffolding: Construct, erect and maintain in conformance with applicable laws and ordinances.

I. Fire Sprinkler System: In areas where sprinkler heads occur, exercise care when installing drywall work. Do not damage or obstruct the heads in any way.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C1007AISI S220 and manufacturer's instructions.

B. Studs: Space studs as indicated.

1. Extend partition framing to structure in all locations.
2. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
3. Where screw attached wallboard is on one side only or extends to the floor above with no screw attached material on either side, brace unbraced flanges at 4 feet on center vertically.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

D. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

E. Resilient Sound Isolation Clips: Install resilient sound isolation clips, and where applicable, associated furring sections and channels, in accordance with clip manufacturer's written instructions.

F. Blocking: Install mechanically fastened steel channel blocking for support of:

1. Framed openings.
2. Wall-mounted cabinets.
3. Plumbing fixtures.
4. Toilet partitions.
5. Toilet accessories.
6. Wall-mounted door hardware.
7. Wall mounted equipment.
8. Wall mounted handrails.
9. Other locations, where indicated.
10. Where sheet steel blocking(backing) is used on a wall with level 5 surface finish, provide shims between stud face and gypsum board panel to maintain a visually smooth level surface.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.

1. Acoustic Tape: Place on top of all partition walls that do not project above suspended ceiling assemblies. Adhesive side shall be place on top of the wall.

C. Acoustic Sealant: Install in accordance with manufacturer's instructions.

1. Place one bead continuously on substrate before installation of perimeter framing members.
2. Place continuous bead at perimeter of each layer of gypsum board.
3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

D. Sound Barrier Mullion Trim Cap Installation: Install in accordance with manufacturer's instructions for installation of fire-rated mullion trim caps.

3.04 BOARD INSTALLATION

A. Regulatory Requirements: Install gypsum board products in accordance with applicable Code requirements and requirements of listed assemblies shown on Drawings.

B. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

C. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

1. Exception: Tapered edges to receive joint treatment at right angles to framing.

D. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

E. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

1. At locations with edge lighting and sheet metal backing for accessories, provide continuous furring strips of the same thickness as the backing to create a level and visually smooth condition.

3.05 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.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

3.06 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. Smooth.
    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. Smooth.
    a. Common Area Walls
    b. 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.

c. Provide one uniform coat of drywall primer over the entire surface.

3. Level 3: Walls to receive textured wall finish. Smooth.
   a. Smooth: Unit Interior Walls.
   b. Back-of-House Areas (occupied).
4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   a. Back-of-House Areas (not normally occupied).
5. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

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.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.08 REPAIR

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.

3.09 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.

3.10 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

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

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. Samples: Submit two samples 12 by 12 inch in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and perimeter molding.

F. Evaluation Service Reports: Show compliance with specified requirements.

1. Submit copies of the suspension system manufacturer's current ICC Evaluation Service Report.

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.armstrongceilings.com/#sle.

2. Certainteed Architectural: www.certainteed.com/ceilings-and-walls/#sle.

3. USG Corporation: www.usg.com/#sle.

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

B. Suspension Systems:

1. Same as for acoustical units.

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

2.02 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Class A in accordance with ASTM E84.

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. ICC-ES Evaluation Report No. ESR-1308.
2. 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 1/17/25.

2.03 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

1. VOC Content: As specified in Section 01 61 16.
2. 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: Mineral fiber with membrane-faced overlay, with the following characteristics:

1. Application(s): ACT-1.
2. Classification: ASTM E1264 Type A.
    a. Form: A2.2, wet formed.
    b. Pattern: E - lightly textured.
3. Size: 24 by 48 inches.
4. Thickness: 3/4 inch.
5. Light Reflectance: 88 percent, in accordance with ASTM E1264.
6. Noise Reduction Coefficient (NRC) Range: 0.75, in accordance with ASTM E1264.
7. Ceiling Attenuation Class (CAC): 35, in accordance with ASTM E1264.
8. Panel Edge: Square.
9. Color: White.
10. Products:
    a. Basis of Design Product: Ultima No. 1913 as manufactured by Armstrong World Industries, or equal.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 SUSPENSION SYSTEMS

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, G90 coating, unless otherwise indicated.

B. Exposed Suspension System, Type TBAR-1: Hot-dip galvanized steel grid with steel cap.

1. Applications: Seismic.

2. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.

3. Profile: Tee; 15/16 inch face width.

a. Main Runners:

1) Basis of Design Product: Heavy Duty Prelude XL 7301, exposed T as manufactured by Armstrong, or equal.

b. Cross Tees - "Stake-on end", Stepped End:

1) Basis of Design Product: XL7328 (24 inch grid), XL7341 (48 inch grid) as manufactured by Armstrong, or equal.

c. Edge Trim:

1) Basis of Design Product: Angle Molding: 7800, 7/8", Prelude 7871 Shadow molding as manufactured by Armstrong, or equal.

4. Finish: Baked enamel.

5. Color: White.

6. Products:

a. TBAR-1 Basis of Design Product: Prelude System - ICC ESR 1308 as manufactured by Armstrong World Industries, or equal.

b. Armstrong World Industries, Inc; Prelude XL: www.armstrongceilings.com/#sle.

c. USG Corporation; Donn Brand ZXLA 15/16 inch Acoustical Suspension System: www.usg.com/#sle.

1) ICC ESR-1222 and LARR 25764.

d. 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, 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

E. Perimeter Moldings: Same metal and finish as grid.

1. Size: As required for installation conditions and specified Seismic Design Category.

2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.

F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

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, 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.

F. Where round obstructions occur, provide preformed closures to match perimeter molding.

G. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

H. Install hold-down clips on panels within 20 ft of an exterior door.

3.05 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.

3.06 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION

SECTION 09 54 26
SUSPENDED WOOD CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood grilles.

1.02 RELATED REQUIREMENTS

A. Section 09 51 00 - Acoustical Ceilings: Metal suspension systems.

1.03 REFERENCE STANDARDS

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

B. CISCA (WC) - Wood Ceilings Technical Guidelines.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure ceilings are not installed until building is enclosed, dust generating activities have terminated, and overhead work is completed.

1.05 SUBMITTALS

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

B. Shop Drawings: Indicate grid layout and related dimensioning, attachment of wood ceiling components to grid, accessory attachments, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.

C. Product Data: Provide data on wood ceiling components and suspension system components.

D. Samples: Submit two full size samples illustrating material and finish of wood ceiling components.

E. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for fire, acoustical, and seismic performance.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Manufacturer's qualification statement.

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. Wood Ceiling Components: Provide a quantity equal to 2 percent of total product installed.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with at least three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.07 MOCK-UPS

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

B. Locate where directed.

C. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver wood ceiling components to project site in original, unopened packages.

B. Store in fully enclosed space, flat, level and off the floor.

1.09 FIELD CONDITIONS

A. Do not install suspended wood ceiling system until wet construction work is complete and permanent heat and air conditioning is installed and operating.

B. Maintain room temperature between 60 degrees F and 75 degrees F and relative humidity between 35 to 55 percent before, during, and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Suspended Wood Ceilings:

1. 9Wood: www.9wood.com/#sle.
2. Armstrong World Industries, Inc; Woodworks: www.armstrongceilings.com/#sle.
3. USG Corporation: www.usg.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SUSPENDED WOOD CEILING SYSTEM

A. Performance Requirements:

1. Design for maximum deflection of 1/360 of span.
2. Design to resist seismic load required by applicable code.
3. Surface Burning Characteristics: Flame spread index of 25, smoke developed index of 450, when tested in accordance with ASTM E84.

B. Wood-Based Materials:

1. Solid Wood: Clear, dry, sound, plain sawn, selected for compatible species, grain and color, no defects.
2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.

C. Wood Grilles: Pre-assembled module of solid wood grilles with battens.

1. Module Size: 12 by 48 inches, nominal.
2. Acoustical Backer: Fiberglass, 1 inch thick.
   a. Color: Black.

3. Solid Wood Species: Maple.
    a. Factory Finish: Wood stain as selected, clear sealer top coat.
4. Attachment to Suspension Grid: Direct screw attachment to suspension grid.
5. Suspension System: See Section 09 51 00.
6. Products:
    a. ACT-2 Basis of Design Product: Woodworks Grille, Forte Solid Ceiling Panels as manufactured by Armstrong World Industries, Inc., or approved equal.
    b. 9Wood; Wood Ceiling Grilles 1000 Series: www.9wood.com/products/grilles/#sle.
    c. Certainteed Architectural; Wood - Grille Modules: www.certainteed.com/ceilings-and-walls/#sle.
    d. USG Corporation; True Wood Grilles: www.usg.com/ceilings/#sle.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FABRICATION

A. Shop fabricate wood ceiling components to the greatest extent possible.

B. Fabricate components to allow access to ceiling plenum as required.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not install ceiling until after interior wet work is dry.

3.02 PREPARATION

A. Coordinate the location of hangers with other work.

B. Layout wood ceiling components in pattern according to reflected ceiling plan and as shown on shop drawings.

C. Acclimate wood ceiling materials by removing from packaging in installation area a minimum of 48 hours prior to installation.

3.03 INSTALLATION

A. General: Install suspended wood ceiling system in accordance with CISCA (WC).

B. Wood Ceiling:
    1. Install wood ceilings in accordance with manufacturer's instructions.
    2. Fit wood components in place, free from damaged edges or other defects detrimental to appearance and function.
    3. Install components in uniform plane, and free from twist, warp, and dents.
    4. Cut to fit irregular grid and perimeter edge trim.
    5. Make field cut edges of same profile as factory edges, seal and finish according to manufacturer.

6. Install clips, stabilizer bars, and other attachments as indicated to secure wood ceiling components tight to the grid system.
7. Install acoustical backer above wood ceiling components; fit tight between grid members.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

3.05 CLEANING

A. Clean and touch up minor finish damage. Remove and replace components that cannot be successfully cleaned and repaired.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

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

B. 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. ANSI A326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

C. ANSI/NFSI B101.3 - Test Method for Measuring the Wet DCOF of Hard Surface Walkways.

D. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

E. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

F. ASTM F150 - Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring.

G. ASTM F1700 - Standard Specification for Solid Vinyl Floor in Modular Format such as Tile(s) or Plank(s).

H. CBC Ch. 11B - California Building Code-Chapter 11B.

I. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

J. 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. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

E. Verification Samples: Submit two samples, 2 by 2 inch in size illustrating color and pattern for each resilient flooring product specified.

F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

G. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

H. Manufacturer's Qualification Statement.

I. Installer's Qualification Statement.

J. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

K. 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.
4. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum ten 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 WARRANTY

A. Provide 10-year Commercial Limited Warranty.

1.07 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.

1.08 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. All products used shall meet VOC requirements listed in Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. All products used for flooring installation shall comply with flammability and smoke classifications for various locations of installation. Comply with applicable requirements of California Building Code (CBC) Chapter 8.

1. Smoke Density: ASTM E662 Rating to be less than 450 Dm (Optical Density) in flaming mode. (CBC 804.4.1).

C. Requirements for persons with disabilities: Provide flooring meeting slip-resistant requirements of California Code of Regulations (CCR), Title 24, Part 2, CBC Ch. 11B and ADA Standards, latest amendment.

1. Flooring demonstrating a coefficient meeting the intent of slip resistance; CBC Ch. 11B-302 Floor or Ground Surfaces, CBC Ch. 11B-403 Walking Surfaces, and ADA Standards.
2. Flooring surface shall be stable, firm, and slip resistant. CBC Ch. 11B-302.1 General.
3. Flooring surface demonstrating a dynamic coefficient of friction of at least 0.42 wet per DCOF AcuTest ANSI A326.3, or ANSI/NFSI B101.3 (using a BOT-3000 testing unit) will be accepted as meeting the intent of slip resistance; CBC Ch. 11B-302 Floor or Ground Surfaces and ADA Standards.
    a. Ramp surface: Provide DCOF value of 0.46 wet.

2.02 ENVIRONMENTALLY PREFERABLE PRODUCTS

A. Comply with ANSI / NSF 332.

2.03 TILE FLOORING

A. (LVT) Luxury Vinyl Tile: Printed film type, with transparent or translucent wear layer.

1. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
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. VOC Content Limits: As specified in Section 01 61 16.
4. NSF 332 Certification: Gold level.
5. Plank Tile Size: 6 by 48 inch.
6. Wear Layer Thickness: 0.020 inch.
7. Total Thickness: 0.125 inch.
8. Color: As indicated on drawings.

2.04 RESILIENT BASE

A. Resilient Base - Type RB-1: ASTM F1861, Type TS rubber, vulcanized thermoset; Style B, Cove.

1. Manufacturers:
    a. Armstrong; Wall Base: www.armstrongflooring.com.

b. Mannington Commercial; Burke: www.manningtoncommercial.com#sle.

c. Roppe Corporation: www.roppe.com/#sle.

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

2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648, NFPA 253, ASTM E 648, or NFPA 253.

3. Height: 4 inches.

4. Thickness: 0.125 inch.

5. Finish: Satin.

6. Length: 4 foot sections.

7. Color: As indicated on drawings.

8. Accessories: Premolded external corners and internal corners.

2.05 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

1. VOC Content Limits: As specified in Section 01 61 16.

C. Moldings, Transition and Edge Strips: Same material as flooring.

D. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).

1. Test in accordance with Section 09 05 61.

2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

C. Environmental Condition: Comply with flooring manufacturer's instructions and recommendations.

1. Verify that ambient and surface temperatures and humidity conditions are in compliance.

D. Verify that required floor-mounted utilities are in correct location.

E. Material Inspection:

1. In accordance with manufacturer's installation requirements, visually inspect materials prior to installation.

2. Material with visual defects shall not be installed.

3. Labor costs required to replace material installed with visual defects shall be the responsibility of the installation contractor.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

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.

C. Install plank tile with a random offset of at least 6 inches from adjacent rows.

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 68 13
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Carpet tile walk-off mat.

1.02 RELATED REQUIREMENTS

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

B. Section 01 74 19 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet tile scrap and removed carpet tile.

C. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. AATCC Test Method 134 - Test Method for Electrostatic Propensity of Carpets.

B. AATCC Test Method 16 - Colorfastness to Light.

C. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.

D. ASTM D5848 - Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings.

E. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

F. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

G. CRI 104 - Standard for Installation of Commercial Carpet.

H. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.04 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Submit two, 6 inch long samples of edge strip and base cap.

F. Manufacturer's Installation Instructions: Indicate special procedures.

G. Installer's Qualification Statement.

H. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

I. Maintenance Materials: Furnish the following for District's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

1. Store inside, in well ventilated area, protected from weather, moisture and soiling. Store rolls flat, not standing on end.

B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

C. Deliver carpet materials in original mill protective wrapping with mill register numbers and tags attached.

D. Ventilate installation area during installation and for 72 hours after installation.

1.07 WARRANTY

A. Carpet Warranty: Provide 10-year Commercial Limited Warranty.

B. Extended Warranty: Provide extended warranty covering edge raveling, delamination and wear exceeding 10 percent of face yarn weight for a period of 15 years after “Notice of Completion”.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. All products used for flooring installation shall comply with flammability and smoke classifications for various locations of installation. Comply with applicable requirements of California Building Code (CBC) Chapter 8.

1. Smoke Density: ASTM E662 Rating to be less than 450 Dm (Optical Density) in flaming mode. (CBC 804.4.1).

B. Provide glue-down installation conforming to CBC Section 11B-302.2.

1. Carpet shall be securly attached and shall have a firm cushion. pad, or backing or no cushion or pad.
    a. Carpet shall have level loop, textured loop, level cut or level cut/uncut pile texture.
    b. Pile height shall be 1/2 inch maximum.

2. Exposed edges shall be fastened to floor surfaces and shall have trim on the entire length.
    a. Carpet edges shall comply with CBC Section 11B-303.

C. Comply with CalGreen Building Standards: All installed carpeting shall be low VOC emissions listed. Certified as Low Emission by one of the following:
    1. Carpet and Rug Institute's Green Label Plus Program. CalGreen 5.504.4.4.1
    2. Compliant with the VOC emission limits and testing requirements specified in the California Department of Public Health's "Standard Method for the Testing and Evaluation Chambers", Version 1.1, February 2010 or Specification 01350. CalGreen 5.504.4.4.2.
    3. NSF/ANSI 140 at Gold level or higher. CalGreen 5.504.4.4.3
    4. SCS Floorscore; www.scscertified.com. CalGreen 5.504.4.4.4.
    5. Compliant with the Collaborative for High Performance Schools California (CA-CHPS) Criteria Interpretation for EQ 7.0 and EQ 7.1 (formerly EQ 2.2) dated July 2012 and listed in the CHPS High Performance Product Database; www.chps.net/manual/lem_table.htm. CalGreen 5.504.4.4.5.

2.02 MANUFACTURERS

A. Tile Carpeting:
    1. Basis of Design Product: District Standards as manufactured by Tarkett North America, or approved equal.
    2. Bentley Mills: www.bentleymills.com.
    3. Milliken & Company: www.milliken.com.
    4. Mohawk Group: www.mohawkgroup.com/#sle.
    5. Tarkett North America: www.commercial.tarkett.com/en_US/.
    6. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MATERIALS

A. Carpet Tile (Entry or "Walk-Off" Mat)
    1. Carpet: Tufted Tip-Sheared, nylon.
        a. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
        b. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
        c. Maximum Electrostatic Charge: 3.5 Kv. at 20 percent relative humidity (RH).
        d. Primary Backing: AFIRMA II Hardback Tile.
            1) Material: Synthetic.
        e. Tile Size: 24 by 24 inch, nominal.
        f. Yarn Weight: 24 oz/sq yd, ASTM D5848.
        g. Gage: 5/64 inch.
        h. Pile Height: 0.090 to 0.198 inch.

i. Density Factor: 6.609 kilotex.

j. Color: As indicated on Drawings.

2. Preferred Manufacture Location: California.

3. Recycling:

a. New Carpet:

1) Carpet must be eligible for recycling by the supplying mill or fiber producer to an existing operational third party certified recycling center;

2) Submit program parameters.

3) Landfills are not an option.

B. Tile Carpeting: Tufted, Textured Loop, manufactured in one color dye lot.

1. Tile Size: 36 by 36 inch, nominal.

2. Thickness: 0.35 inch.

3. Color: As indicated on Drawings.

4. Pattern: Linear.

5. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.

6. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").

7. VOC Content: Comply with Section 01 61 16.

8. Indoor Air Quality—CRI Green Label Plus™

9. Antimicrobial: Yes.

10. Maximum Electrostatic Charge: 3.5 Kv. at 20 percent relative humidity, AATCC Test Method 134.

11. Gauge: 1/10 inch.

12. Stitches: 10.3 per inch.

13. Density Factor: 7.793 kilotex.

14. Light Fastness: >= 4.0 at 80 Hours, AATCC Test Method 16.

15. Primary Backing Material: PVC-Free.

2.04 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Rubber, color as selected by Architect.

C. Adhesives:

1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 61 16.

D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

1. Water-resistant, non-staining and nonflammable type as recommended by carpet manufacturer to be compatible with backing materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

1. Maximum variation of 1/8-inch in 10 ft

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).

1. Test in accordance with Section 09 05 61.
2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
3. Follow moisture and alkalinity remediation procedures in Section 09 05 61.

D. Carpet Verification: Verify carpet match before cutting or placement to ensure minimal variation between dye lots.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions and CRI 104 (Commercial).

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

1. Locate change of color or pattern between rooms under door centerline.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

1. Edges: Run carpet under open bottom items and all cabinets and install tight to walls. Neatly trim and secure edge of carpet adjacent to door jambs where no base occurs.

I. Complete installation of edge strips, concealing exposed edges.

J. Carpet Finishing: Brush all seams and trim protruding pile tufts level. Remove excess adhesive on the carpet surface and thoroughly vacuum entire area. Leave room clean and ready for use.

3.04 PROTECTION

A. Cover carpet during construction period with reinforced kraft paper when construction traffic is required to cross carpeted areas.

B. Remove and replace damaged or improperly installed carpet.

3.05 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

1. Vacuum and remove all stains from carpet to satisfaction of District and in accordance with cleaning specified in Section 01 70 00 - Execution and Closeout Requirements.

END OF SECTION

SECTION 09 72 00
WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation and prime painting.

B. Wall covering.

1. Digital Print Wall Covering.

1.02 RELATED REQUIREMENTS

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

1.03 REFERENCE STANDARDS

A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented 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. Provide panel, 3 panel drops wide, full height, illustrating installed wall covering and joint seaming technique.

B. Locate where directed.

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. Inspect roll materials at arrival on site, to verify acceptability.

B. Protect packaged adhesive from temperature cycling and cold temperatures.

C. Do not store roll goods on end.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surfaces.

PART 2 PRODUCTS

2.01 WALL COVERINGS

A. General Requirements:

1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.

B. Wall Covering: Fabric-backed vinyl roll stock.

1. Comply with ASTM F793/F793M, Category V, Type II.
2. Backing: Woven, osnaburg fabric.
3. Color: As indicated on Drawings.
4. Overcoating: Manufacturer's standard coating for stain resistance.
5. Manufacturers:
   a. Koroseal/RJF International: www.koroseal.com.
   b. MDC Wallcoverings: www.mdcwall.com.
   c. Wolf-Gordon: www.wolfgordon.com.
   d. Versa Wallcovering: www.versawallcovering.com
   e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Digital Print Wall Covering: Fabric-backed vinyl roll stock.

1. Basis of Design Product: Koroseal Digital Type II Vinyl as manufactured by Koroseal/RJF International, or approved equal.
    a. Local Representative: Scott Hewlett, (310) 633-1506.
2. Conform to ASTM F793/F793M, Category V, Type II.
    a. Comply with Federal Specification CCC-W408A and the CFFA-W-101-D, Quality Standard for Vinyl Coated Fabric Wallcovering
    b. Mildew Inhibitors: Yes.
3. General: Graphic film and overlaminate for inkjet printing with solvent, UV, latex inks and screen printing. For field applied application.
4. Graphics: Artwork provided by District.
5. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
6. Backing: Non-woven, synthetic fabric.
7. Overcoating: Manufacturer's standard coating for, factory applied 0.37 thick "Protected Film".
8. Manufacturers:
    a. Koroseal/RJF International; Koroseal Digital Type II Vinyl: www.koroseal.com.
        1) Local Representative: Scott Hewlett, (310) 633-1506.
    b. MDC Wallcoverings: www.mdcwall.com.
    c. Wolf-Gordon: www.wolfgordon.com.
    d. Versa Wallcovering: www.versawallcovering.com
    e. 3M Company - Commercial Solutions Division (CSD); Vinyl Graphic Wall Coverings: https://www.3m.com/3M/en_US/company-us/search/?Ntt=Vinyl+Graphic+Wall+Coverings .
    f. Substitutions: See Section 01 60 00 - Product Requirements.

D. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.

E. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

F. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.

B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

D. Inspect for any conditions detrimental to the proper and timely completion of the installation. Do not proceed with work until conditions have been corrected.

3.02 PREPARATION

A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.

B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

1. Provide hanging surface that is smooth and free of all excess dust, oils or other foreign matter.

C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.

E. Marks: Seal with shellac those that may bleed through surface finishes.

F. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.

G. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply adhesive to wall surface immediately prior to application of wall covering.

C. Use wall covering in roll number sequence.

D. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.

E. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

F. Butt edges tightly.

G. Horizontal seams are not acceptable.

H. Do not seam within 2 inches of internal corners or within 6 inches of external corners.

I. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.

J. Do not install wall covering more than 1/4 inch below top of resilient base.

K. Cover spaces above and below windows, above doors, in pattern sequence from roll.

L. Apply wall covering to electrical, telephone, and communications wall plates prior to replacing.

M. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.

N. Install termination trim.

O. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 FIELD QUALITY CONTROL

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

B. Provide manufacturer's field representative to observe continuing installation.

C. After the application of three sheets of wood wallcovering, request inspection by Architect for material quality and proper installation.

3.05 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this section.

3.06 PROTECTION

A. Do not permit construction activities at or near finished wall covering areas.

3.07 MAINTENANCE

A. Submit a copy of maintenance instructions to District.

END OF SECTION

SECTION 09 84 30
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound-absorbing panels. AWP-1

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 Panels for Walls:

1. AWP-1 Basis of Design Product: Quietform Ribbed A as manufactured by Acoufelt, or approved equal.
2. AWP-2 Basis of Design Product: Beveled as manufactured by Acoufelt, or approved equal.
3. Panel Core: Manufacturer's standard rigid or semi-rigid fiberglass core.
    a. Facing: 1/16-inch high-impact, impact-resistant and tackable surface laminated to core.
4. Core Density: 6 to 7 lb/cu ft.
5. Sound Absorption: Noise Reduction Coefficient (NRC) of 0.80 when tested in accordance with ASTM C423 for Type A mounting, per ASTM E795.
6. Panel Thickness: As required to meet required acoustical performance.
7. Edges: Perimeter edges reinforced by a formulated resin hardener.
8. Corners: As detailed.
9. Fabric: Woven polyester.
10. Color: As indicated on Drawings.
11. Patterns: Where fabric with directional or repeating patterns or fabric with directional weave is used, mark for installation in same direction.
12. Mounting Method: Back-mounted with mechanical fasteners.

2.02 WOOD VENEER SOUND-ABSORBING UNITS

A. Manufacturers:

1. Basis of Design Product: Woodworks Walls as manufactured by Armstrong World Industries, or approved equal.

2. Armstrong World Industries: www.armstrongceilings.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wood Veneer Acoustical Panels for Walls: Medium Density Fiberboard (MDF) core panels with prime grade, finished face veneer and nonwoven acoustical fabric adhered to back of panel.

1. 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.
2. Sound Absorption: Noise Reduction Coefficient (NRC) or Sound Absorption Average (SAA) of 0.70 to 0.80 when tested in accordance with ASTM C423 for Type A mounting, per ASTM E795.
3. Acoustic Back-Up Material: Compressed fiberglass board, 1.5 lbs/cu ft density, in sizes to fit furring applications.
    a. Thickness: As required to comply with NRC requirements indicated.
4. Panel Size: 24 inches by 48 inches.
5. Panel Thickness: 3/4 inch.
6. Provide MDF with no added urea formaldehyde (NAUF).
7. Surface Veneer Species: As selected by Architect.
8. Perforated Panel: Pattern As selected by Architect .
9. Mounting: Use fixing clips to attach to standard aluminum "Z" clip attachment anchored to wall substrate and ceiling substrate.
    a. Edge Profile: Reveal.

2.03 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.

2.04 ACCESSORIES

A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal, and as follows:

1. Two-part clip and base-support bracket system; brackets designed to support full weight of panels and clips designed for lateral support, with one part mechanically attached to back of panel and the other attached to substrate.
2. Z-clip hanger and magnet system with magnets recessed into panel frame and designed to engage steel mounting plates secured to substrate with screws.

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. Furring Mounted Wood Veneer Panels:

1. Install furring strip along meeting edges of adjacent panels to ensure they are attached to same furring strip along abutted edge; 24 inch on center, maximum.
2. Install acoustic back-up material between furring as required for application.
3. Adhere first panel from edge to furring strip, and attach subsequent panels using fixing clips.

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 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, and convector and baseboard cabinets 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.
3. Allow 30 days for approval process, after receipt of complete samples by Architect.
4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as factory finished metals, wood cabinets, and wood doors, have been approved.

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 and approved by manufacturer.

1.07 MOCK-UP

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, full height, minimum 10 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.

E. 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 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 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. Behr Paint Company: www.behr.com/#sle.

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. 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: To be selected from manufacturer's full range of available colors.

1. Selection to be made by Architect after award of contract.
2. Extend colors to surface edges; colors may change at any edge as directed by Architect.
3. 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, concrete, concrete masonry units, brick, wood, plaster, uncoated steel, shop primed steel, galvanized steel, aluminum, and acoustical ceilings.

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.
4. Primer: As recommended by top coat manufacturer for specific substrate.

B. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:

1. Medium duty applications include doors, door frames, railings, handrails, and guardrails.
2. Two top coats and one coat primer.
3. Top Coat(s): Interior Light Industrial Coating, Water Based; MPI #151, 153, or 154.
    a. Products:
        1) Dunn-Edwards Corporation; Endura-Coat Interior/Exterior Semi-Gloss Industrial Maintenance Coating. (MPI #153)
        2) Sherwin-Williams Pro Industrial Acrylic Coating, Semi-Gloss. (MPI #153)
        3) Substitutions: See Section 01 60 00 - Product Requirements
4. Top Coat Sheen:
    a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

C. Paint I-OP-MD-WC - Medium Duty Vertical and Overhead: Including gypsum board, concrete, concrete masonry units, uncoated steel, shop primed steel, galvanized steel, and aluminum.

1. Two top coats and one coat primer.
2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, 141, or 142.
    a. Products:
        1) Behr Premium Plus Interior Eggshell Enamel [No.2050]. (MPI #139)

2) Pittsburgh Paints Pure Performance Interior Latex, 9-110XI Series, Flat. (MPI #142)

3) Pittsburgh Paints Pure Performance Interior Latex, 9-310XI Series, Eggshell. (MPI #138)

4) Sherwin-Williams Pro Industrial Acrylic Coating, Eg-Shel. (MPI #139)

5) Substitutions: See Section 01 60 00 - Product Requirements

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 metal doors and frames.

D. Paint I-OP-DF - 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.

a. Products:

1) Behr Pro HPC Waterborne Acrylic Dryfall Flat, White [No.HP210]. (MPI #118)

2) Dunn-Edwards Corporation; Aquafall Interior Flat Dry Fall Paint. (MPI #118)

3) Pittsburgh Paints Speedhide Super Tech Water Based Interior Dry-Fog Latex, 6-725XI Series, Flat. (MPI #118)

4) Sherwin-Williams Waterborne Acrylic Dryfall, Flat. (MPI #118)

5) Substitutions: See Section 01 60 00 - Product Requirements

4. Top Coat Sheen:

a. Flat: MPI gloss level 1; use this sheen at all locations.

5. Primer: As recommended by top coat manufacturer for specific substrate.

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; MPI #134 or #134 X-Green.
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. Plaster and Stucco: 12 percent.
3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Concrete:

1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
2. Prepare surface as recommended by top coat manufacturer and in accordance with SSPC-SP 13/NACE No.6.

F. Masonry:

G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

H. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high-alkali surfaces.

I. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

J. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

K. 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.

L. 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.

M. 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.

N. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

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. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. 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 93 00
STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Field application of stains.

B. Field application of transparent finishes.

1.02 RELATED REQUIREMENTS

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

B. Section 09 91 23 - Interior Painting: Stains and transparent finishes for concrete substrates.

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.

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 catalog number, and general product category.
2. Manufacturer's installation instructions.

C. Samples: Submit two samples, illustrating selected colors and sheens for each system with specified coats cascaded. Submit on actual wood substrate to be finished, 8 by 8 inch in size.

D. Certification: By manufacturer that stains and transparent finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Manufacturer's Qualification Statement.

G. Applicator's Qualification Statement.

H. Maintenance Data: Submit data including finish schedule showing where each product, color, and finish was used, product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

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 Stock Materials: Stain and transparent finish materials, 1 gal of each color and type; store where directed.
3. Label each container with color and type in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with at least three years of documented experience.

B. Applicator Qualifications: Company specializing in performing work of the type specified and with at least three years of documented 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 stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Stain and Transparent Finish 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 manufacturer of stains and transparent finishes.

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 Temperature: 50 degrees F 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 finishes from the same manufacturer to the greatest extent possible.

1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

2. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.

B. Transparent Finishes:

1. Behr Process Corporation: www.behr.com/#sle.
2. Bona US: www.bona.com/#sle.
3. PPG Paints: www.ppgpaints.com/#sle.
4. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

C. Stains:

1. Behr Process Corporation: www.behr.com/#sle.
2. PPG Paints: www.ppgpaints.com/#sle.
3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 STAINS AND TRANSPARENT FINISHES - GENERAL

A. Finishes:

1. Provide finishes 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 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. Supply each finish material in quantity required to complete entire project's work from a single production run.
4. Do not reduce, thin, or dilute 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 stains and transparent finishes that comply with the most stringent requirements specified in the following:
   a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   b. SCAQMD 1113 Rule.
   c. CARB (SCM).
   d. Architectural coatings VOC limits of California.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

D. Flammability: Comply with applicable code for surface burning characteristics.

E. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

F. Colors: To be selected from manufacturer's full range of available colors.

1. Selection to be made by Architect after award of contract.
2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 EXTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

A. Finish on Wood - Trim:

1. Stain: Exterior Solid Stain for Wood, Water Based.
    a. Products:
        1) Behr Premium Solid Color Waterproofing Stain No.5011 Tintable White (MPI #16).
        2) Pittsburgh Paints Flood Pro Series Solid Color Stain, FLD820 Series. (MPI #16)
        3) Sherwin-Williams WoodScapes Acrylic Solid Color Stain. (MPI #16)
        4) Wolman by Rust-Oleum Corporation DuraStain One Coat Solid Color Stain: www.rustoleum.com/#sle. (MPI #16)
        5) Substitutions: Section 01 60 00 - Product Requirements.
2. Stain: Exterior Semi-Transparent Stain for Wood, Water Based.
    a. Products:
        1) Behr Premium Semi-Transparent Waterproofing Stain No.5077 Tint Base.
        2) Pittsburgh Paints ProLuxe SRD Semi-Transparent Wood Finish, SIK500-190, Matte. (MPI #156)
        3) Sherwin-Williams WoodScapes Polyurethane Semi-Transparent Stain.
        4) Wolman by Rust-Oleum Corporation DuraStain One Coat Semi-Transparent Stain: www.rustoleum.com/#sle.
        5) Substitutions: Section 01 60 00 - Product Requirements.
3. Stain: Exterior Semi-Transparent Stain for Wood Decks, Solvent Based or Water Based.
    a. Products:
        1) Pittsburgh Paints ProLuxe SRD Semi-Transparent Wood Finish, SIK500-190, Matte. (MPI #33)
        2) Wolman by Rust-Oleum Corporation F&P Finish and Preservative: www.rustoleum.com/#sle. (MPI #33)
        3) Substitutions: Section 01 60 00 - Product Requirements.
4. Top Coat(s): Exterior Clear Water Based Varnish with UV Inhibitor.
    a. Products:
        1) Pittsburgh Paints Deft Interior/Exterior Water-Based Polyurethane, DFT259, Satin.
        2) Pittsburgh Paints Deft Interior/Exterior Water-Based Polyurethane, DFT258, Semi-Gloss

3) Pittsburgh Paints Deft Interior/Exterior Water-Based Polyurethane, DFT257, Gloss.

4) United Gilsonite Laboratories ZAR Exterior Water Base High Performance: www.zar.com/#sle.

5) Substitutions: Section 01 60 00 - Product Requirements.

5. Top Coat Sheen:
   a. Satin: MPI gloss level 4; use this sheen at all locations.
   b. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
   c. Gloss: MPI gloss level 6; use this sheen at all locations.
   d. High Gloss: MPI gloss level 7; use this sheen at all locations.

2.04 INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

A. Finish on Wood - Trim:
   1. One-coat varnish over two-coat stain.
   2. Stain: Semi-transparent stain for wood, water based; MPI #186.
      a. Products:
         1) Behr Fast Drying Water-Based Wood Stain [B4500].
   3. Stain: Semi-transparent stain for wood, water based with polyurethane.
      a. Products:
         1) Behr Water-Based Wood Stain and Poly in One, Satin [B6200].
         2) Behr Water-Based Wood Stain and Poly in One, Gloss [B6300].
         3) Substitutions: Section 01 60 00 - Product Requirements.
   4. Sealer: Water based, sanding sealer, clear.
   5. Top Coat: Clear water-based varnish.
      a. Products:
         1) Behr Fast Drying Water-Based Polyurethane [B8100].
         2) Pittsburgh Paints Deft Interior/Exterior Water-Based Polyurethane, DFT259, Satin.
         3) Pittsburgh Paints Deft Interior/Exterior Water-Based Polyurethane, DFT 258, Semi-Gloss.
         4) Pittsburgh Paints Deft Interior/Exterior Water-Based Polyurethane, DFT257, Gloss. (MPI #129)
         5) Rodda Waterborne Alkyd Urethane Varnish, 593 Series, (MPI #128, 129, 130)
         6) Substitutions: Section 01 60 00 - Product Requirements.
   6. Top Coat Sheen:
      a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
      b. Gloss: MPI gloss level 6; use this sheen at all locations.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished 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 stains and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. 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. 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. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand wood surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

G. Reinstall items 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 10 11 00
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass markerboards.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

B. ADA Standards - 2010 ADA Standards for Accessible Design.

C. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

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 glass markerboard.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.

D. Test Reports: Show compliance to specified surface burning characteristics requirements.

E. Manufacturer's printed installation instructions.

F. Manufacturer's Qualification Statement.

G. Maintenance Data: Include data on regular cleaning, stain removal .

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 WARRANTY

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

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. Magnetic Glass Markerboards: MB-1

1. Manufacturers:
    a. Basis of Design Product: Calyx as manufactured by Clarus Glassboards, or approved equal.
    b. Basis of Design Product: View Projection Glass as manufactured by Clarus Glassboards, or approved equal.
    c. Claridge Products and Equipment, Inc: www.claridgeproducts.com/#sle.
    d. Clarus Glassboards: www.clarusglassboards.com.
    e. Egan Visual Corporation; Egan Visual GlassBoards: www.egan.com.
    f. Forms+Surfaces; www.vividglass.com.
    g. Glass Whiteboard: www.glasswhiteboard.com
    h. MooreCo, Inc: www.moorecoinc.com/#sle.
    i. Platinum Visual Systems, Inc.: pvusa.com.
    j. Substitutions: See Section 01 60 00 - Product Requirements.
2. Glass: Tempered, low iron, 1/4 inch thick, with bevel edges and radiused corners, laminated to steel backing sheet for use with magnets. Coated or treated for use as dry erase board or projection surface.
3. Glass Finish: White back-coating.
4. Steel Backing Sheet Thickness: 24 gauge, 0.0239 inch .
5. Size: As indicated on drawings.
6. Frame: No frame.
7. Frame Finish: Anodized, natural.
8. Mounting: Stainless steel standoffs.
9. Accessories: Provide magnetic marker tray and magnetic marker holder.

2.03 MATERIALS

A. Float Glass: Provide float-glass-based glazing unless otherwise indicated.

1. Fully Tempered Safety Glass: Comply with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
2. Thickness: As indicated.

2.04 ACCESSORIES

A. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.

B. 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. 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. Secure units level and plumb.

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. S-1

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: As indicated on Drawing 11.01.
   1. Use individual metal letters.
   2. Mounting Location: Interior as indicated on drawings.

B. Metal Letters:
   1. Material: Bronze casting.
   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.

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 - California Building Code.

D. 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 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 Accessibility : Provide identifying devices meeting the requirements for persons with 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 Section 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 Section 11B-703.2.
   a. Depth: It shall be 1/32 inch minimum above their background and shall be sans serif uppercase and be duplicated in Braille.
   b. Height: It shall be 5/8 inch minimum and 2 inches maximum based on the height of the uppercase letter "I". CBC Section 11B-703.2.5
   c. Finish and contrast: Characters and their background shall have a non-glare finish. Character shall contrast with their background with either light characters on a dark background or dark characters on a light background. CBC Section 11B-703.5.1
   d. Proportions: It shall be selected from fonts where the width of the uppercase letter "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 Section 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 Section 11BCBC Ch. 11B 703.5.7.
   e. Character Spacing: Spacing between individual tactile characters shall comply with CBC Section 11B-703.2.7.
      1) 11B-703.2.8 Line spacing. Spacing between the baselines of separate lines of raised characters within a message shall be 135 percent minimum and 170 percent maximum of the raised character height.
   f. Format: Text shall be in a horizontal format. CBC Section 11B-703.2.9.
   g. Braille: It shall be contracted (Grade 2) and shall comply with CBC Section 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 Section 11B and Figure 11B-703.4.1.
   i. Mounting location: A tactile sign shall be located per CBC Section 11BCBC 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 Section 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.

e. Character Spacing between individual adjacent characters shall be 10% minimum and 35% maximum of character height per CBC Section 11B-703.5.8.

4. Pictograms shall comply with CBC Section 11B-703.6.
5. Symbol of accessibility shall comply with CBC Section 11B-703.7.
6. Variable message signs shall comply with CBC Section 11B-703.8.

2.03 PANEL SIGNAGE

A. Panel Signage:

1. Application: Room and door signs.
2. Description: Flat signs with photopolymer plastic 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-Sheet Sign, Photopolymer face sheet with raised graphics laminated over subsurface graphics to acrylic or phenolic backing sheet to produce composite sheet.
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. 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 Section 11B Figure 11B-703.7.2.4..

a. Include International Symbol of Access for Hearing Loss, CBC Section 11B Figure 11B-703.7.2.4, with text “Assistive-Listening System Available”. Use upper and lower case characters.

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 Section 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 Section 11B-703.4.1 and CBC Ch. 11B11B -703.4.2

D. Protect from damage until final inspection; repair or replace damaged items.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Finishing at recessed fire extinguisher cabinets.

1.03 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

B. FM (AG) - FM Approval Guide.

C. Fire Extinguishers Standard: California Fire Code (CFC) section 906.

D. ADA Standards - 2010 ADA Standards for Accessible Design.

E. ANSI/UL 711 - Rating and Fire Testing of Fire Extinguishers.

F. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

G. CAL Title 19 Chapter 3 - California Code of Regulations (CCR), Title 19, Division 1, Chapter 3, Fire Extinguishers.

H. CBC - California Building Code.

I. CBC Ch. 11B - California Building Code-Chapter 11B.

J. NFPA 10 - Standard for Portable Fire Extinguishers.

K. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

L. UL (DIR) - Online Certifications Directory.

1.04 SUBMITTALS

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

B. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, anchorage details, and installation instructions.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1. Submit for fire extinguishers and cabinets, and indicate compliance with local and State fire regulations for extinguisher mounting heights and locations.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Conform to all requirements of the local and State Fire Marshal. Conform to all applicable requirements of the California Building Code (CBC), CFC, ADA Standards, and Title 19 CCR.

1. Fire Extinguisher cabinets must comply with CBC Ch. 11B-305 Clear floor or ground space, 11B-307 Protruding Objects, CBC Ch. 11B-308 Reach Ranges, CBC Ch. 11B-309/811.4 Operable Parts, CBC Ch. 11B-403 Walking Surfaces, CBC Ch. 11B-811.3 Height.
2. Comply with CBC Ch. 11B-205 Operable Parts and 309 Operable Parts; Controls and operating mechanisms shall be operable with one hand and shall not require tight grasping, pinching or twisting of the wrist. The force required to activate controls shall be no greater than 5 lbf (22.2 N) of force. CBC Ch. 11B-309.4 Operation.

B. Fire Extinguisher Requirements: Conform to NFPA 10, California Fire Code and Title 19 requirements for portable fire extinguishers.

C. Current listing by California State Fire Marshal.

2.02 MANUFACTURERS

A. Fire Extinguishers:

1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com/#sle.
2. Amerex; www.amerex-fire.com.
3. Ansul, Inc. Sentry: www.ansul.com.
4. Kidde, a unit of United Technologies Corp: www.kidde.com.
5. Larsen's Manufacturing Co; Model No. MP5: www.larsensmfg.com.
6. Potter-Roemer; Model 3005: www.potterroemer.com/#sle.
7. Pyro-Chem, a Tyco Business: www.pyrochem.com/#sle.
8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:

1. Activar Construction Products Group, Inc. - JL Industries; Cosmopolitan Series: www.activarcpg.com/#sle.
2. Kidde, a unit of United Technologies Corp: www.kidde.com.
3. Larsen's Manufacturing Co: www.larsensmfg.com.
4. Potter-Roemer: www.potterroemer.com/#sle.
5. Strike First Corporation of America: www.strikefirstusa.com.
6. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10, CAL Title 19 Chapter 3, and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage. Fully serviced and tagged.

1. Stored Pressure Operated: Deep Drawn.
2. Class: 2-A: 10B:C.
3. Size: 5 pound.
4. Size and classification as scheduled.
5. Finish: Baked polyester powder coat color as selected.

2.04 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 and ASTM E119 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.

1. Formed stainless steel sheet; 0.036 inch thick base metal.
2. Basis of Design Product; 6 inch stud: Cosmopolitan Stainless Steel FE Cabinet Recessed 1035V17LDVRFE Flat Trim as manufactured by Activar, or approved equal.
3. Basis of Design Product; 4 inch stud: Cosmopolitan Stainless Steel FE Cabinet Semi-Recessed 1036V17LDVRFE 1-1/2" Square Trim as manufactured by Activar, or approved equal.
4. Basis of Design Product; Surface Mounted: Cosmopolitan Stainless Steel FE Cabinet Surface Mounted 1033V17LDVRFE as manufactured by Activar, or approved equal.

C. Fire Rated Cabinet Construction: One-hour fire rated, or as required by wall assembly.

1. Steel; double wall or outer and inner boxes with 5/8 inch thick fire barrier material.
2. Basis of Design Product; 6 inch stud: Cosmopolitan Stainless Steel FX2 Fire Rated FE Cabinet Semi-Recessed 1036V17FX2-LDVRFE 1-1/2" Square Trim as manufactured by Activar, or approved equal.

D. Cabinet Configuration: Semi-recessed type.

1. Size to accommodate accessories.
2. Exterior nominal dimensions of 13-7/8 inch wide by 27-3/8 inch high by 6 inch deep.
3. Trim: Flat rolled edge, with 13-7/8 inch wide face.
4. Projected Trim: Returned to wall surface, with 3 inch projection, and 1.69 inch wide face.
5. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

E. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with roller type catch. Hinge doors for 180 degree opening with continuous piano hinge.

1. Provide manufacturer's option for compliance with Americans with Disabilities Act (ADA) projection criteria and accessible handle.
2. Latching and locking hardware operable with a single effort by lever-type hardware or other type hardware not requiring ability to grasp opening hardware and not requiring an opening force greater than 5 pounds.

F. Door Style: Slot glazed style vertical duo-panel with glazing, continuous hinge, roller catch, zinc plated pull handle and cylinder lock.
   1. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

G. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

H. Fabrication: Weld, fill, and grind components smooth.

I. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

J. Finish of Cabinet Interior: White colored enamel.

2.05 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.
   1. Where indicated, at Custodial, Mechanical and Electric Rooms, provide surface mounted bracket with retainer straps.
   2. Provide brackets with 3-point connection within cabinets and for locations where fire extinguisher is wall-mounted without cabinet.
      a. Bracket design shall prevent accidental dislodgement of extinguisher.
      b. Provide size required for type and capacity of specified extinguisher.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets in prepared recesses in walls. Verify recess dimensions for standard non-rated and fire rated where required.

C. Install cabinets plumb and level in wall openings, 24 inches from finished floor to inside bottom of cabinet.
   1. Cabinet installation shall conform to requirements of the Fire Marshal, CBC, and ADA for location and height of extinguisher.
   2. Place cabinet to position the extinguisher handle at maximum 48 inches AFF.
   3. Place Cabinet maximum 40 inches (1,016 mm) AFF to centerline of cabinet handle.

D. Secure rigidly in place.

1. Use oval head fasteners with exposed surfaces of same finish as cabinet.
2. Fasten cabinets to metal studs or framing with sheet metal screws
3. Fasten cabinets to wood studs with full threaded wood screws or with sheet metal screws.

E. Maintain acoustical integrity of walls by filling cavity around box with unfaced fiberglass insulation or by applying electrical outlet box acoustical sheeting to the back, top, bottom and sides.

F. Place extinguishers in cabinets and on wall brackets.

1. Mount freestanding fire extinguishers on steel brackets on walls at locations indicated on drawings, with fire extinguisher handle located maximum 48-inches above finish floor. Mount steel brackets to solid backing.
2. Mount fire extinguishers to brackets in all cabinets.
3. Place fire extinguishers immediately prior to issuance of "Notice of Completion" or sooner if directed by Fire Marshal or District.

3.03 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

3.04 SCHEDULES

A. Provide extinguishers and cabinets in quantities and locations as indicated per Drawings, or as indicated by field inspection by Fire Marshall.

B. Conform to CBC Section 906.

C. Place the fire extinguishers based on the allowable maximum travel distance to extinguisher as indicated on Drawing and as follows:

1. Class A = 75 feet
2. Class B = CBC Table 906.3(2)

Hazard Type	Min. Extinguisher Rating	Max. Travel Distance
Light (Low)	5-B	30 Feet
	10-B	50 Feet
Ordinary (Moderate	10-B	30 Feet
	20-B	50 Feet
Extra (High)	40-B	30 Feet
	80-B	50 Feet

3. Class C = 50 Feet
4. Class K = 30 Feet
   a. Comply with CFC 906.4 for spacing and quantity.
      1) Maximum 30 feet from cooking device ("hazard").

D. General Use: 1 Dry Chemical Type 2A-20BC, 10 lb. capacity, baked enamel finish extinguisher; Cabinet recessed mounting.

3.05 TYPES

Fire Class	Geometric Symbol	Pictogram	Intended Use	Mnemonic
A			Ordinary solid combustibles	A for "Ash"
B			Flammable liquids and gases	B for "Barrel"
C			Energized electrical equipment	C for "Current"
D		*(none)*	Combustible metals	D for "Dynamite"
K			Oils and fats	K for "Kitchen"

Fire extinguishing capacity is rated in accordance with ANSI/UL 711: Rating and Fire Testing of Fire Extinguishers.

The ratings are described using numbers preceding the class letter, such as 1-A:10-B:C.

The number preceding the A multiplied by 1.25 gives the equivalent extinguishing capability in gallons of water.

The number preceding the B indicates the size of fire in square feet that an ordinary user should be able to extinguish.

There is no additional rating for class C, as it only indicates that the extinguishing agent will not conduct electricity, and an extinguisher will never have a rating of just C.

END OF SECTION

SECTION 12 24 00
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports for accessories, including in wall framing and plates.

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. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

B. 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. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

B. 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.

C. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

D. Selection Samples: Include fabric samples in full range of available colors and patterns.

E. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Project Record Documents: Record actual locations of control systems and show interconnecting wiring.

H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

I. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in District's name and registered with manufacturer.

J. 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. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com/#sle.
3. MechoShade Systems LLC: www.mechoshade.com/#sle.
4. Skyco Shading; www.skycoshade.com.
5. SWFcontract, a division of Springs Window Fashions, LLC.: www.swfcontract.com/#sle.
6. 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. Roller Shades:

1. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
    a. Drop Position: Regular roll.
    b. Roll Direction: Roll down, closed position is at window sill.
    c. Mounting: Wall mounted.
    d. Size: As indicated on drawings.
    e. Fabric: As indicated under Shade Fabric article.
2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
    a. Material: Stamped steel.

b. Multiple Shade Operation: Provide hardware as necessary to operate more than one shade using a single clutch operator.

3. Roller Tubes: As required for type of shade operation.
   a. Material: Extruded aluminum, clear anodized finish.
   b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
   c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
4. Hembars: Designed to maintain bottom of shade straight and flat.
   a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
5. Manual Operation for Interior Shades:
   a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
   b. Drive Chain: Continuous loop, beaded ball chain with restraining device, 95 lb minimum breaking strength; comply with WCMA A100.1. Provide upper and lower limit stops.
   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.
      2) Manufacturer's standard clip.
6. Accessories:
   a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; fabric wrapped finish to match shade.
      1) Color: As selected by Architect White.
      2) Profile: Square.
   b. End Caps: Provide manufacturer's standard end caps to cover exposed ends of brackets.
   c. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

C. Roller Shades - Basis of Design: MechoShade Systems LLC; UrbanShade Single Roller - Manual; www.mechoshade.com/#sle.
   1. Description: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
      a. Drop Position: Regular roll.
      b. Mounting: Wall mounted.
      c. Size: As indicated on drawings.
      d. Fabric: As indicated under Shade Fabric article.
   2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.

a. Material: Stamped steel.

3. Roller Tubes:
   a. Material: Extruded aluminum.
   b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
   c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
   d. Capable of being removed and reinstalled without affecting roller shade limit adjustments.
4. Hembars: Designed to maintain bottom of shade straight and flat.
   a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
5. Manual Operation:
   a. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
      1) Provide brake assembly mounted on a low-friction plastic hub with wrapped spring clutch.
      2) Brake must withstand minimum pull force of 25 lb in the stopped position.
      3) Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.
   b. Drive Chain: Continuous loop beaded ball chain. Provide upper and lower limit stops.
      1) Chain must withstand a breaking force of no less than 45 lbf.
      2) Chain Retainer: Chain tensioning device complying with WCMA A100.1.
   c. Lift Assist Mechanism: Provide manufacturer's standard device, contained in the idler end of roller tube, when hanging weights exceed roller tube weight limits.
6. Accessories:
   a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; clear anodized finish.
      1) Profile: Square.
      2) Configuration: Captured; fascia stops at bracket end.
   b. 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. MechoShade Systems LLC: www.mechoshade.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: 0, 1, or 3%.
5. Roll Width: 72 inches.
6. Color: As selected by Architect from manufacturer's full range of colors.
7. Fabrication:
   a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.
   b. If height of opening requires multiple panels of railroaded fabric, use battens at seams.
   c. 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 - Inside Mounting: Fill openings from jamb to jamb.
   3. 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.

C. Demonstration: Demonstrate operation and maintenance of window shade system to District's personnel.

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.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Support framing, grounds, and concealed blocking.

1.03 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 2-01 - Classification and Standards for Solid 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).

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation.

1. Provide the information required by AWMAC/WI (NAAWS) Architectural Woodwork Standards.
2. Provide a Woodwork Institute Certified Compliance Label on the first page of the shop drawings.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

G. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

H. 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.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

B. Quality Certification: Provide WI (MCP) inspection report and quality certification of completed work.

1. 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.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

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

B. Correct defective Work within a one year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty for material defects.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWMAC/WI (NAAWS), unless noted otherwise.

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.

1. Flat Sheet Thickness: 1/2 inch, minimum.
2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
    a. Manufacturers:
        1) Avonite Surfaces: www.avonitesurfaces.com.
        2) Dupont: www.corian.com.
        3) Formica Corporation: www.formica.com.
        4) LG Hausys America, Inc; HI-MACS 12mm: www.lghausysusa.com/#sle.
        5) Wilsonart: www.wilsonart.com.
        6) Substitutions: See Section 01 60 00 - Product Requirements.
    b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
    c. NSF approved for food contact.
    d. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
    e. Color and Pattern: As selected by Architect from manufacturer's full line.
3. Other Components Thickness: 1/2 inch, minimum.
4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; bullnosed edge.
5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
6. Skirts: As indicated on drawings.
7. Fabricate in accordance with AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

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.

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.

D. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

1. Finish exposed surfaces smooth and polish to a gloss sheen.
2. Radius corners and edges.
3. Cure components prior to shipment, except sheet materials requiring site handling.

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.
2. Joints Between Adjacent Pieces of Quartz Surfacing:
    a. Joints shall be flush, tight fitting, level, and neat.
    b. Securely join with stone adhesive. Fill joints level with quartz surfacing.
    c. Clamp or brace quartz surfacing in position until adhesive sets.

3.05 CLEANING

A. Remove masking and excess adhesives and sealants. Clean exposed surfaces.

B. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 21 13 00

WET PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes performance requirements for a wet pipe automatic fire sprinkler system and sprinkler system specialties. The contractor shall follow these specifications and the DSA-approved drawings to provide a fully functional fire sprinkler system.

1.02 QUALITY ASSURANCE

A. References: This section contains references to the following standards for manufacture and installation requirements. They are a part of this section in their entirety or as specifically modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

ANSI/ASME B16.9	Factory-Made Wrought Steel Buttwelding Fittings.
ANSI/ASME B16.25	Buttwelding Ends.
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
ANSI/ASME B16.5-96	Pipe Flanges and Flanged Fittings.
ANSI/ASME B16.11-96	Forged Fittings, Socket-Welding and Threaded.
ANSI/ASME B16.1-98	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800. ANSI/ASME B16.4-98 Cast-Iron Threaded Fittings Class 125 and 300.
ANSI/ASME B16.3	Malleable-Iron Castings.
ASTM A47	Ferritic Malleable Iron Castings.
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated.
NFPA 13-2022	Installation of Sprinkler Systems.
UL 262	Gate Valves for Fire Protection Service.
UL 789	Indicator Post for Fire-Protection Service.

B. Automatic Sprinkler Systems: Conform to NFPA 13 (California Amended); 2022 Edition

C. Equipment and Components: Bear UL and/or FM label or marking.

D. Specialist Firm: C-16 licensed fire sprinkler contractor with three years of experience.

E. Design: If the shop drawing differs from the DSA-approved design drawings, the contractor shall submit the changes for DSA review and approval. Design shall be performed under direct supervision of a Professional Engineer experienced in the design of this work and licensed in the State of California.

1.03 SUBMITTALS

A. Submittals: Submit shop drawings, product data, and hydraulic calculations (only if the design is different from the approved drawings).

B. Shop Drawings: Indicate detailed pipe layout, the location of fire risers and fire department connections (FDC), supports, components, accessories, sizes, and coordination with ducts, pipes and any other disciplines.

C. Product Data: Provide data for pipe materials used, valves, and manufacturer's catalog sheet for equipment, indicating rough-in size, finish, and accessories.

D. Operation and Maintenance Instructions: Include components of system, servicing requirements, Record Drawings, inspection data, and parts lists.

E. Extra Materials: Provide extra sprinkler heads, wrenches, and metal storage cabinet.

F. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds code requirements.

PART 2 - PRODUCTS

2.01 SPRINKLER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53, ASTM A120, ANSI/ASTM A135, or ANSI/ASME B36.10, Schedule 10 or 40 black.

1. Steel Fittings: ANSI/ASME B16.9, wrought steel, butt welded; ANSI/ASME B16.25, butt weld ends; ASTM A234, wrought carbon steel and alloy steel; ANSI/ASME B16.5, steel flanges and fittings; ANSI/ASME B16.11, forged steel socket welded and threaded.
2. Cast Iron Fittings: ANSI/ASME B16.1, flanges and fittings; ANSI/ASME B16.4, screwed fittings.
3. Malleable Iron Fittings: ANSI/ASME B16.3, screwed type; ASTM A47.
4. Mechanical Grooved Couplings: Malleable iron housing, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.02 DRAIN VALVES

A. Manufacturers:

1. Crane Co.
2. Kennedy Valve Co.
3. Nibco, Inc.
4. Mueller Co.
5. or Equal

B. UL Listed bronze compression stop with hose thread nipple and cap.

C. UL listed brass ball valve with cap and chain, 3/4 inch hose thread.

2.03 SPRINKLER HEADS

A. Suspended Ceiling Type (Gypsum Board or Acoustical Ceiling Tile)

1. Type: “White” paint finish, concealed pendant.
2. Gypsum Board and Acoustical Ceiling Tile Installation: Where possible sprinkler spacing shall be equal distance between lights, between wall and lights, between lights and air diffuser grilles.
3. Where possible sprinklers shall be located at the center of 2x2 acoustical ceiling tiles and at the “Quarter Point” of 2x4 acoustical ceiling tiles.
4. Quick Response Concealed Pendent Sprinkler.

B. Exposed Ceiling Areas

1. Type: Standard upright with guard. Piping is to be painted; color as selected by Architect.
2. Head Finish: Brushed Chrome Finished.
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Quick Response Sprinklers (Installed where required).

1. Type: Quick response sprinkler with guard.
2. Head Finish: Rough brass.
3. Heat Sensor: Heat sensitive liquid contained in glass bulb.
4. Quick response concealed sprinkler.

D. Guards: Match finish with sprinkler head.

2.04 SPRINKLER PIPING SPECIALTIES

A. Electric Alarm: Electrically operated red enameled gong with pressure alarm switch.

B. Water Flow Switch: Vane type switch with two contacts.

C. Identification Signs: Attach properly lettered and approved metal signs at alarm device. Permanently affix hydraulic design data nameplates to the riser of system.

D. Inspector’s Test Connection: Provide test connections approximately 6 feet above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device; locate at the hydraulically most remote part of each system. Provide test connection piping to a location where the discharge will be readily visible and where water may be discharged without property damage.

E. Main Drains: Provide separate drain piping to discharge at safe points outside each building. Provide auxiliary drains as required by NFPA 13.

J. Escutcheon Plates: Provide one piece or split hinge type metal plates for piping passing through walls, floors, and ceilings in exposed spaces. Provide polished stainless-steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All pipefitters on this must be certified through SFM for AES certification and shall have their card on them at all times (note: n/a to apprentices)

B. Install equipment in accordance with manufacturer's instructions.

C. Ream pipe and tube ends to full inside diameter. Remove burrs and bevel plain end ferrous pipe.

D. Remove scale and foreign material, inside and outside, before assembly.

E. Provide sleeves when penetrating footings, floors and walls. Seal pipe and sleeve penetration to maintain fire resistance equivalent to fire separation required.

F. Place pipe runs to minimize obstruction to other work. Offset around ductwork. Place piping in concealed spaces above finished ceilings.

H. Provide drain valves at main shut-off valves, low points of piping and apparatus.

I. Determine volume and pressure of incoming water supply from recent water flow test.

J. Protection:

1. Apply temporary tape or paper cover to ensure sprinkler heads do not receive paint finish.
2. Ensure concealed sprinkler head cover plates do not receive field paint finish.

K. Interface sprinkler system with building fire and smoke alarm system.

L. Flush entire piping system of foreign matter.

M. Hydrostatically test entire system. Test shall be witnessed by the “Inspector of Record”.

N. Layout shall reflect hazard rating density and related requirements.

O. Fire sprinkler mains and branches shall be located as required to avoid chilled and hot water piping, ductwork and exhaust shafts.

P. Mains and branches shall be supported from the building structure.

S. All fire-rated wall and floor penetrations shall comply with an established UL listed method.

T. All sprinkler and fire protection piping shall be primed for painting.

U. For areas with dropped T-bar ceiling, locate sprinkler heads at center of tile.

PART 4 – TESTS

4.01 TESTS

A. Perform all acceptance tests required by NFPA 13 and DSA.

B. Sprinkler piping to be hydrostatically tested at 200 psi and shall maintain that pressure for 2 hours.

C. Required test shall be witness by DSA inspector.

D Prepare test and inspection reports.

END OF SECTION

SECTION 230000
GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. Basic mechanical requirements specifically applicable to Division 23 and 33 Sections.

B. Work includes but is not necessarily limited to the following:

1. Labor, materials, services, equipment, and appliances required for completion of tasks as indicated on drawing or in specification or as inherently necessary to prepare spaces and systems for new installations as follows:

a. Steam piping systems and equipment

b. Testing, adjusting and balancing

1.3 DRAWINGS AND SPECIFICATIONS

A. Drawings accompanying these Specifications show intent of Work to be done. Specifications shall identify quality and grade of installation and where equipment and hardware is not particularly specified, Contractor shall provide submittals for all products and install them per manufacturers' recommendations, and in a first class manner.

B. Examine Drawings and Specifications for elements in connection with this Work; determine existing and new general construction conditions and be familiar with all limitations caused by such conditions.

C. Plans are intended to show general arrangement and extent of Work contemplated. Exact location and arrangement of parts shall be determined after the Owner has reviewed equipment, as Work progresses, to conform in best possible manner with surroundings, and as directed by the Owner's Representative.

D. Contract Documents are in part diagrammatic and intended to show the scope and general arrangement of the Work under this Contract. The Contractor shall follow these drawings in laying out the equipment, piping and ductwork. Drawings are not intended to be scaled for roughing in measurements or to serve as shop drawings. Where job conditions require minor changes or adjustments in the indicated locations or arrangement of the Work, such changes shall be made without change in the Contract amount.

E. Follow dimensions without regard to scale. Where no figures or notations are given, the Plans shall be followed.

1.4 UTILITIES

A. Location and sizes of electrical, mechanical and plumbing service facilities are shown in accordance with data secured from existing record drawings and site observations. Data shown are offered as an estimating guide without guarantee of accuracy. Check and verify all

data given, and verify exact location of all utility services pertaining to Work prior to excavation or performing Work.

1.5 APPLICABLE REFERENCE STANDARDS, CODES AND REGULATIONS

A. Meet requirements of all state codes having jurisdiction.

B. State of California Code of Regulations:

1. Title 8, Industrial Relations
2. Title 19, State Fire Marshal Regulations
3. Current California Building Code (CBC), Title 24, Part 2
4. Current California Electrical Code, Title 24, Part 3
5. Current California Mechanical Code, Title 24, Part 4
6. Current California Plumbing Code, Title 24, Part 5
7. Current California Energy Code, Title 24, Part 6
8. Current California Fire Code, Title 24, Part 9
9. Current California Standards Code, Title 24, Part 12

C. Additional Referenced Standards:

1.	AABC	Associated Air Balance Council
2.	AMCA	Air Moving and Conditioning Association
3.	ARI	Air-Conditioning and Refrigeration Institute
4.	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
5.	ASME	American Society of Mechanical Engineers
6.	ASTM	American Society for Testing and Materials
7.	NEMA	National Electrical Manufacturer's Association
8.	NFPA	National Fire Protection Association Standards
9.	PDI	Plumbing and Drainage Institute
10.	UL	Underwriters Laboratories

D. Codes and ordinances having jurisdiction over Work are minimum requirements; but, if Contract Documents indicate requirements, which are in excess of those minimum requirements, then requirements of the Contract Documents shall be followed. Should there be any conflicts between Contract Documents or codes or any ordinances having jurisdiction, report these to the Owner's Representative.

E. Obtain permits, and request inspections from authority having jurisdiction.

1.6 PROJECT AND SITE CONDITIONS

A. The arrangement of and connection to equipment shown on the Drawings is based upon information available and is not intended to show exact dimensions peculiar to a specific manufacturer. The Drawings are, in part, diagrammatic and some features of the illustrated equipment installations may require revision to meet actual equipment installation requirements. Structural supports, housekeeping pads, piping connections and adjacent equipment may have to be altered to accommodate the equipment provided. No additional payment will be made for such revisions or alterations.

B. Examine all Drawings and Specifications to be fully cognizant of all work required under this Division.

C. Examine site related work and surfaces before starting work of any Section.

D. Install Work in locations shown on approved Drawings, unless prevented by Project conditions.

E. Prepare shop drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission from the Owner's Representative before proceeding.

1.7 COOPERATION WITH WORK UNDER OTHER DIVISIONS

A. Cooperate with other trades to facilitate general progress of Work. Allow all other trades every reasonable opportunity for installation of their work.

B. Work under this Division shall follow general building construction closely. Set pipe sleeves and inserts and verify that openings for chases and pipes are provided.

C. Work with other trades in determining exact location of outlets, pipes, and pieces of equipment to avoid interference with lines required to maintain proper installation of Work.

D. Make such progress in the Work to not delay work of other trades.

1.8 DISCREPANCIES

A. The Contractor shall check all Drawings furnished him immediately upon their receipt and shall promptly notify the Owner's Representative of any discrepancies. Figures marked on Drawings shall in general be followed in preference to scale measurements. Piping and instrumentation diagrams shall in general govern floor plans and sections. Large-scale drawings shall in general govern small-scale drawings.

B. Where requirements between Drawings and Specifications conflict, the more restrictive provisions shall apply.

C. If any part of the Specifications or Drawings appears unclear or contradictory, apply to Owner's Representative for interpretation and decision as early as possible, including during bidding period. Do not proceed with such work without Owner Representatives decision. Beginning work of any Section constitutes acceptance of conditions.

1.9 CHANGES

A. The Contractor shall be responsible to make and obtain approval from the Owner's Representative for all necessary adjustments in piping and equipment layouts as required to accommodate the relocations of equipment and/or devices, which are affected by any approved authorized changes or Product substitutions. All changes shall be clearly indicated on the "Record" drawings.

1.10 SUBMITTALS

A. Refer to Division 01 for additional requirements.

B. The manufacturer, contractor or supplier shall include a written statement that the submitted equipment, hardware or accessory complies with the requirement of that particular specification section.

C. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section.

D. All **exceptions** shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

E. Note that prior to acceptance of submittals for review, a submittal schedule shall be submitted to the Owner's Representative.

F. Submit all Division 23 shop drawings and product data grouped and referenced by the specification technical section number in one complete submittal package.

G. Shop Drawings:

1. Include installation details of equipment indicating proposed location, layout and arrangement, accessories, piping, and other items that must be shown to assure a coordinated installation.
2. Indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.
3. If equipment is disapproved, revise drawings to show acceptable equipment and resubmit.
4. Whenever more than one (1) manufacturer's product is specified, the first named product is the basis of design used in the Drawings and the use of alternate-named manufacturer's products or substitutes may require modifications to the design.
5. The Contractor shall be responsible for all equipment ordered and/or installed prior to receipt of shop drawings returned from the Owner's Representative bearing the Owner's Representative stamp of "Reviewed". All corrections or modifications to the equipment as noted on the shop drawings shall be performed and equipment removed from the job site at the request of the Owner's Representative without additional compensation.
6. Manufacturer's Data: For each manufactured item, provide current manufacturer's descriptive literature of cataloged products, certified equipment drawings, diagrams, performance and characteristic curves if applicable, and catalog cuts.
7. Standard Compliance: When materials or equipment provided by the Contractor must conform to the standards of organizations such as American National Standards Institute (ANSI) or American Water Works Association (AWWA), submit proof of such conformance to the Owner Representative for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified. In lieu of the label or listing, submit a certificate from an independent testing organization, which is competent to perform acceptance testing and is approved by the Owner Representative. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard.
8. Certified Test Reports: Before delivery of materials and equipment, certified copies of all test reports specified in individual sections shall be submitted for approval.
9. Certificates of Compliance or Conformance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for this Contract. Pre-printed certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet

requirements specified, such as "as good as"; or "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance or conformance.

1.11 PRODUCT ALTERNATIVES OR SUBSTITUTIONS

A. Refer to General Conditions and Division 01 for additional requirements.

1.12 OPERATING INSTRUCTIONS

A. Furnish approved operating instructions for systems and equipment indicated in the technical sections for use by operation and maintenance personnel.

1.13 MANUFACTURER'S RECOMMENDATIONS

A. Where installation procedures or any part thereof are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendations shall be cause for rejection of the equipment or material.

1.14 DELIVERY AND STORAGE

A. Refer to Division 01 for additional requirements.

B. Handle, store, and protect equipment and materials in accordance with the manufacturer's recommendations and with the requirements of NFPA 70B P, Appendix I, titled "Equipment Storage and Maintenance During Construction." Replace damaged or defective items with new items.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 GENERAL

A. Obtain and pay for all permits and inspections, including any independent testing required to verify standard compliance, and deliver certificates for same to the Owner’s Representative.

3.2 WORK RESPONSIBILITIES

A. The drawings indicate diagrammatically the desired locations or arrangement of piping, 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 with structural conditions.

B. The Contractor is responsible for the correct placing of Work and the proper location and connection of Work in relation to the work of other trades. Advise appropriate trade as to locations of access panels.

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 extra cost, providing the change is ordered before the ductwork, piping, etc. and work directly connected to same is installed and no extra materials are required.

D. Where equipment is furnished by others, verify dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.

E. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc. with the drawings to see that the equipment will fit into the spaces provided without violation of applicable codes.

F. Should any changes to the Work indicated on the Drawings or described in the Specifications be necessary in order to comply with the above requirements, notify the Owner immediately and cease work on all parts of the contract, which are affected until approval for any required modifications to the construction has been obtained from the Owner.

G. Be responsible for any cooperative work, which must be altered due to lack of proper supervision or failure to make proper provisions in time. Such changes shall be under direction of the Owner and shall be made to his satisfaction. Perform all Work with competent and skilled personnel.

H. All work, including aesthetic as well as mechanical aspects of the Work, shall be of the highest quality consistent with the best practices of the trade.

I. Replace or repair, without additional compensation, any Work, which, in the opinion of the Owner, does not comply with these requirements.

END OF SECTION

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. Dielectric fittings.
3. Escutcheons.
4. Equipment installation requirements common to equipment sections.
5. Concrete bases.
6. 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.

1.3 SUBMITTALS

A. Welding certificates.

B. Product Information for approval before purchase

C. Operation and Maintenance Manuals

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.

PART 2 - PRODUCTS

2.1 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.

2.2 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

C. Pipe Flange Nuts and Bolts: Provide 304 stainless steel bolts, washers and nuts for mechanical rooms, underground piping and in humid areas.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12.

2.3 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150 psig minimum working pressure as required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 150-psig minimum working pressure at 225 deg F.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 150-psig minimum working pressure at 225 deg F.

2.4 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, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated

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.

M. Verify final equipment locations for roughing-in.

N. 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 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 "

3.6 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.

3.7 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.

END OF SECTION

SECTION 23 05 19

METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.
5. Test plugs.
6. Test-plug kits.

1.3 ACTION SUBMITTALS

A. The manufacturer, contractor or supplier shall include a written statement that the submitted equipment, hardware or accessory complies with the requirement of this particular specification section.

1. The manufacturer shall resubmit this specification section showing compliance with each respective paragraphs and specified items and features.
2. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.
3. Individual or partial submittals are not acceptable and will be returned without review.

B. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ADJUSTABLE ANGLE THERMOMETERS

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

1. Trerice, H. O. Co.

2. Weiss Instruments, Inc.
3. WIKA Instrument Corporation - USA.

B. Standard: ASME B40.200.

C. Case: V-shape design. cast aluminum.

D. Fill type: Blue liquid

E. Connector Type(s): Union joint, adjustable angle, lockable.

F. Connector Size: 3/4 inch, with ASME B1.1 screw threads.

G. Stem: 304 Stainless steel.

H. Window: Glass or ultraviolet protective acrylic.

I. Scale Size: 9 inches.

J. Accuracy: Plus or minus 1 percent of scale range.

2.2 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: CUNI.
4. Material for Use with Steel Piping: Type 316 stainless steel.
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.

2.3 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. Ashcroft Inc
   b. Trerice, H. O. Co.
   c. Weiss Instruments, Inc.
   d. WIKA Instrument Corporation - USA.
2. Standard: ASME B40.100.
3. Case: Silicone liquid filled, hermetically sealed, solid-front, pressure relief type; cast aluminum or drawn steel; 4-1/2-inch nominal diameter.

4. Pressure-Element Assembly: Bourdon tube.
5. Pressure Connection: Brass, with NPS 1/4, 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: Stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.4 TEST PLUG

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
   1. Peterson Equipment Co., Inc.
   2. Sisco Manufacturing Company, Inc.
   3. Trerice, H.O. Co.
   4. 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 ¼ or NPS ½, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 275 °F.

F. Core Inserts: Nordel (Ethylene-Propylene self sealing rubber).

2.5 TEST-PLUG KITS

A. Temperature Readout Manufacturer & Model:
   1. Fluke Model 116-HVAC with (in addition) 80PK-22 Type K Probe

B. Pressure Gauge:
   1. Ashcroft Series D1005PS Gerneral Purpose Digital Gauge, provide (2) pressure gages 0 to 100 PSIG and 0 to 200 PSIG, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

C. Carrying Case: provide carrying case with foam cutouts to hold Gauges with P/T probes, and a case for the Fluke 80PK-22 Type K Probe.

2.6 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 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 pipe threads.

C. Valves: Brass or stainless-steel needle, with NPS 1/4, ASME B1.20.1 pipe threads.

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. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

G. Install valve and snubber in piping for each pressure gage for fluids.

H. Install test plugs in piping tees or weld-o-lets. Total length of top of test plug to surface of pipe shall not exceed 4-1/2" Test plug cap restraint and cap shall extent past pipe insulation, and test plug shall be vapor sealed to insulation with cap and cap restraint exposed and easily accessible.

I. Install thermometers in the following locations:

1. Inlet and outlet of air handling chilled water and hot water coil.
2. Entrance and exit of main building service.

J. Install pressure gages in the following locations:

1. Inlet and outlet of air handling chilled water and hot water coil.
2. Entrance and exit of main building service.
3. Discharge of each pressure-reducing valve.

K. Install pressure/temperature plug in the following locations:

1. Next to a location of a pressure gauge, temperature gauge, or EMS pressure/temperature sensor location. Can use one plug location for common Temperature / Pressure / EMS readings.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines and equipment.

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 entrance and exit of building and inlet and outlet of coils shall be adjustable angle type.

B. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Heating Hot Water: 30°F to 240°F

B. Chilled Water: 0°F to 100°F

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at entrance and exit of building and inlet and outlet of coil shall be the following:

1. Solid-front, pressure-relief, direct-mounted, metal case.
2. Test plug with chlorosulfonated polyethylene synthetic EPDM self-sealing rubber inserts.

B. Pressure gages at discharge of each pressure-reducing valve shall be the following:

1. Solid-front, pressure-relief, direct-mounted, metal case.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Heating Hot Water: 0 to 100 psi.

B. Chilled Water: 0 to 100 psi.

END OF SECTION

SECTION 23 05 23

GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Iron, single-flange butterfly valves.

B. Related Sections:

1. Division 23 HVAC piping Sections for specialty valves applicable to those Sections only.
2. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.2 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handlever: For quarter-turn valves NPS 6 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. 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.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.

2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.2 BRONZE BALL VALVES

A. Three-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Milwaukee Valve Company.
    b. NIBCO INC.
    c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
    a. Standard: MSS SP-110.
    b. SWP Rating: 150 psig.
    c. CWP Rating: 600 psig.
    d. Body Design: Two piece.
    e. Body Material: Bronze.
    f. Ends: Threaded.
    g. Seats: PTFE or TFE.
    h. Stem: Stainless steel.
    i. Ball: Stainless steel, vented.
    j. Port: Full.

2.3 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Crane Co,; Crane Valve Group; Jenkins Valves.
    b. Crane Co.; Crane Valve Group; Stockham Division.
    c. Tyco Valves & Controls; a unit of Tyco Flow Control.
    d. Milwaukee Valve Company.
    e. NIBCO INC.
2. Description:
    a. Standard: MSS SP-67, Type I.
    b. CWP Rating: 200 psig
    c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
    d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
    e. Seat: EPDM.
    f. Stem: One- or two-piece stainless steel.

g. Disc: Aluminum bronze.

B. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Jenkins Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Tyco Valves & Controls' a unit of Tyco Flow Control.
   d. Milwaukee Valve Company.
   e. NIBCO INC.
2. Description:
   a. Standard: MSS SP-67, Type I.
   b. CWP Rating: 200 psig.
   c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
   d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
   e. Seat: EPDM.
   f. Stem: One- or two-piece stainless steel.
   g. Disc: Nickel-plated or -coated ductile iron.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or butterfly.
2. 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 except where solder-joint valve-end option is indicated in valve schedules below.
2. For Steel Piping, NPS 2 and Smaller: Threaded ends.
3. For Steel Piping, NPS 2-1/2" to NPS 4": Flanged ends
4. For Steel Piping, NPS 5" and Larger: Flanged ends.

3.5 CHILLED WATER AND HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2" and Smaller:

1. Ball Valves: Three piece, full port, bronze with stainless-steel trim.

B. Pipe NPS 2-1/2" and Larger:

1. Iron Valves, NPS 2-1/2" to NPS 4": flanged ends.
2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2" to NPS 12": 200 CWP, EPDM seat, aluminum-bronze or ductile-iron disc.

END OF SECTION

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope: This section specifies pipe and equipment hangers, brackets, and supports. Pipe supports shall be furnished complete with all necessary inserts, bolts, nuts, rods, washers and other accessories. Piping seismic restraints are specified in Section 23 05 48.

B. Operating Conditions: The hangers and supports specified in this section are provided to resist pipe loads occurring primarily in the downward (gravity) direction. For the purpose of pipe hanger and support selection, this section establishes pipe support classifications based on the operating temperatures of the piping contents. Pipe support classifications are as follows:

1. Cold Systems: 33°F to 59°F.
2. Ambient Systems: 60°F to 119°F.
3. Hot Systems: 120°F to 250°F.

C. Hanger and Support Selection:

1. In certain locations, pipe supports, anchors, and expansion joints have been indicated on the Drawings, but no attempt has been made to indicate every pipe support, anchor and expansion joint. It shall be the Contractor's responsibility to provide a complete system of pipe supports, to provide expansion joints, and to anchor all piping, in accordance with the requirements set forth herein. Additional pipe supports may be required adjacent to expansion joints, couplings, or va
2. lves.
3. Concrete or fabricated steel and FRP supports shall be as indicated on the Drawings, as specified in other sections, or, in the absence of such requirements, as permitted by the Owner's representative.
4. The Contractor shall select pipe hangers and supports as specified in this Section. Stock hanger and support components shall be used wherever practical. Selections shall be based upon the pipe support classifications specified in this Section; the piping insulation thickness specified in Section 23 07 19, and any special requirements, which may be specified in the Project Specification.
5. The Contractor shall review the piping layout in relation to the surrounding structure and adjacent piping and equipment before selecting the type of support to be used at each hanger point.
6. All piping shall be rigidly supported and anchored so there is no movement or visible sagging between supports.
7. Hangers and supports shall withstand all static and specified dynamic conditions of loading to which the piping and associated equipment may be subjected. As a minimum, consideration should be given to the following conditions:

a. Weights of pipe, valves, fittings, insulating materials, suspended hanger components, and normal fluid contents.

b. Weight of hydrostatic test fluid or cleaning fluid if normal operating fluid contents are lighter.

c. Reaction forces due to the operation of safety or relief valves.

d. Wind loadings on outdoor piping.

8. Hangers and supports shall be sized to fit the outside diameter of pipe, tubing, or, where specified, indicated or required, the outside diameter of insulation.

9. Where negligible movement occurs at hanger locations, rod hangers should be used for suspended lines, wherever practical. For piping supported from below, bases, brackets or structural cross members should be used.

10. Hangers for the suspension of size 2-1/2 inches and larger pipe and tubing shall be capable of vertical hanger component adjustment under load.

11. The supporting systems shall provide for and control the free or intended movement of the piping including its movement in relation to that of connected equipment.

12. Where there is horizontal movement at a suspended type hanger location, hanger components shall be selected to allow for swing. The vertical angle of the hanger rod shall not, at any time, exceed 4 degrees.

13. There shall be no contact between a pipe and hanger or support component of dissimilar metals when supporting copper tubing by use of felt isolator inserts, rubber, plastic or vinyl coated, or felt lined hanger and support components.

14. Unless otherwise specified, existing pipes and supports shall not be used to support new piping.

15. Unless otherwise specified, pipe support components shall not be attached to pressure vessels.

16. Plumber's tape shall not be used to support piping.

1.2 QUALITY ASSURANCE

A. References: This section contains references to the following standards for manufacturer and installation requirements. They are a part of this section in their entirety or as specifically modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail. In case of conflict between the listed documents, the more stringent requirement shall prevail.

AISC M016	Manual of Steel Construction - 9th Edition
ASME B31.1	Power Piping
ASME B31.2	Fuel Gas Piping
ASME B31.9	Building Services Piping
ASTM E84	Surface Burning Characteristics of Building Materials, Test Method for
MSS SP58	Pipe Hangers and Supports - Materials, Design and Manufacturer.
MSS SP69	Pipe Hangers and Supports - Selection and Application.

NFPA 13	Installation of Sprinkler Systems.
NFPA 14	Installation of Standpipe and Hose Systems.
SMACNA	Seismic Restraint Manual Guidelines for Mechanical Systems.
UL 203	Pipe Hanger Equipment for Fire Protection Service

B. Supports for Mechanical Systems and Plumbing Piping Systems: In conformance with MSS SP-58 and SP-69.

C. Supports for Sprinkler Piping: In conformance with minimum requirements as established in NFPA 13.

D. Supports for Standpipes: In conformance with minimum requirements as established in NFPA 14.

1.3 SUBMITTALS

A. Submit the following under provisions of Section 230000:

1. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.
2. Product Data: Provide manufacturers catalog data including load capacity.
3. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers. For every piece of material or equipment with an operating weight of 500 pounds or more, the Contractor shall submit a design support drawing prepared and sealed by a California Licensed Structural Engineer. All designs shall conform to 2010 CBC requirements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

A. Standard pipe supports and components shall be manufactured by B-Line, Carpenter & Patterson, Kin-Line, ITT Grinnell, Michigan, Pipe Shields Incorporated, Superstrut, Unistrut, Tolco, Piping Technology & Products, Inc. or equal.

B. Hydronic Piping:

1. Conform to ASME B31.9, MSS SP58 and MSS SP69.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring, and spring hanger.
3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis, spring hanger.
4. Hangers for Hot Pipe Sizes 2 to 6 Inches: Carbon steel, adjustable, roller, spring hanger.
5. Hangers for Hot Pipe Sizes 6 Inches and Over: Not Used.
6. Pipe Anchor:
    a. Manufacturers:
        1) Piping Technology & Products, Inc.
        2) ITT Grinnell
        3) B-Line
        4) Or equal.

b. Factory fabricated, double saddle, welded construction, made of high strength carbon steel.

c. Anchor shall be capable of withstanding a deadweight (downward force) equivalent to the weight 28 feet of Sch.40 pipe filled with water of the pipe size it supports.

d. Provide with critical dimensions as indicated on the Drawings.

e. Anchors shall be degreased, and deburred, shop coat primed and ready for welding when delivered to the jobsite.

f. Pipe anchor shall be capable of withstanding a lateral seismic force equal to 0.6 times the deadweight force. Pipe anchor shall be capable of withstanding an axial thrust load equal to 1/2 of the deadweight force.

7. Pipe Slide Support Assembly:

a. Manufacturers:

1) Piping Technology & Products, Inc.

2) ITT Grinnell

3) B-Line

4) Or equal.

b. Factory fabricated, (2) piece assembly, as indicated on the Drawings.

c. Top piece shall consist of saddle support with double U-bolt hold down assembly. Assembly shall be completely factory fabricated and have slots for the four (4) hold down bolts of the bottom assembly. Slots shall be sized as follows:

1) Chilled Water: Provisions for 3/4" slide, either direction along pipe axis.

2) Refer to the front and side view shown on the drawings.

d. Assembly shall be capable of withstanding a downward deadweight force equal to the weight of 28 feet of Schedule 40 pipe filled with water of the pipe size it supports. Assembly shall also be capable of withstanding a lateral or tangential seismic horizontal force equal to 0.6 times the deadweight.

8. Pipe Guide Assembly:

a. Manufacturers:

1) Piping Technology & Products, Inc.

2) ITT Grinnell

3) B-Line

4) Or equal.

b. Factory fabricated, two (2) piece, welded construction, and made entirely of carbon steel.

c. Unit shall consist of retainer outer tube and spider slide/pipe clamp assembly.

d. Assembly shall be capable of withstanding a downward deadweight force equal to the weight of 28 feet of Schedule 40 pipe filled with water of the pipe size it supports. Assembly shall also be capable of withstanding a lateral or tangential seismic horizontal force equal to 0.6 times the deadweight.

9. Elbow Supports:

a. Welded steel pipe stand with steel base plate anchored and grouted to floor, seismic spring support and welded steel extension off pipe elbow. Use U-bolt cradle where support is below horizontal pipe; refer to the Drawings.

b. Spring shall have minimum 2" deflection.

10. Wall Support for Pipe Sizes to 4" shall be as indicated on the Drawings.

2.2 STRUCTURAL ATTACHMENTS

A. Steel beam clamp with Eye Nut: Beam clamp and eye nut shall be forged steel. Configuration and components shall comply with MSS and FEDSPEC Type 28. Grinnell Fig. 292, Carpenter & Patterson Fig. 297, or equal.

B. Welded Beam Attachment: Beam attachment shall be carbon steel and comply with MSS and FEDSPEC Type 22. B-Line B3083, Grinnell Fig. 66, or equal.

C. Welded Steel Bracket: Bracket shall be carbon steel and comply with MSS Type 32 and FEDSPEC Type 33 for medium welded bracket shall comply with MSS Type 33 and FEDSPEC Type 34.

D. Beam "C" Clamp with Locknut and Retaining Strap: Beam clamp and locknut shall be forged steel. Configuration and components shall comply with MSS and FEDSPEC Type 19. Tolco Fig. 65 or 66 with Fig. 69 retaining strap, B-Line B3036 with B3362 strap, or equal.

E. Concrete Wall Attachment: Concrete wall attachments shall conform to SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

2.3 ACCESSORIES

A. Hanger Rods: Rods shall be carbon steel or 304 stainless steel, threaded on both ends or continuous threaded and sized as specified.

B. Weldless Eye Nut: Eye nut shall be forged steel and shall comply with MSS and FEDSPEC Type 17. Eye nut shall be Grinnell Fig. 290, B-Line B2300, or equal.

C. Welded Eye Rod: Eye rod shall be carbon steel with eye welded closed. Inside diameter of eye shall accommodate a bolt diameter 1 / 8 inch larger than the rod diameter. Eye rod shall be Grinnell Fig. 278, B-Line B2311, or equal.

D. Turnbuckle: Turnbuckle shall be forged steel and shall comply with MSS and FEDSPEC Type 15. Turnbuckle shall be Grinnell Fig. 230, B-Line B2311, or equal.

E. Metal Framing Channel: Framing channel shall conform to the Metal Framing Manufacturers Association Standard MFMA-1. Framing channel shall be 1-5/8 inches square, roll formed, and 12–gage carbon steel. Channel shall have a continuous slot along one side with inturned clamping ridges. Framing channel shall be Unistrut P-1000 series, Superstrut A-1200

F. series, or equal.

G. Vinylester Resin Fiberglass Framing Channel: Framing channel shall conform to ASTM E84 and shall be Class 1 fire-rated. Framing channel shall be 1-5/8" square. All channels shall be supplied with integral notches at 1" on center. Notches shall be located on the interior flange to prevent stoppage of pipe clamps and fittings after installation. Seal exposed glass fibers at cuts with manufacturer's sealant. Framing channel shall be StruTech, Series 200, vinylester resin fiberglass or equal (no known equ

H. al).

I. Thermal Pipe Hanger Shield: Thermal shields shall be provided at hanger, support and guide locations on pipe requiring insulation. The shield shall consist of an insulation layer encircling the entire circumference of the pipe and a steel jacket encircling the insulation layer and shall be as specified in Section 23 07 13. The thermal shield shall be the same thickness as the piping system insulation specified in Section 23 07 13. The vapor barrier shield shall be used for cold systems. Stainless steel band clamps shall be used where specified to ensure against slippage between the pipe wall and the thermal shield.

2.4 INSERTS:

A. Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

PART 3 - EXECUTION

3.1 INSERTS

A. Provide inserts for placement in concrete formwork.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.2 PIPE HANGER AND SUPPORT LOCATIONS

A. The Contractor shall locate hangers and supports as near as possible to concentrated loads such as valves, flanges, etc. Locate hangers, supports and accessories within the maximum span lengths specified in the project specifications to support continuous pipeline runs unaffected by concentrated loads.

B. At least one hanger or support shall be located within 2 feet from a pipe change in direction.

C. The Contractor shall locate hangers and supports to ensure that connections to equipment, tanks, etc., are substantially free from loads transmitted by the piping.

D. Where piping is connected to equipment, a valve, piping assembly, etc. that will require removal for maintenance, the piping shall be supported in such a manner that temporary supports shall not be necessary for this procedure.

E. Pipe shall not have pockets formed in the span due to sagging of the pipe between supports caused by the weight of the pipe, medium in the pipe, insulation, valves and fittings.

F. Support horizontal cast iron pipe within 18 inches of each joint.

G. Support vertical piping at every floor. Support vertical cast iron pipe at each floor level, not to exceed 8 feet on center spacing.

3.3 INSTALLATION

A. Welded and bolted attachments to the building structural steel shall be provided where required and shall be in accordance with the requirements of SMACNA Seismic Restraint

Guide and AISC M016. Unless otherwise specified, there shall be no drilling or burning of holes in the building structural steel.

B. Unless otherwise indicated, attachments to the building concrete shall be in accordance with the requirements of SMACNA Seismic Restraint Guide.

C. Hanger components shall not be used for purposes other than, for which they were designed. They shall not be used for rigging and erection purposes.

D. The Contractor shall install items to be embedded before concrete is poured. Fasten embedded items securely to prevent movement when concrete is poured.

E. Embedded anchor bolts shall be used instead of concrete inserts for support installations in areas below water surface or normally subject to submerging.

F. The Contractor shall install thermal pipe hanger shields on insulated piping at required locations during hanger and support installation. Butt joint connections to pipe insulation shall be made at the time of insulation installation in accordance with the manufacturer's recommendations.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide felt lined inserts for copper piping.

J. Hanger and support components in contact with plastic or FRP pipe shall be free of burrs and sharp edges.

K. Rollers shall roll freely without binding.

L. Finished floor beneath pipe stand and framing channel post bases shall be roughed prior to grouting. Grout between base plate and floor shall be free of voids and foreign material.

M. Base plates shall be cut and drilled to specified dimensions prior to welding stanchions or other attachments and prior to setting anchor bolts.

N. Plastic or rubber end caps shall be provided at the exposed ends of all framing channels that are located up to 7 feet above the floor.

O. Prime coat all exposed steel hangers and supports. Refer to Section 09900 for finish painting. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

P. Unless otherwise indicated, exposed exterior steel pipe supports, channel, and clamps shall have hot dipped galvanized finish of minimum 1.50 ounces per square foot on each side in conformance with ASTM A123.

Q. Welds on pipe supports, either interior or exterior shall be cleaned of flux and finished with a "zinc rich" primer.

R. The Contractor shall adjust hangers and supports to obtain required pipe slope and elevation. Shims made of material that is compatible with the piping material may be used. Stanchions shall be adjusted prior to grouting their base plates.

S. Beam clamps shall not be installed on piping greater than 8 inches in diameter. All beam clamps shall have beam clamp retaining straps.

3.4 EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, thickness as indicated on the Drawings and extending 6 inches beyond supported equipment.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.5 FLASHING

A. Provide flashing where indicated or necessary.

B. Provide flexible flashing and metal counter flashing where ductwork penetrates weather or waterproofed walls, floors, and roofs.

C. Flash vent and water pipes projecting 12 inches minimum above finished roof surface with lead flashing and cast iron counter flashing, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, seal per Drawing Details.

D. Flash floor drains in floors with topping over finished areas with 6-lb. lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

E. Seal floor drains watertight to adjacent materials.

F. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms installed in accordance with manufacturer's instructions for sound control.

G. Adjust storm collars tight to pipe with bolts; calk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.6 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through floors one inch above finished floor level. Calk sleeves.

D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and calk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

E. Install chrome plated steel escutcheons at finished surfaces.

3.7 SUPPORT SCHEDULE

PIPE SIZE (Inches)	MAXIMUM SUPPORT SPACING (Feet)	HANGER ROD DIAMETER (Inches)
Steel (sched 40)		
1/2	6	3/8
3/4 to 1	8	3/8
1-1/4 to 2	10	3/8
2-1/2 to 3	10	1/2
4 to 6	14	5/8
Copper Type L		
1/2 to 3/4	5	3/8
1 to 1-1/4	6	3/8
1-1/2 to 2	8	3/8
2-1/2	9	1/2
3	10	1/2
4 to 6	12	5/8
C.I. No-Hub and at Joints		
1-1/2 to 2	8	3/8
2-1/2 to 3	8	1/2
4 to 6	8	5/8

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope: This section specifies mechanical identification for equipment, piping systems and ductwork specified in Division 23. The following are included: nameplates, tags, and pipe markers.

1.2 QUALITY ASSURANCE

A. References: This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

ANSI A13.1	Scheme for the Identification of Piping Systems.
MIL-STD-810C	Environmental Test Methods.

1.3 SUBMITTALS

A. Submit the following under provisions of section 013300, 016000 and section 230000.

1. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
2. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
3. Product Data: Provide manufacturers catalog literature for each product required.

1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 013300.

B. Record actual locations of tagged valves on Record Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Seton Name Plate Company, Inc.

B. Marking Services, Inc.

C. WH Brady Company.

2.2 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved white letters on black background color.

2.3 TAGS

A. Metal Tags: Brass with 1/4-inch stamped letters for piping system abbreviation and 1/2-inch numbers; tag size minimum 1-1/2 inch diameter with smooth edges.

B. Chart: Typewritten letter size list in anodized aluminum frame.

2.4 PIPE MARKERS

A. Plastic markers for coding pipe shall conform to ANSI A13.1. Markers shall be the mechanically attached type that are easily removable and firmly attached; they shall not be the adhesive applied type. Markers shall consist of pressure sensitive legends applied to plastic backing which is strapped or otherwise mechanically attached to the pipe. Legend and backing shall be resistant to petroleum based oils and grease and shall meet criteria for humidity, solar radiation, rain, salt, fog and leakage fungus, as specified by MIL-STD-810C. Markers shall withstand a continuous operating temperature range of -40°F to 180°F. Plastic coding markers shall not be the individual letter type but shall be manufactured and applied in one continuous length of plastic.

B. Markers bearing the legends on the background colors specified in ANSI A13.1 shall be provided in the following letter heights:

Outside Pipe Diameter*, Inches	Letter Height, Inches
Less than 1-1/2	1/2
1-1/2 through 3	1-1/8

* Outside pipe diameter shall include insulation and jacketing

In addition, pipe markers shall include uni- and bi- directional arrows in the same sizes as the legend. Legends and arrows shall be white on blue or red backgrounds and black on other specified backgrounds.

C. Tracer tape shall be 6 inches wide, colored the same as the background colors as specified in ANSI A13.1, and made of inert plastic material suitable for direct burial. Tape shall be capable of stretching to twice its original length.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Identify air handling units, VAV boxes, condensing units, exhaust fans and zone dampers with plastic nameplates. Small devices, such as a control valve, may be identified with tags.

F. Identify control panels and major control components outside panels with plastic nameplates.

G. Identify room sensors relating to zone dampers with nameplates.

H. Identify valves in main and branch piping with tags.

I. Tag automatic controls, instruments, and relays. Key to control schematic.

J. Identify piping, concealed or exposed with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

3.3 IDENTIFICATION SCHEDULE

A. Piping

1.	Heating Water Supply	HHWS
2.	Heating Water Return	HHWR
3.	Chilled Water Supply	CHWS
4.	Chilled Water Return	CHWR
5.	Refrigerant Gas	RG
6.	Refrigerant Liquid	RL

B. Valves

1.	Isolation Valves	V-xxx
2.	Control Valves	CV-xxx

C. Equipment

1.	Air Conditioners	AC-xxx (per equipment schedule)
2.	Exhaust Fans	EF-xxx (per equipment schedule)
3.	Fan Coil Units	FC-xxx (per equipment schedule)
4.	Condensing Units (split system)	CU-xxx (per equipment schedule
5.	Variable Frequency Drives	VFD-xxx (per equipment schedule)
6.	VAV Box	VAV-xxx (per equipment schedule)

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:
    a. Constant-volume air systems.
    b. Variable-air-volume systems.
2. Balancing Hydronic Piping Systems:
    a. Variable-flow hydronic systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 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 60 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.

1.5 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 Construction Manager, and Commissioning Authority 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 14 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/Engineer.

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."

1.6 COORDINATION

A. Notice: Provide 14 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 under-floor 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 and pump 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 terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine operating safety interlocks and controls on HVAC equipment.

O. 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. Hydronic systems are filled, clean, and free of air.

3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. 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 ASHRAE 111 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 Construction Manager 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.

E. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set system at maximum indicated airflow by setting the required number of terminal units at minimum airflow. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

2. Adjust supply fan to maximum indicated airflow with the variable-airflow controller set at maximum airflow.

3. Set terminal units at full-airflow condition.

4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to indicated airflow. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.

5. Adjust terminal units for minimum airflow.

6. Measure static pressure at the sensor.

7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

C. To meet T24 code (121c), the dampers and air flows have to linearly modulate by energy management system:

1. When fan is at full speed, measure minimum ODSA ventilation air- records the supply flow (CFM) and minimum damper position (%).
2. When fan is at minimum zone air flows measure OSA ventilation air - record the supply flow (CFM) and minimum damper position (%)

3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at building connection to end of system. Check the sum of branch-circuit flows against the design flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check liquid level in expansion tank.
3. Check makeup water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation, and set at indicated flow.
5. Set differential-pressure control valves at the specified differential pressure.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.8 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

3.9 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.10 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.11 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:
   1. Entering- and leaving-water temperature.
   2. Water flow rate.
   3. Water pressure drop.
   4. Dry-bulb temperature of entering and leaving air.
   5. Wet-bulb temperature of entering and leaving air for cooling coils.
   6. Airflow.
   7. Air pressure drop.

B. Measure, adjust, and record the following data for each refrigerant coil:
   1. Dry-bulb temperature of entering and leaving air.
   2. Wet-bulb temperature of entering and leaving air.
   3. Airflow.
   4. Air pressure drop.
   5. Refrigerant suction pressure and temperature.

3.12 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. Heating-Water Flow Rate: Plus or minus 10 percent.
   4. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.13 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.

B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.14 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 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. 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.

E. Apparatus-Coil Test Reports:
   1. Coil Data:
      a. System identification.
      b. Location.
      c. Coil type.

d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft..
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):
a. Air flow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F.

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. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.

b. Location and zone.

c. Apparatus used for test.

d. Area served.

e. Make.

f. Number from system diagram.

g. Type and model number.

h. Size.

i. Effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.

b. Air velocity in fpm.

c. Preliminary air flow rate as needed in cfm.

d. Preliminary velocity as needed in fpm.

e. Final air flow rate in cfm.

f. Final velocity in fpm.

g. Space temperature in deg F.

I. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.

b. Location and zone.

c. Room or riser served.

d. Coil make and size.

e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.

b. Entering-water temperature in deg F.

c. Leaving-water temperature in deg F.

d. Water pressure drop in feet of head or psig.

e. Entering-air temperature in deg F.

f. Leaving-air temperature in deg F.

J. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.

b. Serial number.

c. Application.

d. Dates of use.

e. Dates of calibration.

3.15 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 water flow of at least 5 percent of terminals.

c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.

d. Verify that balancing devices are marked with final balance position.

e. Verify calibration of differential pressure transmitters.

f. Verify calibration of temperature transmitters.

g. Verify calibration of flow meters.

h. 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/Engineer.

2. Architect/Engineer 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.

3. 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."

4. 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.

3.16 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.

END OF SECTION

SECTION 23 07 13
DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply, return and make-up air.
2. Indoor, exposed supply and return air.
3. Outdoor, exposed supply and make-up air.

B. Related Sections:

1. Retain Sections in subparagraphs below that coSection 230719 "Pipe Insulation."
2. Section 233113 "Metal Ducts" for duct liners.

1.3 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.

1.4 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.

1.5 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.

1.6 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.

1.7 COORDINATION

A. 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.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems. 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. 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. Johns Manville; 800 Series Spin-Glas.

c. Knauf Insulation; Insulation Board.

d. Owens Corning; Fiberglas 700 Series.

2.2 DUCT LINING

A. Manufacturer:

1. Schuller/Manville
2. Owens-Corning
3. Pittsburgh
4. Certainteed

B. For the outdoor application use 2 in. lining and for the indoor application use 1-1/2 in. lining.

1. Rectangular ductwork: Fiberglass Schuller/Manville Permacote Linacoustic flexible duct liner insulation with approved fire-resistant coating for erosion control, bonded with a dark thermosetting resin. The airstream surface and long edges shall be protected with acrylic coating. Apply to flat sheets with full coverage adhesive and insulation pins prior to fabrication of ducts or fittings. Lining shall be dual density duct liner. Duct sizes indicated on Drawings are net inside acoustical lining insulation dimensions, increase duct sizes accordingly.
2. Circular ductwork: Fiberglass duct liner manufactured to fit small and large radius round ducts with approved fire-resistant coating for erosion control located as indicated on Drawings. Apply to round ducts with full coverage adhesive prior to fabrication of ducts or fittings. Lining shall be Schuller/Manville Spiracoustic Plus in ducts over 24 in. dia., Schuller/Manville Permacote Spiracoustic in ducts under 24 in. dia. Duct sizes shown are net inside duct liner. Increase duct sizes accordingly. Provide with duct liner adhesive design Polymerics (DP-2502)
3. Line all ductwork as indicated on Drawings.

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. 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, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers".

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: 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. Vapor-Barrier Permeance: ASTM 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.

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.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.

3. Service Temperature Range: Minus 50 to plus 220 deg F (minus 46 to plus 104 deg C)..

4. Solids Content: ASTM D1644, 33 percent by volume and 46 percent by weight.

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.
    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: 20 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Use sealants that 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," including 2004 Addenda.

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. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II. when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
B. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
    b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
    c. RPR Products, Inc.; Insul-Mate.
2. Sheet and roll stock ready for shop or field sizing.

3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper 3-mil- thick.
5. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper 2.5-mil- thick polysurlyn.

2.8 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.
      e.
   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 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. Aluminum Bands: 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.
   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.

B. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

1. Products: Subject to compliance with requirements, provide one of the following:

a. AGM Industries, Inc.; Tactoo Self-Adhering Insul-Hangers.

b. GEMCO; Peel & Press.

c. Midwest Fasteners, Inc.; Self Stick.

2. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.

3. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

4. Adhesive-backed base with a peel-off protective cover.

C. 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.

1. Products: Subject to compliance with requirements, provide one of the following:

a. AGM Industries, Inc.; RC-150.

b. GEMCO; R-150.

c. Midwest Fasteners, Inc.; WA-150.

d. Nelson Stud Welding; Speed Clips.

e. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

D. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

E. Wire: 0.062-inch soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, provide product by:

a. C & F Wire, or equal.

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.

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 07 8413 "Penetration Firestopping".

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 (50 mm).
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 8413 "Penetration Firestopping."

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Liner:

1. Supply Air Ducts: Fibrous glass, Type I, 1-1/2 inch thick, (Indoor), 2” thick (Outdoor)
2. Return Air Ducts: Fibrous glass, Type I, 1-1/2 inch thick, (Indoor)

3. Transfer Ducts: Fibrous glass, Type I, 1-1/2 inch thick.

B. Blanket Insulation Installation on Ducts: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct.

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.

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.

C. 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 50 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.

D. 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.

3.6 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and return and make-up air.

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

B. Concealed, round return-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

C. Concealed, rectangular, supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

D. Concealed, rectangular, return-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

3.8 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. Ducts and Plenums outdoor, exposed, up to 48 inches in diameter or with flat surfaces up to 72 inches:

1. Aluminum, Stucco Embossed: 0.020” thick.

D. Ducts and Plenums outdoor, exposed, larger than 48 inches in diameter or with flat surfaces larger than 72 inches:

1. Aluminum, Stucco Embossed: 0.024” thick with 1-1/4 inch deep corrugations.

END OF SECTION

SECTION 230719

HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Heating hot-water piping.

B. Related Sections:

1. Section 230713 "Duct Insulation."

1.3 ACTION SUBMITTALS

A. Submittals shall be formatted per Section 230000 “General Mechanical Requirements”. The manufacturer shall resubmit the specification section showing compliance with each respective paragraph and specified items and features in that particular specification section. All **exceptions** shall be clearly identified by referencing the respective paragraph and other requirements. Next to each specification item, indicate the following:

1. “No Exception Taken.”
2. “Exception.” All exceptions shall be clearly identified by referencing the respective paragraph and other requirements along with the proposed alternative.

B. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance, thickness, and jackets (both factory and field applied, if any). Clearly mark the materials being provided and its intended use of each product

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

1.4 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 if requested by the Owner's Representative.

1.5 QUALITY ASSURANCE

A. Insulation materials shall be manufactured at facilities certified and registered with an approved registrar to conform to the ISO 9001 Quality Standard.

B. All work shall conform to accepted industry and trade standards for commercial and industrial insulations and shall conform with manufacturer's recommendations.

C. Installation shall be by licensed applicators.

D. Insulation materials that have become wet or contaminated shall not be installed.

E. 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.

F. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver all materials (insulation, coverings, tapes, cements, adhesives, coatings, etc.) to the jobsite in factory containers with manufacturer's label showing manufacturer, product name, and product hazard information.

B. Insulation shall be delivered to the job site in original, unopened manufacturer's containers.

C. Insulation shall be stored in a dry location and kept dry throughout construction. Wet or damaged insulation shall be removed and replaced by the Contractor at no additional cost.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Systems."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain CFC, asbestos, lead, mercury, or mercury compounds.

B. Insulation shall meet fire and smoke hazard ratings as tested under procedure ASTM E-84, NFPA 255, and UL 723 and shall not exceed flame spread rating of 25 and maximum smoke developed rating of 50.

C. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Johns Manville's Micro-Lok *HP* all-service (ASJ) vapor-retarder jacket with a self-sealing longitudinal closure lap (SSL) and butt strips.
    b. Owens Corning; ASJ Fiberglas Pipe Insulation.
2. Preformed mineral fiber pipe insulation with factory applied all-service vapor-retarder jacket (ASJ) jacket with a self-sealing longitudinal closure lap (SSL) and butt strips or approved alternate to seal butt joints. Preformed mineral fiber pipe insulation shall conform to ASTM C547. The ASJ facing shall conform to ASTM C1136 Type I.
3. Preformed mineral fiber pipe insulation with factory applied all-service vapor-retarder jacket (ASJ) jacket shall have a flame spread rating not greater than 25 and a smoke developed rating not greater than 50 when tested as in accordance with ASTM E84, UL 723.
4. Thermal conductivity (k-value): 0.23 Btu-in/hr-ft^2-°F at 75°F
5. Preformed mineral fiber pipe insulation shall have a water vapor sorption of less than 5% by weight as tested in accordance ASTM C 547.
6. All service jacket (ASJ) shall have a water vapor permeance of 0.02 perms or less as tested in accordance to ASTM E96, procedure "A".
7. When a vapor mastic is required, a water vapor permeance of 0.02 per ASTM E-96 Procedure B must be achieved.
8. Fittings, valves, tees, etc. shall be insulated with fiberglass insulation inserts covered with white PVC insulated fitting covers.

D. Phenolic Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Dyplast Products. Dytherm Phenolic
    b. Resolco Inc. Insul-Phen Green.
    c. Polyguard.
2. Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.
3. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.
4. Thermal conductivity (k-value): 0.18 Btu-in/hr-ft^2-°F at 75°F
5. Factory fabricate shapes according to ASTM C 450 and ASTM C 585

E. Cellular Glass Insulation:

1. Products: Subject to compliance with requirements, provide the following:
    a. Pittsburg Corning Corporation Foamglas.
    b. Cell-U Foam Corporation Ultra-CUF.

2. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
3. Pipe insulation shall be fabricated according to the requirements of ASTM C1639 “Standard Specification for Fabrication of Cellular Glass Pipe and Tubing Insulation”.
4. Thermal Conductivity: 0.29 Btu-in/hr-ft^2-°F at 75°F.
5. Compressive Strength: 90 psi.
6. Density: 7.5 lb/ft3.
7. The insulation may be fabricated in half, curved sidewall, or segmented, depending on the operating conditions.
8. Bore Coating shall be Hydrocal B-11 or equal gypsum cement, manufactured by U.S. Gypsum Corporation.
9. Insulation Accessories:
    a. Mastic: PITTCOTE 300 Finish, asphalt cutback mastic.
    b. Reinforcing Fabric: PC Fabric 79 open mesh polyester fabric with a 6 x 5.5 mesh/inch configuration.
    c. Sealant: PITTSEAL 444N sealant, a non-setting butyl sealant as supplied by Pittsburgh Corning.
    d. Securements: Aluminum bands, ASTM B 209, 0.020-inch thick, 3/4 inch wide.

F. Flexible Elastomeric Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Armacell LLC Armaflex.
    b. Aeroflex USA, Inc. Aerocel.
    c. K-Flex USA Insul-sheet.
2. Closed-cell. Comply with ASTM C 534, Type I for tubular materials.
3. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
4. Pipe insulation shall be fabricated according to the requirements of ASTM C1639 “Standard Specification for Fabrication of Cellular Glass Pipe and Tubing Insulation”.
5. Thermal Conductivity: 0.25 Btu-in/hr-ft^2-°F at 75°F.
6. Short runs of pipe or valves and fittings where it is impractical to install tubing insulation shall be insulated with two layers of 1/4” elastomeric foam tape.

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. Adhesives shall contain no flammable solvents if that option is available.

B. Cellular-Glass Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 200 deg F.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Design Polymerics
    b. Foster Products Corporation
2. For indoor applications use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Flexible Elastomeric 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 LCC; 520 BLV Adhesive.
    c. Foster Products Corporation, H. B. Fuller Company; 85-75.
    d. RBX Corporation; Rubatex Contact Adhesive.
2. For indoor applications use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. 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. Design Polymerics DP 2590-CA
    b. ITW TACC, Division of Illinois Tool Works; SP80, T1080
    c. Marathon Industries, Inc.
2. For indoor applications use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. 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. Design Polymerics DD2590-CA.
    b. ITW TACC, Division of Illinois Tool Works; SP80, T1080
    c. Marathon Industries, Inc.
2. For indoor applications use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Dow Chemical Company (The); 739, Dow Silicone.
    b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
    c. P.I.C. Plastics, Inc.; Welding Adhesive.
    d. Speedline Corporation; Speedline Vinyl Adhesive.
2. For indoor applications use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

A. Materials shall water based and 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 40 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 and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Childers Products, Division of ITW; CP-35.
    b. Design Polymerics 3040 with zero VOC's.

c. Foster Products Corporation, H. B. Fuller Company; 30-90.

2. Water-Vapor Permeance: ASTM E 96, 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 Products, Division of ITW; CP-10.
b. Foster Products Corporation, H. B. Fuller Company; 35-00.
c. ITW TACC, Division of Illinois Tool Works; CB-05/15.

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 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-76.
b. Foster Products Corporation, H. B. Fuller Company; 30-45.
c. Marathon Industries, Inc.; 405.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
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).

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-76-8.
b. Foster Products Corporation, H. B. Fuller Company; 95-44.
c. Marathon Industries, Inc.; 405.

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 use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-76.

b. Or equal.

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 and use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 FACTORY-APPLIED JACKETS

A. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Johns Manville; Zeston.
   b. P.I.C. Plastics, Inc.; FG Series.
   c. Proto Corporation; LoSmoke.
   d. Speedline Corporation; SmokeSafe.
2. Adhesive: As recommended by jacket material manufacturer.
3. PVC Jacket Color:
   a. Heating Hot Water Piping:
      1) Heating Hot Water Supply: Dark Red
      2) Heating Hot Water Return: Light Red
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
   a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Moisture Barrier Jacket:

1. Manufacturer: Pittsburg Corning PITTWRAP or approved equal.
2. 125 mil thick heat-seal multi-ply laminate consisting of three layers of a polymer-modified bituminous compound separated by glass reinforcement and aluminum foil.

D. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Products, Division of ITW; Metal Jacketing Systems.

b. PABCO Metals Corporation; Surefit.
c. RPR Products, Inc.; Insul-Mate.

2. Factory cut and rolled to size.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
5. Factory-Fabricated Fitting Covers:
   a. Same material, finish, and thickness as jacket.
   b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
   c. Tee covers.
   d. Flange and union covers.
   e. End caps.
   f. Beveled collars.
   g. Valve covers.
   h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.7 REMOVABLE INSULATION JACKETS

A. Manufacturers:
   1. ThermaXX LLC.
   2. INSULTECH.
   3. Firwin.

B. Insulation:
   1. Glass mat, type E needled fiber, 1" at 11.3 LB/CF.
   2. Maximum Use Temperature 400 deg F.

C. Jacket:
   1. Hot Side
      a. PTFE Fiberglass Composite Jacketing, 16.5 oz/sq. yd. minimum
      b. Estimation of Maximum Use Temperature 550 deg F.
   2. Cold Side
      a. PTFE Fiberglass Composite Jacketing, 16.5 oz/sq. yd. minimum
      b. Estimation of Maximum Use Temperature 600 deg F.

D. Thread:
   1. Does not decompose below 800 deg F.
   2. Does not melt.
   3. Diameter: 0.0114
   4. Break Point: 35 Lbs.

E. Construction:
   1. Double sewn lock stitch with a minimum 4 to 6 stitches per inch. Jackets shall be sewn with two (2) parallel rows of stitching. The thread must be able to withstand the skin temperatures without degradation.
   2. Hog rings, staples, and wire are not are not acceptable methods of closure.
   3. No raw cut jacket edges shall be exposed.

4. Jackets shall be fastened using hook and loop (Velcro) straps and 1” slide buckles.
5. Provide a permanently attached aluminum or stainless-steel nameplate on each jacket to identify its location, size, and tag number.
6. Provide a stainless steel or brass grommet at the low point of each jacket, in wet areas for moisture drain (on horizontal jackets as required).
7. The insulation shall be designed to minimize the convection current in the space between the hot metal surface and the inner layer of insulation. To this end, during jacket fabrication, the layers of insulating mat shall be placed in an overlapping pattern.
8. All jacket pieces which match mating seams must include an extended 2" flap constructed from the exterior fabric and shall be secured using hook & loop closure (Velcro) parallel to the seam.
9. Insulation must be sewn as integral part of the jacket to prevent shifting of the insulation.

2.8 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.

C. 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. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
    b. Compac Corp.; 130.

c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
d. 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.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
b. Compac Corp.; 120.
c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.9 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020-inch thick, 1/2 inch 3/4 inch wide with closed seal.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following]:

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch wide, stainless steel, or Monel.

C. Wire: 0.062-inch soft-annealed, Monel.

1. Manufacturers: Subject to compliance with requirements, provide product by:

a. C & F Wire.
b. Childers Products.
c. PABCO Metals Corporation.
d. RPR Products, Inc.

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 all inspection and acceptance testing of the piping as required by the specification has been completed and that the piping is ready for installation of insulation.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

4. Verify there is adequate clearance to install the pipe insulation in accordance with the operation performance parameters of the specification, such as access to controls, valves and for maintenance and repair.

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. Insulation shall not be installed until the following have been completed and documentation has been submitted to Owner for approval and record:

1. Cleaning and flushing
2. Pressure testing

B. 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.

C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

D. 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.

E. Install insulation with longitudinal seams at top and bottom of horizontal runs.

F. Install multiple layers of insulation with longitudinal and end seams staggered.

G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

H. Keep insulation materials dry during application and finishing.

I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

J. Install insulation with least number of joints practical.

K. Install rigid pre-insulated pipe supports to protect from compression of insulation material due to point loads.

L. Provide aluminum sleeves at all pipe support joints, between hanger support and exterior layer of insulating systems, to protect from compression of insulation material due to point loads.

M. Install insulation on piping accessories requiring future reoccuring access and service with factory fabricated insulation covers that are easily removed and reapplied.

N. 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.

O. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

P. 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 1.5 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
    a. For below-ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

Q. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

R. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

S. 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.

T. Existing pipe insulation damaged or affected by the work of this contract shall be repaired to comply with these specifications except that materials and thicknesses may match existing unless otherwise directed by the Owner’s Representative.

U. 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:

1. Terminate insulation with sleeve seal at wall penetration.
2. 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: Install insulation continuously through walls and partitions.

E. 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. 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, 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. Label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

B. 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.

C. 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 PHENOLIC INSULATION

A. General Installation Requirements:

1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.
2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.

B. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as

recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

C. 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 cut sections of block insulation of same material and thickness as pipe insulation.

D. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.

E. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.
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.

3.8 INSTALLATION OF CELLULAR GLASS INSULATION

A. Follow manufacturer’s recommendations for installation.

B. Cutting of cellular-glass shall be outdoors or in a well ventilated space if indoors in a sealed building.

C. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches on center.
4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
5. For insulation in utility trench, provide bands at 12 inches on center to the exterior of the field instated jacketing.

D. 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 cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

E. Insulation Installation on Pipe Couplings, Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

F. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. 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.

3.9 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.

3.10 THERMAL BLANKET INSTALLATION

A. Apply removable and reusable insulating thermal blankets on systems operating at greater than 180°F, and other water systems as follows:

1. Valves.

2. Strainers.
3. Pumps.
4. Regulators.
5. Flow meters.
6. Flow control, balancing, and instrumentation devices.
7. Service connection piping at locations that require maintenance, i.e., tube pull and heat exchanger head removal.
8. HTW anchors, guides, expansion joints, and pipe supports.

B. Blanket Overlap: Install blanket with a minimum 2 inches overlap of adjacent insulation, as existing insulation with a minimum of 2 inches overlap. Where blanket cannot overlap existing oversized insulation, blanket shall butt up to existing insulation with a friction closing seam. Open gaps are prohibited. Blanket diameters which are 2 inches larger than existing insulation must be capped to eliminate open air void.

C. Any one piece shall not exceed 40 lbs. in weight.

3.11 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 1.5-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 PVC jackets are indicated, install as follows:

1. With 1-inch overlap at longitudinal seams and end joints; for horizontal applications.
2. Seal with manufacturer's recommended adhesive.
3. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install as follows:

1. With 2-inch overlap at longitudinal seams and end joints.
2. Overlap longitudinal seams arranged to shed water.
3. Seal end joints with weatherproof sealant recommended by insulation manufacturer.
4. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.12 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.13 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range.

3.14 ABOVEGROUND PIPING INSULATION SCHEDULE

A. Heating Hot Water Supply and Return, 200°F and below:

1. NPS 1.25 inch and smaller: Mineral Fiber, pre-formed pipe insulation, 1.5 inches thick.
2. NPS 1.5 inch and larger: Mineral Fiber, pre-formed pipe insulation, 2 inches thick.

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. Piping, Concealed: None.

C. Piping, Exposed: PVC, Color-Coded by system, 30 mils thick for all indoor applications.

END OF SECTION

SECTION 23 09 00

INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for cooling units not supplied with factory-wired controls.

B. Related Sections include the following:

1. Section 230519 "Meters and Gages for HVAC Piping" for measuring equipment that relates to this Section.
2. Section 230993 "Sequence of Operations for HVAC Controls" for requirements that relate to this Section.

C. Definitions:

1. Alarm: Notification of an abnormal condition.
2. Algorithm: A logical procedure for solving a recurrent mathematical problem.
3. Analog: A continuously varying signal value (temperature current, velocity, etc.)
4. Application Generic Controller (AGC): A networked device or node that contains a complete, configurable application that is generic in nature and suited for various control tasks. The device manufacturer produces this application. The manufacturer exposes a high number of network variables and configuration properties on the device to allow the specific use of the device to be configured with network tools.
5. Application Specific Controller (ASC): A networked device or node that contains a complete, configura
6. ble application that is specific to a particular task. This application is normally produced by the device manufacturer and contains a number of configuration parameters that may be adjusted by network tools.
7. Binary: A two-state system where an "on" condition is represented by a high signal level and an "off" condition is represented by a low signal level.
8. Bridge: A device that routes messages or isolates message traffic to a particular segment sub-net or domain of the same physical communication media.
9. Building Automation System (BAS): The complete facility control system comprised of all mechanical system automation, and automatic temperature control, etc., as defined in the contract documents. The BAS is built upon a single network infrastructure based upon BACnet protocol. This infrastructure may include field wiring, BACnet wiring, routers, bridges, raceways, and gateways as required connecting noninteroperable subsystems and devices.

10. Channel: A physical media serving a number of nodes. All nodes on any given channel 'hear' messages produced by other nodes on the channel. The network configuration and node application program determines whether or not a device responds to the messages.
11. Control Unit: A BACnet control product that handles multiple inputs and outputs and more than one control loop. May utilize a supplemental general-purpose microprocessor in addition to the standard BACnet chip to perform additional functions or software applications.
12. Control Wiring: Includes conduit, wire and wiring devices to install complete control systems including motor control circuits, interlocks, thermostats, EP and PE switches and like devices. Includes all wiring from Intelligent Devices and Controllers to all sensors and points defined in the input/output summary shown on the drawings or specified herein and required to execute the sequence of operation.
13. Custom Application Controller (CAC): Programmable control product that incorporates solid-state components to perform control loops or functions. The application in the controller is custom software produced by the Control System Contractor specifically for the project. These applications shall conform to BACnet functional profiles and interoperability standards. Complete documentation including object diagrams, Device Resource Files (DRF), and External Interface Files (XIF) must be submitted EOR (Engineer of Record) when such devices/controllers are used.
14. Deadband: A temperature range over which no heating or cooling energy is supplied, such as 72-78 degrees F, i.e. as opposed to single point changeover or overlap.
15. Device Resource File: External Interface files and BACnet plug-ins that are required to display manufacturer's defined network variables or configuration parameters correctly.
16. DDC: Direct digital control.
17. Distributed Control: A system whereby all control processing is decentralized and independent of a central computer.
18. Diagnostic Program: A machine-executable program with instructions used to detect and isolate system and component malfunctions.
19. Domain: A domain is logical collection of nodes on one or more channels. Communications can only take place among nodes configured in a common domain; therefore, a domain forms a virtual network. Multiple domains can occupy the same channels, so domains may be used.
20. Gateway: A device that contains an I/O software driver to translate data from other protocols to the conforming BACnet standards.
21. Graphical User Interface (GUI): A graphical subset of operator interfaces.
22. HVAC Control Systems: The complete BACnet Control System comprising User Interface, routers, gateways, repeaters, Control Units (CU), software, portable operators terminals, network communications wiring and raceways, and required field hardware, etc.
23. Intelligent Devices: BACnet product that is configured to provide control over a single control loop or to monitor a single or multiple control variable(s); incorporates solid-state components based upon BACNet protocol to perform dedicated functions (ex: actuators, sensors, and switches).

24. Man-Machine Interface (MMI): A graphical, object-oriented method by which an operator is capable of communicating with the system. The Man-Machine interface allows the operator to manage, control, monitor, and configure the system.
25. Network: A system of distributed control devices that are linked together on a communication bus. A network allows sharing of point information between all control devices. Additionally, a network may provide central monitoring and control of the entire system from an MMI/GUI.
26. Node: An intelligent device attached to the network. Usually falls into one of the following categories - sensor, actuator, ASC, AGC, CAC.
27. Operator Interface: A device combination of hardware and software, (PC, laptop or display terminal) which provides client access to the control system, primarily used for network management, configuration, and diagnostics.
28. Operating System (OS): Software which controls the execution of computer programs.
29. Peripheral: External devices used o communicate to and from a computer. Peripherals include CRT, printer, hard drives, disk drives, modems, etc.
30. Point: Group of data, which corresponds to a hardware input, output, or calculated value.
31. Portable Operator's Terminal (POT): Laptop/tablet device that allows local and remote access to the local control network.
32. Router: A device that routes or forwards messages destined for a node on another subnet or domain of the control network. The device controls message traffic based on node address and priority. Routers may also serve as communication interfaces between different channel media. (i.e., powerline, twisted pair, Ethernet\TCP\IP, and RF)
33. Segment: A set of channels connected by bridges or repeaters. A node sees every packet from every other node on its segment.
34. Sensor: Device capable of measuring the condition or value of a variable.
35. Software: Programs and routines used to extend the capabilities of computers hardware.
36. Subnet: A subnet is a logical collection of up to 127 nodes within a domain. Up to 255 subnets can be defined within a single domain. All nodes in a subnet must be on the same segment. Subnets cannot cross-intelligent routers.

D. Abbreviations

1. AAC Advanced Application Controllers
2. AGC Application Generic Controller
3. ASC Application Specific Controller
4. BAS Building Automation System
5. BC Building Controllers
6. CAC Custom Application Controller
7. DDC Direct Digital Controller
8. DRF Device Resource File

9. FAS Facility Automation System
10. FPM Feet per minute
11. GPM Gallons per minute
12. GUI Graphical User Interface
13. I/O Input/Output
14. NFPA National Fire Protection Association
15. OS Operating System
16. OWS Operating Work Station
17. PE Pneumatic-electric
18. PID Proportional Integral Derivative
19. PRV Pressure Reducing Valve
20. PSI(g) Pounds per square inch (gauge)
21. RAM Random Access Memory
22. SA Smart Actuators
23. SS Smart Sensors
24. TCS Temperature Control System
25. TCC Temperature Control Contractor
26. UL Underwriters' Laboratory
27. VCS Voice Communication System
28. WC Water Column
29. XIF External Interface File

1.3 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.
2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.
3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.
5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.
6. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.
7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.

1.4 QUALITY ASSURANCE

A. The Building Automation System (BAS) shall be furnished, engineered and installed by a certified Vendor ControlWorks controls system supplier and approved by the Owner Representative.

B. System Integrator shall:

1. Be in good standing with the Manufacturer.
2. Have on staff, trained Integrators.
3. Have at least four (4) fully trained programming staff members at all times.
4. Provide training class certifications of staff members if requested.
5. Have direct line of technical support from suppliers.
6. Employ technicians who have completed factory-authorized training.
7. Employ technicians to provide instruction, routine maintenance, and emergency service within 24 hours upon receipt of request.

C. The installing Contractor must be regularly engaged in the service and installation of ControlWorks based systems as specified herein.

D. The installing Contractor shall have an office within 200 miles that is staffed with designers trained in integrating interoperable systems and technicians fully capable of providing instruction and routine emergency maintenance service on all system components.

E. The installing Contractor shall have in house capabilities to provide control strategies for whole building control. This includes HVAC, lighting, access, and security applications etc.

F. The installing Contractor shall have a service facility, staffed with qualified service personnel, capable of providing instructions and routine emergency maintenance service for networked control systems.

1.5 ACTION SUBMITTALS

A. The manufacturer, contractor or supplier shall include a written statement that the submitted equipment, hardware or accessory complies with the requirement of this particular specification section.

1. The manufacturer shall resubmit this specification section showing compliance with each respective paragraphs and specified items and features.
2. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.
3. Individual or partial submittals are not acceptable and will be returned without review.

B. The installing Contractor shall provide project list stating completion of no less than three (3) construction projects of similar size or larger within the past five (5) years, which have BacNET based BAS as specified herein installed by the Contractor. These projects must be on-line and functional such that the system can be observed in full operation.

C. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation

equipment, interface equipment, control units, transducers/transmitters, sensors

2. , actuators, valves, relays/switches, control panels, and operator interface equipment.
3. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.
4. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

D. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Bill of materials of equipment indicating quantity, manufacturer and model number.
2. Schematic flow diagrams showing fan coil units, air handlers, condensers, boilers, pumps, valves and control devices and accessories.
3. Wiring Diagrams: Power, signal and control wiring.
4. Details of control panel faces, including controls, instruments and labeling.
5. Written description of sequence of operation.
6. Schedule of valves including flow characteristics.
7. DDC System Hardware:
    a. Wiring diagrams for control units with termination numbers.
    b. Schematic diagrams and floor plans for field sensors and control hardware.
    c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
8. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.
9. Controlled Systems:
    a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
    b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
    c. Written description of sequence of operation including schematic diagram.
    d. Points list.

1.6 INFORMATIONAL SUBMITTALS

A. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with ASHRAE 135.

B. Qualification Data: For Installer and manufacturer.

C. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.

D. Field quality-control test reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For direct digital control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017700 "Closeout Procedures," include the following:

1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
5. Calibration records and list of set points.

B. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.
5. Software license required by and installed for DDC workstations and control systems.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

B. System Software: Update to latest version of software at Project completion.

1.9 COORDINATION

A. Coordinate location of exposed control sensors with plans and room details before installation.

B. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

C. Coordinate equipment with Section 262416 "Panelboards" to achieve compatibility with starter coils and annunciation devices.

PART 2 - PRODUCTS

2.1 CONTROL SYSTEM

A. Control system manufacturer shall be ControlWorks, installing Staefa TALON to match campus standard, or owner approved contractor able to meet the specifications of this section.

B. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. An operator workstation permits interface with the network

via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

C. The selected ControlWorks Controls System Contractor shall be fully responsible to install all graphics required under this project. Provide necessary software, devices, upgrades, modifications, etc. as required for a fully operational direct digital controls (DDC) system.

2.2 COMMUNICATION

A. The design of the Building Management and Control System (BMCS) shall network operator workstations and Stand-Alone DDC Controllers through the Ethernet network provided by Owner's IT Department. The network architecture shall consist of multiple levels for communication efficiency, a campus-wide (Management Level Network) Ethernet network based on TCP/IP protocol, high performance peer-to-peer building level network(s) and DDC Controller floor level local area networks.

B. The design of BAS shall allow the c

C. o-existence of new DDC Controllers with existing DDC Controllers in the same network without the use of gateways or protocol converters.

1. System shall have the capability to communicate with a BACnet network over Ethernet or BACnet/IP (according to Annex J). The intent is to use the system provided under this contract to communicate with control systems provided by other vendors. PICS must be provided describing the BACnet, ANSI/ASHRAE 135-2001 implementation. Minimum system functionality must include mon

2. itoring, commanding, and alarming for daily operator functions from a common workstation.

3. System shall have the capability to be an OPC Client and Server for dynamic communication with OPC Clients or Servers over an Ethernet network. At a minimum, the following must be supported:

    a. Data Access 1.0 (96), 1.0A (97) and 2.0 (11/98)

    b. Alarms & Events 1.0 (1/99)

D. Access to system data shall not be restricted by the hardware configuration of the system. The hardware configuration of the BMCS network shall be totally transparent to the user when accessing data or developing control programs.

E. Peer-to-Peer Management & Building Level Networks (MLN & BLN):

1. Operator workstations and DDC Controllers shall directly reside on an Ethernet network such that communications may be executed directly between DDC Controllers, directly between workstations, and between DDC Controllers and workstations on a peer-to-peer basis.

2. All operator devices either network resident or connected via dial-up modems, shall have the ability to access all point status and application report data or execute control and maintenance functions for any and all devices via the peer-to-peer net

3. work.

4. The BMCS shall operate as a true token-pass peer-to-peer communication network. Resident processors in each DDC panel shall provide for full exchange of system data

between other DDC Panel's on the network trunk.

5. Network design shall include the following provisions:

    a. Provide high-speed data transfer rates for alarm reporting, quick report generation from multiple controllers and upload/download efficiency between network devices. System performance shall insure that an alarm occurring at any DDC Controller is displayed at workstations and/or alarm printers within five seconds.

    b. Support of any combination of DDC Controllers and operator workstations directly connected to the peer-to-peer network. A minimum of 32 devices shall be supported on a single network.

    c. Message and alarm buffering to prevent information from being lost

    d. Error detection, correction and re-transmission to guarantee data integrity

    e. Synchronization of real-time clocks including automatic daylight savings time updating between all DDC Controllers, shall be provided.

    f. The peer-to-peer network shall support a minimum of 100 DDC controllers and PC workstations

    g. Each PC workstation shall support a minimum of 4 peer-to-peer networks hardwired or dial up.

    h. The system shall support integration of third party systems (fire alarm, security, lighting, PCL, chiller, boiler) via panel mounted open protocol processor. This processor shall exchange data between the two systems for inter-process control. All exchange points shall have full system functionality as specified herein for hardwired points. Field panels must be capable of integration with open

    i. Standards including Modbus, BACnet, and LonWorks as well as with third party devices via existing vendor protocols

    j.

F. The peer-to-peer Building Level Network shall use the TCP/IP over Ethernet. All devices must:

1. Auto-sense 10/100 Mbps networks.
2. Receive an IP Address from a Dynamic Host Configuration Protocol (DHCP) Server or be configured with a Fixed IP Address.
3. Resolve Name to IP Addresses for devices using a Domain Name Service (DNS) Server on the Ethernet network.
4. Allow access using Telnet.

G. DDC Controller Floor Level Network (FLN):

1. This level of communication shall support a family of application-specific controllers such as terminal box controllers and heat pump controllers and shall communicate bi-directionally with the peer-to-peer network through DDC Controllers for transmission of global data.
2. Application specific controllers shall be arranged on the FLN in a functional relationship manner with DDC Controllers. For example, a VAV terminal box in a functional relationship manner with DDC Controllers is controlling its correspondi
3. ng VAV fan system.
4. Provide Terminal Equipment Controllers with field adjustable PID gains and biases. Controllers that incorporate proportional and integral (PI) control algorithms only, shall not be acceptable.

2.3 **HVAC MECHANICAL EQUIPMENT CONTROLLERS**

A. HVAC Mechanical Equipment Controllers shall be a 12-bit stand-alone, multi-tasking, multi-user, real-time digital control processors consisting of modular hardware with plug-in enclosed processors.

B. Each HVAC Mechanical Controller shall have sufficient memory to support its own operating system and databases, including:
1. Control processes
2. Energy management applications
3. Alarm management applications including custom alarm messages for each level alarm for each point in the system.
4. Historical/trend data for points specified
5. Maintenance support applications
6. Custom processes
7. Operator I/O
8. Remote communications

C. HVAC Mechanical Equipment Controllers shall provide a RS-232C serial data communication port for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals.

D. HVAC Mechanical Equipment Controllers shall provide local LED status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.

E. Each HVAC Mechanical Equipment Controller shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all components. The HVAC Mechanical Equipment Controller shall provide both local and remote annunciation of any detected component failures, low battery conditi

F. ons or repeated failure to establish communication.

G. Isolation shall be provided at all peer-to-peer network terminations, as well as all field point terminations to suppress induced voltage transients consistent with:
1. RF-Conducted Immunity (RFCI) per ENV 50141 (IEC 1000-4-6) at 3 V

2. Electro Static Discharge (ESD) Immunity per EN 61000-4-2 (IEC 1000-4-2) at 8 kV air discharge, 4 kV contact
3. Electrical Fast Transient (EFT) per EN 61000-4-4 (IEC 1000-4-4) at 500 V signal, 1 kV power
4. Output Circuit Transients per UL 864 (2,400V, 10A, 1.2 Joule max)
5. Isolation shall be provided at all peer-to-peer panels' AC input terminals to suppress induced voltage transients consistent with:
    a. IEEE Standard 587-1980
    b. UL 864 Supply Line Transients
    c. Voltage Sags, Surge, and Dropout per EN 61000-4-11 (EN 1000-4-11)

H. The Controls Contractor shall provide an uninterrupted power supply for every HVAC mechanical equipment controller to prevent the loss of database or operating system software in the event of the loss of normal power. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.
1. Upon restoration of normal power, the HVAC Mechanical Equipment Controller shall auto
2. matically resume full operation without manual intervention.
3. Should HVAC Mechanical Equipment Controller memory be lost for any reason, the user shall have the capability of reloading the HVAC Mechanical Equipment Controller via the local RS-232C port, via telephone line dial-in or from a network workstation PC.

2.4 DDC & HVAC MECHANICAL EQUIPMENT CONTROLLER RESIDENT SOFTWARE FEATURES

A. General:
1. The software programs specified in this Section shall be provided as an integral part of DDC and HVAC Mechanical Equipment Controllers and shall not be dependent upon any higher level computer for execution.
2. All points shall be identified by up to 30-character point name and 16 character point descriptor. The same names shall be used at the PC workstation.
3. All digital points shall have user defined two-state status indication [descriptors with minimum of 8 characters allowed per state (i.e. summer/winter)].

B. Control Software Description:
1. The DDC and HVAC Mechanical Equipment Controllers shall have the ability to perform the following pre-tested control algorithms:
    a. Two-position control
    b. Proportional control
    c. Proportional plus integral control
    d. Proportional, integral, plus derivative control
    e. Automatic tuning of control loops

C. DDC and HVAC Mechanical Equipment Controllers shall provide the following energy management routines for the purpose of optimizing energy consumption while maintaining occupant comfort.

1. Start-Stop Time Optimization (SSTO) shall automatically be coordinated with event scheduling. The SSTO program shall start HVAC equipment at the latest possible time that will allow the equipment to achieve the desired zone condition by time of occupancy. The SSTO program shall also shut down HVAC equipment at the earliest
2. possible time before the end of the occupancy period, and still maintain desired comfort conditions.
    a. The SSTO program shall operate in both the heating and cooling seasons.
    b. It shall be possible to apply the SSTO program to individual fan systems.
    c. The SSTO program shall operate on both outside weather conditions as well as inside zone conditions and empirical factors.
    d. The SSTO program shall meet the local code requirements for minimum outside air while the building is occupied.
3. Event Scheduling: Provide a comprehensive menu driven program to automatically start and stop designated points or groups of points according to a stored time.
    a. It shall be possible to individually command a point or group of points.
    b. For points assigned to one common load group, it shall be possible to assign variable time delays between each successive start and stop within that group.
    c. The operator shall be able to define the following information:
        1) Time, day
        2) Commands such as on, off, auto, and so forth.
        3) Time delays between successive commands.
        4) There shall be provisions for manual overriding of each schedule by an appropriate operator.
    d. It shall be possible to schedule events up to one year in advance.
        1) Scheduling shall be calendar based.
        2) Holidays shall allow for different schedules.
4. Enthalpy switchover (economizer) .The Energy Management Control Software (EMCS) will control the position of the air handler relief, return, and outside air dampers. If the outside air dry bulb temperature falls below changeover set point, the EMCS will modulate the dampers to provide 100 percent outside air. The user will be able to quickly changeover to an economizer system based on dry bulb temperature and will be able to override the economizer cycle and return to minimum outside air operation at any
5. time.
6. Temperature-compensated duty cycling.
    a. The DCCP (Duty Cycle Control Program) shall periodically stop and start

loads according to various patterns.

b. The loads shall be cycled such that there is a net reduction in both the electrical demands and the energy consumed.

7. Automatic Daylight Savings Time Switchover: The system shall provide automatic time adjustment for switching to/from Daylight Savings Time.

8. Night setback control: The system shall provide the ability to automatically adjust set points for night control.

9. The Peak Demand Limiting (PDL) program shall limit the consumption of electricity to prevent electrical peak demand charges.

   a. PDL shall continuously track the amount of electricity being consumed, by monitoring one or more electrical kilowatt-hour/demand meters. These meters may measure the electrical consumption (kWh), electrical demand (kW), or both.

   b. PDL shall sample the meter data to continuously forecast the demand likely to be used during successive time intervals.

   c. If the PDL forecasted demand indicates that electricity usage is likely to exceed a user preset maximum allowable level, then PDL shall automatically shed electrical loads.

   d. Once the demand peak has passed, loads that have been shed shall be restored and returned to normal control.

D. DDC and HVAC Mechanical Equipment Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.

1. A single process shall be able to incorporate measured or calculated data from any and all other DDC and HVAC Mechanical Equipment Controllers on the network. In addition, a single process shall be able to issue commands to points in any and all other DDC and HVAC Mechanical Equipment Controllers on the network. Datab

2. ase shall support 30 character, English language point names, structured for searching and logs.

3. Processes shall be able to generate operator messages and advisories to operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of a dial-up connection to a remote device such as a printer or pager.

4. DDC and HVAC Mechanical Equipment Controller shall provide a HELP function key, providing enhanced context sensitive on-line help with task orientated information from the user manual.

5. DDC and HVAC Mechanical Equipment Controller shall be capable of comment lines for sequence of operation explanation.

E. Alarm management shall be provided to monitor and direct alarm information to operator devices. Each DDC and HVAC Mechanical Equipment Controller shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost. At no time shall the DDC

and HVAC Mechanical Equipment Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device

F. or communications with other panels on the network.

1. All alarm or point change reports shall include the point's English language description and the time and date of occurrence.

2. The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of six priority levels shall be provided for each point. Point priority levels shall be combined with user definable destination categories (PC, printer, DDC Controller, etc.) to provide full flexibility in defining the handling of system alarms. Each DDC and HVAC Mechanical Equipment Controller shall automati

3. cally inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point.

4. Alarm reports and messages will be directed to a user-defined list of operator devices or PCs based on time (after hour's destinations) or based on priority.

5. In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 200 character alarm message to more fully describe the alarm condition or direct operator response.

6. In dial-up applications, operator-selected alarms shall initiate a call to a remote operator device.

G. A variety of historical data collection utilities shall be provided in order to manually or automatically sample, store and display system data for points as specified in the I/O summary.

1. Any point, physical or calculated may be designated for trending. Any point, regardless of physical location in the network, may be collected and stored in each DDC and HVAC Mechanical Equipment Controllers point group. Two methods of collection shall be allowed: either by a pre-defined time interval or upon a pre-defined change of value. Sample intervals of l minute to 7 days shall be provided. Each DDC and HVAC Mechanical Equipment Controller shall have a dedicated RAM-based buffer for trend data and

2. shall be capable of storing a minimum of __ data samples. All trend data shall be available for transfer to a Workstation without manual intervention.

3. DDC and HVAC Mechanical Equipment Controllers shall also provide high resolution sampling capability for verification of control loop performance. Operator-initiated automatic and manual loop tuning algorithms shall be provided for operator-selected PID control loops as identified in the point I/O summary.

    a. Loop tuning shall be capable of being initiated either locally at the DDC and HVAC Mechanical Equipment Controller, from a network workstation or remotely using dial-in modems. For all loop tuning funct

    b. ions, access shall be limited to authorized personnel through password protection.

H. DDC and HVAC Mechanical Equipment Controllers shall be capable of automatically accumulating and storing run-time hours for digital input and output points and automatically

sample, calculate and store consumption totals for analog and digital pulse input type points, as specified in the point I/O schedule.

I. The peer to peer network shall allow the DDC and HVAC Mechanical Equipment Controllers to access any data from or send control commands and alarm reports directly to any other DDC and HVAC Mechanical Equipment Controller or combination of controllers on the network without dependence upon a central or intermediate processing device. DDC and HVAC Mechanical Equipment Controllers shall send alarm reports to multiple workstations without dependence upon a central or intermediate processing device. The peer to

J. peer network shall also allow any DDC and HVAC Mechanical Equipment Controller to access, edit, modify, add, delete, back up, and restore all system point database and all programs.

K. The peer to peer network shall allow the DDC and HVAC Mechanical Equipment Controllers to assign a minimum of 50 passwords access and control priorities to each point individually. The logon password (at any PC workstation or portable operator terminal) shall enable the operator to monitor, adjust and control the points that the operator is authorized for. All other points shall not be displayed on the PC workstation or portable terminal (e.g. all base building and all tenant points shall be accessible to a

L. ny base building operators, but only tenant points shall be accessible to tenant building operators). Passwords and priorities for every point shall be fully programmable and adjustable.

2.5 ROOM PRESSURIZATION CONTROLLERS

A. VAV Room Pressurization Controllers shall be a networked, stand-alone controller designed for the specific application of volumetric offset room control. Units utilizing room differential pressure monitors as a control point are not acceptable. Providers using two controllers to control room pressure will not be accepted. Room pressure monitors may be a monitored point for compliance in isolation rooms. The manufacturer of the controller shall be able to demonstrate a history of product performance in the healthcare industry and local installations of at least five years of age.

2.6 TERMINAL EQUIPMENT CONTROLLERS (TEC)

A. UL listing 916 and UL 864. Provide one Terminal Equipment Controller (TEC) for each zone. TEC's shall be fully electronic and shall be connected to an MEC or MBC via Floor Level Network trunk. The TEC shall provide PID control by means of Direct Digital Control (DDC).

B. Each controller shall include algorithms incorporating proportional, integral and derivative (PID) gains for all applications. All PID gains and biases shall be field-adjustable by the user via terminals as specified herein. Controllers that incorporate proportional and integral (PI) control algorithms only shall not be acceptable.

C. TEC Memory: The TEC shall utilize EEPROM memory for storing set points and control parameters. The TEC shall return from power loss without operator intervention. Systems th

D. at require reprogramming after power loss are not acceptable.

E. Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable laptop or similar operators' terminal to control and monitor all hardware and software points associated with the controller. In lieu of an internal jack, provide a separate terminal jack mounted on a stainless steel wall plate adjacent to the sensor to facilitate direct access to the controller via t

F. he terminal.

G. Each room sensor shall include Setpoint Adjustment Dial, Temperature Indicator, and Override Switch.

H. The setpoint adjustment dial shall allow for modification of the temperature by the occupant. Setpoint adjustment may be locked out, overridden or limited as to time or temperature through software by an authorized operator at the central workstation, DDCP or via the portable programming tool. In lieu of an integral adjustment dial, provide a separate dial mounted on a stainless steel wall plate adjacent t

I. o the sensor to perform the specified functionality.

J. The temperature indicator shall be a bi-metal or mercury thermometer and shall be visible without removing the sensor cover. In lieu of integral indication, provide a separate thermometer or digital readout mounted on a wall plate adjacent to the sensor for local temperature indication.

K. The override switch shall initiate override of the night setback mode to normal (day) operation when activated by the occupant. The override function may be locked out, overridden or limited as to the time through software

L. by an authorized operator at the central workstation, DDCP or via the portable programming tool. In lieu of an integral switch, provide a separate momentary contact switch mounted on a wall plate adjacent to the sensor to perform the specified functionality.

M. Each controller shall perform its primary control function independent of other DDCP network communication, or if network communication is interrupted. Reversion to a fail-safe mode of operation during network interruption is not acceptable. Should th

N. e controller reside on a DDCP network, the controller shall receive its real-time data from the DDCP clock to insure network continuity.

O. Each controller shall have connection provisions for a portable laptop or similar operators' terminal. This connection shall be possible at both the controller and at the matching room temperature sensor as previously specified. The terminal may be used for readout of system variables, override control, adjustment of control parameters, air balancing, servicing and trou

P. bleshooting. The terminal shall provide the user with the following functionality as a minimum:

1. Display system status (heating, cooling, etc.)
2. Display all point values and setpoints
3. Set and change all setpoints
4. Set and change heating/cooling dead-bands
5. Set and change PID loop gains
6. Set and change system mode (occupied/unoccupied)
7. Set and change system mode times
8. Override all setpoints
9. Override all digital and analog outputs
10. Command all digital and analog outputs
11. Select application mode

12. Assign controller address

Q. The TEC shall operate with 24 volt AC power. Provide 120/24 transformers. The 120 volt power supply to each TEC is provided under Division 16.

2.7 THERMOWELLS

A. When thermowells are required, the sensor and well shall be supplied as a complete assembly including wellhead and Greenfield fitting.

B. Thermowells shall be pressure rated and constructed in accordance with the system working pressure.

C. Thermowells and sensors shall be mounted in a threadolet or 1/2" NPT saddle and allow easy access to the sensor for repair or replacement.

D. Thermowells shall be constructed of machined stainless steel, Type 316.

E. Manufacturer shall be BAPI Model BA/4"M316 or approved equal.

F. Provide Honeywell 107408 heat conductive compound in each thermowell.

2.8 LIQUID IMMERSION TEMPERATURE SENSORS & TRANSMITTER

A. Temperature Sensor BAPI Model 1K8 or approved equal.

1.	Operating Temperature	-40 to 185°F
2.	Sensing Element 385 Curve RTD	1000 Ohm
3.	Accuracy at Calibration Temperature	+/- 0.27 °F

B. Temperature Transmitter Minco Model TT807

1.	Min / Max Span	35°F to 1112°F
2.	Accuracy of Span	+/- 0.1%
3.	Linearity of Span	+/- 0.1%

C. All sensors measuring temperatures in pipes larger than 2 inches in diameter or in pressure vessels shall be supplied with wells properly fabricated for the service. Wells shall be non-corrosive to the medium being measured and shall have sufficient physical strength to withstand pressures and velocities to which they are subjected. Wells shall be installed in the piping at elbows where piping is smaller than the length of the well to affect proper flow across the entire area of the well.

D. Stainless steel, Type 304, socket with minimum insertion length of 4 inches.

2.9 OUTSIDE AIR TEMPERATURE AND HUMIDITY SENSORS

A. Vaisala HUMICAP Outdoor Humidity and Temperature Transmitter HMD60YO. No known equal.

1.	Humidity Operating Range RH	0-100%

2.	Humidity Output Signal mA, 0 to 100% linear, proportional	4 to 20
3.	Humidity Accuracy RH, 0-90% RH	+/- 2.0%
4.	Humidity Sensing Element 180	HUMICAP
5.	Temperature Range	-40-140°F
6.	Temperature Output Signal mA, 0 to 100% linear, proportional	4 to 20
7.	Temperature Accuracy	± 0.36°F
8.	Temperature Sensing Element Platinum RTD 1/3 Class B IEC 751	1K-ohm

B. Outdoor installations shall be of weatherproof construction or in appropriate NEMA enclosures. These installations shall be protected from solar radiation and wind effects. They shall also be provided with a solar radiation shield.

2.10 DUCT TYPE TEMPERATURE SENSORS

A. BAPI or approved equal.

1.	Operating Temperature 240°F	-40 to
2.	Sensing Element (Type II) Thermistor	NTC 10K
3.	Accuracy at Calibration Temperature	+/- 1 °F

B. Sensors in ducts shall be mounted in locations to sense the correct temperature of the air only and shall not be located in dead air spaces, in close proximity to coils so as to display inaccurate temperatures, or positions obstructed by ducts, equipment, and so forth. Locations where installed shall be within the vibration and velocity limit of the sensing element.

C. Duct mount sensors shall mount in an electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement. A neoprene grommet (Seal-tite fitting and mounting plate) shall be used on the sensor assembly to prevent air leaks.

D. Duct sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate. Duct sensors probe shall be constructed of 304/316 stainless steel.

E. Duct sensors shall not be mounted within 36 inches of heating and cooling coils.

F. For outdoor air duct applications, use a weatherproof mounting box with weatherproof cover and gasket.

2.11 AVERAGING DUCT TYPE TEMPERATURE SENSORS

A. Minco 1000 Ohm 375 Platinum Averaging Sensor & T90PNR Temperature Transmitter.

1.	Operating Temperature 240°F	-40 to
2.	Sensing Element	1000 Ohm

375 Curve RTD

3. Accuracy at Calibration Temperature +/- 0.6 °F

B. For ductwork that has a dimension greater than 48 inches and/or where air temperature stratification exists, utilize an averaging sensor with multiple sensing points. The averaging sensor shall be installed complete with end cap, compression fittings, gaskets, mounting flange and required accessories.

C. Provide CC-1G-K capillary supports at the sides of the duct to support the sensing string.

2.12 ROOM TEMPERATURE SENSORS

A. Room temperature sensors shall be Siemens or approved equal and shall match the campus standard.

B. Room sensors are to be provided with a cover to prevent accidental damage.

1. Operating Temperature -40 to 240°F
2. Operating Range, Active Signal Types 40 to 90°F
3. Temperature Effect Less than 0.1% per °C
4. Sensing Element NTC 10K (Type II) Thermistor
5. Accuracy at Calibration Temperature +/- 1 °F

2.13 ROOM CO2 SENSORS

A. Telaire 8102, GE Ventostat T8100, AirTest EE80-2CT or approved equal.

B. CO2 sensors shall be certified by the manufacturer to have an accuracy of 400-1250 ppm ±30 ppm or 3% of reading (whichever is greater), factory calibrated or calibrated at start-up, and certified by the manufacturer to require calibration no more frequently than once every 5 years.

C. The sensors shall use dual beam, non-dispersive infrared absorption (NDIR) CO2 sensor with gold-plated optics.

D. The CO2 sensors shall have no more than 2% drift during the life of the sensor (15 years).

E. The units shall be wall-mounted type as indicated on plans and in the Sequence of Operations and shall be provided with a NEMA 1 white plastic cover, without LED indicator.

F. The sensor shall meet the following requirements:

1. Operating Temperature -23 to 113 °F
2. Operating voltage 13.5 to 35 VDC
3. CO2 measuring range 0 to 2000 ppm
4. Accuracy +/- 75 ppm
5. Output 0 – 10 VDC, 0-100% Linear

2.14 AIR DIFFERENTIAL PRESSURE TRANSMITTERS

A. Air differential pressure sensors shall be Setra Model 269 transmitters with digital display or approved equal.

B. Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage and to hold calibrated accuracy when subject to a momentary 40% over-range input.

C. Provide a minimum of a NEMA 1 housing for the transmitter. Locate transmitters in accessible local control panels wherever possible.

D. The pressure transmitter shall be capable of transmitting a linear electronic signal proportional to the differential of the room and reference static pressure input signals with the following minimum performance specifications.

1. Span: Refer to Points List
2. Accuracy: ±0.5% of full scale
3. Non-Repeatability: ±0.05%
4. Non-Linearity: ±0.35%
5. Response: Less than one second for full span input.
6. Temperature Stability: Less than 0.02%FS/°F change
7. Output: 4 to 20 mA

2.15 WATER DIFFERENTIAL PRESSURE TRANSMITTERS

A. Water differential pressure sensors shall be Setra Model 230 transmitters or approved equal.

B. Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage and to hold calibrated accuracy when subject to a momentary 40% over-range input.

C. Provide:

1. NEMA 1 transmitter housing and locate in accessible local control panels wherever possible.
2. Brass 3-valve manifold assembly with shut-off and shunt valves.
3. Standard Viton/Silicone bleed screw seals.
4. Calibration certificate.

D. The pressure transmitter shall be capable of transmitting a linear electronic signal proportional to the differential of the pressure input signals with the following minimum performance specifications.

1. Span: Refer to Points List
2. Accuracy: ±0.25% of full scale
3. Non-Repeatability: 0.05%
4. Non-Linearity: ±0.20%
5. Response: 30 to 50 ms
6. Temperature Stability: Less than 0.02%FS/°F change
7. Output: 4 to 20mA

2.16 AIRFLOW MEASUREMENT

A. Airflow Measurement

1. Provide Ebtron Gold Series thermal dispersion airflow and temperature measurement device (ATMD) equipped with 'C' sensor density probes or approved equal.
2. The ATMD shall include the GTL116 industrial grade integrated transmitter and the BACnet network communication. The static pressure manifold shall incorporate dual offset static tips on opposing sides of the averaging manifold so as to be insensitive to flow-angle variations of as much as ±20o in the approaching air stream.
3. The Calibrated Range: .0 to 5,000 fpm
4. The Operating Temperature: Probe: -20 to 160°F Transmitter: -20 to 120°F.
5. Operating Humidity Range: .0 to 99% non-condensing; Transmitter must be protected from exposure to precipitation

B. Transmitter and Enclosure

1. Transmitter Construction: Heavy duty with industrial grade IC's and rugged aluminum chassis with sliding cover
2. Transmitter Dimensions: 9.251 x 6.688 x 2.5 in (HxWxD)
3. Transmitter Mounting: Four 0.188 in dia mounting holes located 0.75 in from top/bottom, and 0.375 from left/right edges on integral mounting plate

C. Sensor Probes

1. Factory Calibrated Sensor
2. Accuracy: Airflow: ±2% of reading
3. Temperature: ± 0.15°F
4. Probe Construction: Type 6063 gold anodized aluminum
5. Mounting Brackets: Type 304 SS
6. Probe Dimensions: Alum: 1.1 in diameter
7. Standard Size Ranges: 8 to 120 in for Insertion/Standoff Mount 12 to 120 in for Internal Mount
8. Maximum Quantity Probes / Sensing Nodes: 4 probes per transmitter; 8 sensing nodes per probe; 16 nodes total max.
9. Probe/Transmitter Cable: 10 ft. [3.05 m] plenum rated FEP cable, positive locking connector with gold plated pins (Optional cable length of up to 50 feet)

D. Output Interface

1. BACnet.
2. Repeatability: 0.25% of reading
3. Airflow Output Signal Filter: Adjustable 0 to 99% (via pushbutton interface)
4. Airflow Low Limit Cutoff: Forces output to zero below a user specified value

2.17 THERMAL-ENERGY METERS (CHILLED WATER AND HEATING HOT WATER)

A. Onicon System 10-BAC MS/TP BTU Meter. No known equal.

B. Provide system with flow sensor, temperature sensors, transmitter, indicator and connecting wiring for interface via BACnet MS/TP based ControlWorks system.

C. Electromagnetic, insertion flow sensor (no moving parts) with corrosion-resistant-metal body

and transmitter for installation in piping. Onicon F-3200 Series.

1. Design: Total thermal-energy measurement.
2. Minimum Pressure Rating: 150 psig.
3. Minimum Temperature Range: 15 to 250 deg F.

D. Temperature Sensors.

1. Manufactured by Onicon.
2. Solid-state sensors calibrated using NIST traceable temperature standards.
3. Differential temperature accuracy ±0.15°F over calibrated range.

E. Indicator: Solid-state, integrating-type meter for wall mounting.

1. Sixteen character alphanumeric LCD display.
2. Display Data: total energy, total flow, energy rate, flow rate, supply temperature and return temperature.

F. Accuracy: Plus or minus 0.05 percent computing non-linearity.

G. Display: Visually indicates total energy, total flow, energy rate, flow rate, supply and return temperature.

H. Output Interface: BacNET MS/TP compatible transceiver high-speed interface.

2.18 NATURAL GAS FLOW AND TOTALIZING METER

A. Provide natural gas (Methane) flow meter model 620S by Sierra Instruments or approved equal. Integration shall be through MODBUS. See plumbing drawings for location and quantity.

B. Performance Specifications:

1. Accuracy of Point Velocity - +/- 1% of full scale
2. Repeatability - +/- 0.2% of full scale
3. Temperature Coefficient - +/- 0.02% of reading per °F within +/- 50°F of customer specified conditions, +/- 0.03% of reading per °F within +/- 50°F to 100°F of customer specified conditions+/- 0.04% of reading per °C within +/- 25°C of customer specified conditions, +/- 0.06% of reading per °C within +/- 25°C to 50°C of customer specified conditions
4. Pressure Coefficient, .02% per psi for air, consult factory for other gases
5. Response Time, 200 milliseconds to 63% of final velocity value

C. Operating Specifications:

1. Gas Pressure - 120 psig maximum design pressure
2. Pressure Drop - Negligible
3. Gas & Ambient Temperature - Gas -40° to 176°F, Ambient -40° to 120°F
4. Power Requirements - 18 to 30 VDC (regulated), 625 mA maximum
5. Output Signal - Linear 0–5 VDC or 0-10 VDC, 1000 ohms minimum load resistance or Linear 4–20 mA proportional to mass flow rate, 700 ohms maximum resistance power supply dependent User-selectable. Active non-galvanically separated or, passive galvanically separated (loop power required)

6. Alarms - Hard contact user-adjustable high and low, Dead band adjustable with Smart Interface™ software, Relay ratings maximum 42 VAC or 42 VDC, 140 mA
7. Displays - Alphanumeric 2 x 12 digit backlit LCD Adjustable variables via on-board switches (password protected) or, with Smart Interface™ software, Adjustable variables. . Full scale (50 to 100 %)Time Response (1 to 7 seconds) Correction factor setting (0.5 to 5) Zero and span
8. Totalizer - Eight digits (9,999,999) in engineering units, Resettable by software, on-board switches or external magnet

2.19 CURRENT TRANSFORMERS

A. The current transformers shall be provided to be installed or removed without dismantling the primary bus or cables. The transformer shall be of a split core design.

B. The core and windings shall be completely encased in a UL approved thermoplastic rated 94VA. No metal parts shall be exposed other than the terminals.

C. The current transformers shall meet the following specifications.

1. Frequency Limits: 50 to 400 Hz.
2. Insulation: 0.6 KV Class, 10 KV BIL.
3. Accuracy: ± 1 % at 5.0 to 25.0 VA accuracy class with U.P.F. burden.
4. Provide a disconnect switch for each current transformer.

2.20 CURRENT SENSING SWITCHES

A. Current sensing switch shall be self-powered with solid-state circuitry and a dry contact output.

B. Current sensing switches shall consist of a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over current up to twice its trip into range.

2.21 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
3. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
4. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Manufacturers shall be Belimo Aircontrols (USA), Inc.
2. Valves: Size for torque required for valve close off at maximum pump differential pressure.
3. Coupling: V-bolt and V-shaped, toothed cradle.
4. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
5. Provide external, manual gear release on nonspring-return actuators.
6. Power Requirements (Two-Position): 24-V ac.
7. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
8. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
9. Temperature Rating: 40 to 104 deg F.
10. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg F
11. Run Time: 60 seconds.

2.22 CONTROL VALVES

A. Manufacturer shall be Belimo Aircontrols or approved equal.

B. Control Valves: Factory fabricated, of type, body material and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

C. Ball Valves:

1. NPS 2 and Smaller: 400 psi brass body, nickel plated, stainless steel trim, PTFE seats and screwed ends.
2. NPS 2-1/2 and 4: 400 psi brass body, nickel plated, stainless steel trim, PTFE seats and flanged ends.
3. Sizing:
    a. Two Position: Line size.
    b. Two-Way Modulating: As specified on the Drawings with Tefzel characterizing disc.
4. Flow Characteristics: Two-way valves shall have equal percentage characteristics.
5. Close-Off or Differential Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 200 psig.

D. High Performance Butterfly Valves:

1. Maximum close-off or differential pressure of 150 psig, ASTM A 126 cast-iron or ASTM A 536 ductile-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals.
2. Body Style: Lug.
3. Disc Type: Nickel-plated ductile iron.
4. Sizing: 1-psig maximum pressure drop at design flow rate.

2.23 ELECTRICAL BULK MATERIALS

A. The controls contractor shall be fully responsible to provide all wiring (low voltage, 120 volts,

etc.) and conduit (3/4” minimum or as required by electrical codes) for connection of all associated DDC HVAC devices and control valves, sensors, panels and any other DDC components for a completely operational DDC system.

1. The controls contractor shall be fully responsible to coordinate with their electrical subcontractor, prior to bid, to insure that all necessary electrical power wiring and conduit are provided for the new HVAC system, devices, control valves, control panels, etc.

B. Enclosures: Terminal boxes located indoors shall be rated for NEMA 1. Terminal boxes exposed to outdoors shall be rated for NEMA 12. Terminal boxes with potential water leakage shall be rated for NEMA 4X. They shall have protective coatings suitable to the environment in which they are to be installed. All enclosures shall be hinged with lockable doors.

C. Transformers: Provide step-down transformers where control equipment operates at lower than circuit voltage. Transformers serving shall be fed from the fan motor leads, or fed from the nearest distribution panelboard or motor control center, using circuits provided for the purpose. Transformers, other than transformers in bridge circuits, shall have primaries wound for the voltage available and secondaries wound for the correct control circuit voltage. Size transformers so that 80 percent of the rated capacity equals the connected load. Enclose transformers in a steel cabinet with conduit connections. Provide a disconnect switch on the primary side

D. and a fuse cutout on the secondary side. Transformers shall conform to UL 506.

E. The Controls Contractor shall furnish all electrical relays and coordinate with the supplier of magnetic starters for the auxiliary contact requirements. All electrical control devices shall be of a type to meet current, voltage, and switching requirement of their particular application. Relays shall be provided with 24 VAC coils and contacts shall be rated at 10 amps minimum.

F. Wiring:

1. Provide complete electric wiring for all temperature control apparatus, including wiring to transformer primaries, panels, valves, etc.

2. Control circuit conductors which run in same conduit as power circuit conductors shall have same insulation level as power circuit conductors.

3. Circuits operating at more than 100 volts shall be in accordance with Section 16050, "Basic Materials and Methods".

4. Circuits operating at 100 volts or less shall be defined as low voltage and shall be run in rigid or flexible conduit, metallic tubing, metal raceways or wireways, armored cable, or multiconductor cable. Use multiconductor cable for concealed accessible locations only. Provide circuit and wiring protection as required by NFPA 70. Aluminum-sheathed cable or aluminum conduit may be used but s

5. hall not be buried in concrete.

6. Provide all exposed wiring shall be in rigid conduit (minimum ¾”) or EMT. Refer to Section 16050, "Basic Materials and Methods" for different usages of rigid conduit, EMT, or IMT. All wiring in return air plenums shall be plenum rated.

7. For less than nominal 120V service: Cable in control panels for analog loops shall be twisted and shielded two conductor, #16 x 30 stranded with #22 AWG drain wire and aluminum-polyester 100 percent shielding cover for each pair. Cable outside of control panels for analog signal loops shall be single twisted #18 AWG shielded pair.

Conductors shall be copper coated with Class B strand. Insulation shall be 30 mils XPLE rated at 300 volts. Cable for digital signals shall be two conductor, #16 x 30 strande

8. d. Each conductor shall be color coded. Each cable shall have polyethylene jacket.
9. Wire for low voltage DC and electronic circuits carrying less than 0.5 ampere, cable of two or more conductors, shall be not smaller than No. 18 AWG stranded copper (shielded).
10. Shield cables carrying analog signals and install in separate conduit from AC power circuits.
11. Terminate cables in solder or screw type terminal strips. Do not tap cables at intermediate points.
12. Color code or number wires, whether individual or in cables, for identification.
13. Cables terminating in screw type terminal strips shall have pressure type connectors conforming to UL 486A. Wire in physical contact with compression screw is not acceptable.

2.24 NETWORK COMMUNICATION REQUIREMENTS

A. Wired network communication shall follow the published guidelines for twisted pair BacNET network.

B. Communication conduits shall not be installed closer than six feet from high power transformers or run parallel within six feet of electrical high power cables. Care shall be taken to route the cable as far from interference generating devices as possible. Where communication wire must cross high power wire (deemed as 110VAC or greater) it must do so at right angles.

C. All shields shall be grounded (earth ground) at one point only to eliminate ground loops. All shield grounding shall be done at the controller

D. location with the shield at the sensor/device end of the applicable wire being left long and “safed” off in an appropriate manner.

E. There shall be no power wiring, in excess of 30 VAC rms, run in conduit with communications wiring. In cases where signal wiring is run in conduit with communication wiring, all communication wiring and signal wiring shall be run using separate twisted pairs (24awg) in accordance with the manufacturer’s wiring practices.

2.25 INPUT/OUTPUT CONTROL WIRING

A. RTD wiring shall be two-wire or four-wire twisted, shielded, minimum number 22 gauge.

B. Other analog inputs shall be a minimum of number 22 gauge, twisted, (shielding optional).

C. Binary control function wiring shall be a minimum of number 18 gauge.

D. Analog output control functions shall be a minimum of number 18 gauge, twisted, shielded.

E. Binary input wiring shall be a minimum of number 18 gauge.

2.26 SPLICES

A. Splices in shielded cables shall consist of terminations and the use of shielded cable couplers, which maintain the integrity of the shielding. Terminations shall be in accessible locations. Cables shall be harnessed with cable ties as specified herein.

2.27 CONDUIT AND FITTINGS

A. Conduit for Control Wiring, Control Cable and Transmission Cable: Electrical metallic tubing (EMT) with compression fittings, cold rolled steel, zinc coated or zinc-coated rigid steel with threaded connections.

B. Outlet Boxes (Dry Location): Sheradized or galvanized drawn steel suited to each application, in general, four inches square or octagon with suitable raised cover.

C. Outlet Boxes (Exposed to Weather): Threaded hub cast aluminum or iron boxes with gasket device plate.

D. Pull and Junction Boxes: Size according to number, size, and position of entering raceway as required by National Electrical Codes. Enclosure type shall be suited to location.

2.28 RELAYS

A. Relays other than those associated with digital outputs shall be general-purpose, enclosed plug-in type with 8-pin octal plug and protected by a heat and shock resistant duct cover. Number of contacts and operational function shall be as required.

B. Relays associated with digital outputs shall have the ability to override the controlled equipment as a function of the relay. Relays shall be protected by a heat and shock resistant duct cover. Number of contacts and operational function shall be as required.

2.29 IDENTIFICATION

A. Automatic Control Valve Tags

1. For valves, etc., use metal tags with a 2-inch minimum diameter, fabricated of brass, stainless steel or aluminum. Attach tags with chain of same materials. For lubrication instructions, use linen or heavy duty shipping tag.
2. Tag valves with identifying number and system. Number valves by floor level, column location and system served.
3. Prepare lists of all tagged valves showing location, floor level, and tag number, use. Prepare separate lists for each system. Include copies in each maintenance manual.

B. Wire Tags

1. All multi-conductor cables in all pull boxes and terminal strip cabinets shall be tagged.
2. Provide wire Tags as per Division 26.

C. Conduit Tags

1. Provide tagging or labeling of conduit so that it is always readily observable which conduit was installed or used in implementation of this Work.

D. Miscellaneous Equipment Identification

1. Screwed-on, engraved black lamicoid sheet with white lettering on all control panels and remote processing panels. Lettering sizes subject to approval.
2. Inscription, subject to review and acceptance, indicating equipment, system numbers, functions and switches. For panel interior wiring, input/output modules, local control panel device identification.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that systems are ready to receive work.

B. Beginning of installation means installer accepts existing conditions.

C. The project plans shall be thoroughly examined for control device and equipment locations, and any discrepancies, conflicts, or omissions shall be reported to the Owner Representative for resolution before rough-in work is started.

D. The contractor shall inspect the site to verify that equipment is installable as show, and any discrepancies, conflicts, or omissions shall be reported to the Owner Representative for resolution before rough-in work is started.

E. The Controls Contractor shall examine the drawings and specifications for other parts of the work, and if head room or space conditions appear inadequate or if any discrepancies occur between the plans and his work and the plans for the work of others, he shall report such discrepancies to the Owner Representative and shall obtain written instructions for any changes necessary to accommodate his work with the work of others.

3.2 INSTALLATION, GENERAL

A. Install routers and repeaters as required to combine different communication channels onto a central field bus or as required to segment groups of Intelligent Devices and/or Control Units.

B. Install Intelligent Control Devices, Programmable Controllers, and Application Specific Controllers as herein specified, as needed to perform functions indicated in the input/output summaries and sequences of operation, and/or indicated on the HVAC drawings.

C. Install wire, raceway systems, conduit, 24 VDC and/or 24 VAC power supplies and final connections to nodes provided by this contract. Must comply with Division 26 requirements.

D. Provide 120 VAC power to control panel locations. The controls contractor shall be fully responsible to provide all wiring (low voltage, 120 volts, etc.) and conduit (3/4” minimum or as required by electrical codes) for connection of all associated DDC sensors, panels, valves, and any other DDC components for a completely operational DDC system.

E. Install all required devices, sensors, hardware, software, wiring, controllers, etc. including any required and not specifically addressed in this specification but required for syst

F. em functionality. It shall be the responsibility of the Contractor to provide a complete and functional system.

G. Install all control components in accordance with manufacturer's instructions and recommendations.

H. Mount control panels adjacent to associated equipment on vibration-free walls or freestanding angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide nameplates for instruments and controls inside cabinet and nameplates on cabinet face.

I. After completion of installation, test and adjust control equipment. Submit data showing setpoints and final adjustments of controls.

J. Install equipment, piping, wiring/conduit parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.

K. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

L. Connect and configure equipment and software to achieve sequence of operation specified.

M. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

N. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

O. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

P. Verify location of temperature, humidity and other sensors, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above the floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

Q. Install labels and nameplates to identify control components according to Section 230553 "Identification for HVAC Piping and Equipment."

R. Install hydronic instrument wells, valves, and other accessories according to Section 232113 "Hydronic Piping."

3.3 ELECTRICAL SYSTEM INSTALLATION

A. Comply with all Division 16 Installation Requirements.

B. Install low voltage power and LAN communication trunks in conduit in the following locations regardless of local building code allowances otherwise.

1. Mechanical rooms
2. Electrical rooms
3. Vertical risers (exception: fire rated continuous closet like a telephone closet)
4. Open Areas where the wiring will be exposed to view or tampering

C. Conceal conduit within finished shafts, ceilings and wall as required. Install exposed conduit parallel with or at right angles to the building walls and ceilings.

D. Where Class 2 wires are in concealed and accessible locations including ceiling return air plenums, approved cables not in raceway may be used provided that:

1. Circuits meet NEC Class 2 (current-limited) requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.)
2. All cables shall be UL listed for application, i.e., cables used in ceiling plenums shall be UL listed specifically for that purpose.
3. Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels containing high voltage may not be used for low voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).
4. Where Class 2 wiring is run exposed, wiring to be run parallel along a surface or perpendicular to it, and NEATLY tied at 3m (10 ft.) intervals minimum.
5. Cabling are supported every 10’ away from electrical conduit and ballasts. Extra cabeling shall be neatly coiled and supported.

E. All wire-to-device connections shall be made at a terminal blocks or terminal strip. All wire- to-wire connections shall be at a terminal block, or with a crimped connector. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to

devices and terminals.

F. Plug or cap all unused conduit openings and stub-ups. Do not use caulking compound.

G. Route all conduit to clear beams, plates, footings and structure members. Do not route conduit through column footings or grade beams.

H. Set conduits as follows:

1. Expanding silicone fire stop material sealed watertight where conduit is run between floors and through walls of fireproof shaft.
2. Cap open ends of conduits until conductors are installed.
3. Where conduit is attached to vibrating or rotating equipment, flexible conduit with a minimum length of 18 inches and maximum length of 36 inches shall be installed and anchored in such a manner that vibration and equipment noise will not be transmitted to the rigid conduit.
4. Where exposed to the elements or in damp or wet locations, waterproof flexible conduit shall be installed. Installation shall be as specified for flexible metal conduit.

3.4 CLEANING

A. The Controls Contractor shall clean up all debris resulting from his or her activities daily. The contractor shall remove all cartons, containers, crates, etc. under his (or his subcontractors) control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Construction Manager or General Contractor.

B. At the completion of work in any area, the Controls Contractor shall clean all of his/her work, equipment, etc., making it free from dirt and debris, e

C. tc.

D. At the completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.5 PROTECTION

A. The Controls Contractor shall protect all work and material from damage by his/her work or workers or sub-contractors, and shall be liable for all damage thus caused.

B. The Controls Contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The Controls Contractor shall protect his/her work against theft or damage, and shall carefully store material and equipment received on-site that is not immediately installed. The Controls Contractor shall close all open

C. ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.6 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.

3. Test each point through its full operating range to verify that safety and operating control set points are as required.
4. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
5. Test each system for compliance with sequence of operation.
6. Test software and hardware interlocks.

B. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check instrument tubing for proper fittings, slope, material, and support.
5. Check installation of air supply for each instrument.
6. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.
7. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
8. Check temperature instruments and material and length of sensing elements.
9. Check control valves. Verify that they are in correct direction.
10. Check air-operated dampers. Verify that pressure gages are provided and that proper blade alignment, either parallel or opposed, has been provided.
11. Check DDC system as follows:
    a. Verify that DDC controller power supply is from emergency power supply, if applicable.
    b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
    c. Verify that spare I/O capacity has been provided.
    d. Verify that DDC controllers are protected from power supply surges.

C. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.7 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.
2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
4. Control System Inputs and Outputs:
    a. Check analog inputs at 0, 50, and 100 percent of span.

b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.

c. Check digital inputs using jumper wire.

d. Check digital outputs using ohmmeter to test for contact making or breaking.

e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Flow:

a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.

b. Manually operate flow switches to verify that they make or break contact.

6. Pressure:

a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.

b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

7. Temperature:

a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.

b. Calibrate temperature switches to make or break contacts.

8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.

9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.

10. Provide diagnostic and test instruments for calibration and adjustment of system.

11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

3.8 CALIBRATION

A. The following devices shall be factory calibrated prior to installation and calibration certificates shall be provided by the manufacturer. The device will have to be field calibrated (4-20 mA of VDC signal to GUI/Trend value):

1. Water flow meters

2. Air differential pressure sensors

3. Water differential pressure sensors

4. Humidity sensors

B. The following devices shall be factory and field(4-20 mA signal to GUI/Trend value) calibrated

after installation:

1. RTD temperature sensors
2. Thermistor Sensors (If it is not an offset calibration but varies with span outside of accuracy, replace the sensor)
3. Current switches
4. Air flow sensors

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls.

3.10 TRAINING

A. Provide a minimum of four (4) classroom training sessions, four (4) hours each, throughout the contract period for personnel designated by the Owner.

B. Train the Owner staff to enable them to proficiently operate the system; create, modify and delete programming; add, remove and modify physical points for the system, and perform routine diagnostic and troubleshooting procedures.

C. Additional training shall be available in courses designed to meet objectives as divided into three logical groupings; participants may attend one or more of these, depending on the level of knowledge required:

1. Day-to-day Operators
2. Advanced Operators
3. System Managers/Administrators

D. Provide course outline and materials as per Part 1 of this Section. The instructor(s) shall provide one copy of training material per student.

E. The instructor(s) shall be factory-trained instructors experienced in presenting this material.

F. Classroom training shall be done using a network of working controllers representative of the installed hardware or at the customer’s site. This training shall be made available in addition to the interactive audio-visual tutorial, provided with the system.

3.11 ACCEPTANCE

A. The control systems will not be accepted as meeting the requirements of Completion until all tests described in this specification have been performed to the satisfaction of the Owner Representatives.

B. Controls contractor shall work with TAB contractor to ensure proper balancing of the building. Refer to 230593 "Testing, Adjusting, and Balancing".

C. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Owner’s Representative. Such tests shall then be performed as part of the warranty.

END OF SECTION

SECTION 230993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems, and equipment. Refer to the controls portion of this Specification and the Drawings for a complete understanding of the control sequences. Contractor shall be responsible for coordinating Division 230900 and service representatives of the equipment manufacturers to implement these control sequences along with Division 26. Prior to providing submittals, all field wiring connections shall be determined and shown on the submittals for electrical and controls interface.

B. Related Sections include the following:

1. Section 230900 "Instrumentation and Controls for HVAC" for control equipment and devices and for submittal requirements.

1.03 DEFINITIONS

A. DDC: Direct digital control.

B. VAV: Variable air volume.

1.04 SEQUENCE OF OPERATIONS

A. GRAPHICAL USER INTERFACE (GUI)

1. All timers, time remaining on timers, set points or operation ranges shall be visible and adjustable through the GUI.

2. A status LED shall be shown on the graphic next to each piece of equipment to show if the device is in hand (local control) the LED shall be blue, forced through the Graphics page in hand the LED shall be yellow, in alarm the LED shall be red, if the equipment is in auto and off the LED shall be black, if the equipment is in auto and operating the LED shall be green.

B. Building Chilled Water Interface:

1. The Direct Digital Control system (DDC) shall monitor, trend and sequence the chilled water service to the building as follows:

a. The chilled water dp setpoint for DP-303 shall have a starting setpoint of 15 PSID and reset through a range of 0.5 PSID to 20 PSID. If the most open CHW valve is open more than 85% the dp setpoint shall be reset up 0.1 PSID every minute until the most open valve is open 85% or less. If the most open CHW valve is open less than 80% the dp setpoint shall be reset down 0.1 PSID every minute until the CHW valve is open 80% or more. The GUI shall have a page dedicated to the CHW valves showing valves, their valve position, a GUI link of the device they serve, trends, and the ability to include or exclude the valve from the dp reset.

b. If the chilled water differential pressure at DP-303 exceeds dp setpoint CV-401 shall modulate to maintain dp setpoint.

c. If the chilled water differential pressure at DP-303 is below dp setpoint CV-401 shall modulate open to maintain dp setpoint.

d. DDC Control system shall be configured to generate a Setpoint Reset History report.

e. Metering: The control system shall monitor instantaneous chilled water tons and trend ton-hours consumption.

C. Building Heating Hot Water Interface:

1. The Direct Digital Control system (DDC) shall monitor, trend and sequence the heating hot water service to the building as follows:

a. The heating hot water dp setpoint for DP-304 shall have a starting setpoint of 15 PSID and reset through a range of 0.5 PSID to 20 PSID. If the most open HHW valve is open more than 85% the dp setpoint shall be reset up 0.1 PSID every minute until the most open valve is open 85% or less. If the most open HHW valve is open less than 80% the dp setpoint shall be reset down 0.1 PSID every minute until the HHW valve is open 80% or more. The GUI shall have a page dedicated to the HHW valves showing valves, their valve position, a GUI link of the device they serve, trends, and the ability to include or exclude the valve from the dp reset.

b. If the heating hot water differential pressure at DP-304 exceeds dp setpoint CV-402 shall modulate to maintain dp setpoint.

c. If the heating hot water differential pressure at DP-304 is below dp setpoint CV-402 shall modulate open to maintain dp setpoint.

d. DDC Control system shall be configured to generate a Setpoint Reset History report.

e. Metering: The control system shall monitor instantaneous natural gas therms, HHW BTUs and trend natural gas total Therms, BTUH consumption using a BTU meter.

D. AHU-1 & AHU-2 Sequence of Operation:

1. The Direct Digital Control system (DDC) shall schedule, turn on and off, monitor, trend, and sequence the airside system as follows:

a. Post-Occupancy Title 24 Required 1-HR Building Purge

1) Air handling system, ventilation system and VAV boxes shall be enabled.

2) VAV boxes shall modulate to maintain the minimum airflow setting.

3) Air handling unit shall operate under demand control ventilation setting.

4) Purge duration shall be scheduled for 1-hour before the scheduled occupied start hour and shall end at the scheduled occupied start hour.

2. Start/Stop

a. When the air handler is OFF (stopped/disabled for any reason) the following occurs:

1) The minimum outside air damper is commanded closed.

2) The economizer damper is commanded closed.

3) The relief air damper is commanded closed.

4) The return air damper is commanded open.

5) Supply fan is commanded to stop.

6) Return fan is commanded to stop.

7) All alarms are suppressed.

3. Enable/Disable
   a. The air handler is enabled based on a time of day programmable schedule.
   b. The air handler shall start one hour before scheduled programmed occupancy and operate in accordance with paragraph 1.4.E.2 Post-Occupancy Title 24 Required 1-HR Building Purge.
   c. The following schedule shall be programmed:

Day	Start	Stop
Monday	7:00 AM	10:00 PM
Tuesday	7:00 AM	10:00 PM
Wednesday	7:00 AM	10:00 PM
Thursday	7:00 AM	10:00 PM
Friday	7:00 AM	10:00 PM
Saturday	7:00 AM	10:00 PM
Sunday	Off	Off
Holidays	Off	Off

4. Start-up
   a. When the air handler is enabled automatically by the time of day schedule or manually by the operator the following occurs:
      1) The minimum outside air damper is commended open.
      2) The return air damper is commanded open.
      3) The supply fan is commanded to start.
      4) The supply fan speeds up to the programmed minimum speed 15 Hz (adjustable)
      5) Supply fan status is confirmed by the current switch.
      6) Once the supply fan status is confirmed, the return fan is commanded on.
      7) The return fan speeds up to programmed minimum speed 15 Hz (adjustable)
      8) Return fan status is confirmed by the current switch.
      9) Supply fan speed control loop is enabled.
      10) Return fan speed control loop is enabled.
      11) Supply air temperature control loop is enabled.
      12) Temperature and pressure alarms are enabled after 15 minutes (adjustable)
5. Outside Air Economizer:
   a. This application shall be based upon dry bulb temperature.
   b. The minimum and economizer outdoor air dampers shall be opened as the first stage of cooling if the outside air temperature is less than the return air temperature and the outdoor air dry bulb temperature is below 69°F (adjustable), while the return damper remains open (provided that the economizer is operating). This sequence provides less than 100% outdoor air but a very low-pressure air path for the supply fan. If more cooling is needed, the return damper shall modulate closed to ensure that the system has 100% outside air.

c. When outside air temperature is 2°F (adjustable) greater than the return air temperature:

1) The economizer cycle shall be disabled. The outside air economizer damper shall be closed, and the return damper shall be opened.

2) The minimum outside air damper shall modulate based on the demand control ventilation sequence. The minimum outside air damper shall never close during occupied hours.

d. When outside air temperature decreases below supply air temperature setpoint, the outside air dampers shall modulate closed to maintain desired cold deck temperature setpoint, while the return damper modulated open.

e. The economizer cycle shall be locked out during morning warm-up.

6. Outside Air / Return Air / Relief Air Control and Demand Controlled Ventilation (DCV)

a. Minimum Outdoor Air Control: Modulate minimum outdoor air damper to maintain minimum outside air setpoint when the supply air fan is proven on. Damper shall be closed otherwise.

b. Demand Controlled Ventilation (DCV)

1) The CO2 sensors must be located in the breathing zone (4 ft. above the floor). CO2 sensors shall be certified by the manufacturer to have an accuracy of no less than 75 ppm, factory calibrated or calibrated at start-up, and certified by the manufacturer to require calibration no more frequently than once every 5 years.

2) Outside air measuring station shall measure minimum outside air quantity and report its value to the DDC system. The outside air CO2 reading shall be assumed at 400 ppm. A differential of no more than 600 ppm shall be maintained during all occupied hours. Regardless of the CO2 sensor's reading, the system is not required to provide more than the maximum ventilation rates given below. This high limit shall be implemented in the controls. The minimum outside air damper shall modulate to maintain the required ventilation rates.

3) The zone CO2 controls should increase the airflow rate at the space as described in the VAV BOX CONTROL with Demand Controlled Ventilation sequence.

4) The minimum outdoor air setpoint shall be reset based on the highest zone CO2 loop signal from absolute minimum at 50% signal by modulating to design minimum at 100% signal to maintain the CO2 setpoint.

7. Return Air Damper:

a. The return air damper shall be fully open when the unit is not in economizer unless the minimum OSA damper is open more than 95% (adjustable). The return damper shall modulate to maintain the minimum OSA damper between 90% to 95% open (adjustable).

8. Exhaust Air Damper Building Pressurization Control:

a. Static pressure relative to the outside shall be measured within the space. Building static pressure shall be time averaged at each location with a sliding one minute window (to reduce damper and fan control fluctuations).

b. A PI loop maintains the return plenum pressure at a setpoint of 0.02" W.C (adjustable). The AHU exhaust damper shall modulate to maintain building dp setpoint of 0.05" W.C.

(adjustable). If building pressure is greater than setpoint the exhaust damper shall modulate open. If the pressure is less than setpoint the exhaust damper shall modulate closed.

9. Return Fan Control:
    a. The return fan shall modulate to maintain return plenum pressure dp setpoint. The return fan shall only be enabled when the supply fan is enabled. The setpoint shall be reset through a range of 00" W.C. to 1.0" W.C. The starting setpoint shall be 0.153" W.C. If the exhaust damper is open more than 90% the dp setpoint shall be reset up to 0.05" W.C. per minute. If the exhaust damper is open less than 85% the dp setpoint shall be reset down 0.05" W.C. per minute. If the return fan is at a minimum speed and the dp setpoint is exceed by 0.2" W.C. (adjustable) for 5 minutes (adjustable), the return fan shall be disabled.
10. 1Supply Duct Static Pressure Control and Reset:
    a. The air handlers shall have a supply air duct static pressure in the main duct between VAV-2-1B and VAV-2-1C.
    b. The control logic shall be slow-acting to avoid hunting. Supply fan speed shall modulate to maintain the pressure sensors at minimum setpoint. The supply fan speed minimum shall be 10% for motor cooling.
    c. The starting static pressure setpoint shall be 0.75" W.C. (adjustable) the setpoint shall be reset through a range of 0.1" W.C. to MaxP setpoint. If the most open VAV box is open more than 85% the dp setpoint shall be reset up 0.05" W.C. per minute until the VAV box is open less than 85%. If the most open VAV box is open less than 80% the dp setpoint shall be reset down 0.05" W.C. per minute until the most open VAV box is open at or above 80%.
    d. MaxP shall be determined by the air balancer in conjunction with the control contractor as required to provide design airflow in all boxes downstream of the duct static pressure sensor.
    e. The GUI shall have a page dedicated to the VAV boxes per AHU showing VAV Box, their damper position, a GUI link of the space they serve, trends, and the ability to include or exclude the VAV from the dp reset.
11. Supply Air Temperature Control
    a. AHU Chilled Water Coil:
        1) A "trim and respond" control algorithm shall maintain the actual average supply temperature to the corresponding setpoint. The chilled water valve shall modulate to maintain desired temperature setpoint when in cooling mode.
        2) he supply air temperature shall be reset using the following reset schedule. Sequence shall allow for Owner to identify and define "rogue" zones to be excluded from the reset control

            Supply Air Setpoint, °F OSA Temp, °F

            58 55

            57 60

            56 65

            55 70

        3) If AHU supply fan is off, the corresponding AHU chilled water valve shall be closed.

12. 1Failure
    a. If the supply fan is commanded ON and a positive status is not received from the current switch after 30 seconds (adjustable), the start-up is aborted.
    b. If the supply air fan is running and positive status is lost, the air handler is disabled.
    c. If the return air fan is commanded ON and positive status is not received from the current switch after 30 seconds (adjustable), the start-up is aborted.
    d. If the return air fan is running and positive status is lost, the air handler is disabled.
    e. If the supply duct pressure increases beyond 4" W.C. (adjustable) the high static pressure switch installed in the supply duct will cause the supply and return fan to stop. The switch requires a manual reset to allow the fans to restart.
    f. If the return duct pressure decreases beyond -2" W.C. (adjustable) the low static pressure switch installed in the return duct will cause the supply and return fan to stop. The switch requires a manual reset to allow the fans to start.
13. 1Alarms
    a. Critical alarms are generated at the operator workstation when:
        1) The high duct static pressure switch is triggered.
        2) The low duct static pressure switch is triggered.
        3) If the supply air fan is commanded ON and positive status is not received from the current switch after 30 seconds (adjustable).
        4) If the return air fan is commanded ON and positive status is not received from the current switch after 30 seconds (adjustable).
        5) Minimum outside air damper is commanded fully open and positive status is not received from the open end switch after 30 seconds (adjustable).
        6) Minimum outside air damper is commanded fully closed and positive status is not received from the open end switch after 30 seconds (adjustable).
        7) Economizer air damper is commanded fully open and positive status is not received from the open end switch after 30 seconds (adjustable).
        8) Economizer damper is commanded fully closed and positive status is not received from the open end switch after 30 seconds (adjustable).
        9) Supply air temperature rises above 60°F (adjustable) for 5 minutes (adjustable).
    b. Maintenance alarms are generated at the operator workstation when:
        1) The pre-filter pressure drop reaches 0.5" W.C. (adjustable).
        2) The alarm shall vary with fan speed roughly as follows: DPx = DP100(x)1.4, Where DP100 is the high limit pressure drop (0.8" WC) at design cfm and DPx is the high limit at speed (IGV) signal x (expressed as a fraction of full signal). For instance, the setpoint at 50% of full speed would be (0.5)1.4 or 38% of the design high limit pressure drop
        3) The final filter pressure drop reaches 0.8" W.C. (adjustable).
        4) The alarm shall vary with fan speed roughly as follows: DPx = DP100(x)1.4, where DP100 is the high limit pressure drop (0.8" WC) at design cfm and DPx is the high limit at speed (IGV) signal x (expressed as a fraction of full signal). For instance,

the setpoint at 50% of full speed would be (0.5)1.4 or 38% of the design high limit pressure drop

5) Difference between supply air volume and return air volume is higher than 2,000 CFM (adjustable) for 5 minutes (adjustable).
6) Difference between supply air volume and return air volume is lower than 2,000 CFM (adjustable) for 5 minutes (adjustable).
7) Supply air temperature drops below 50°F (adjustable) for 5 minutes (adjustable).
8) Alarm state is received from supply fan VFD.
9) Alarm state is received from return fan VFD.
10) The outside air varies from the setpoint by 10% (adjustable) for more than 10 minutes (adjustable).
11) The CO2 for any space varies from the setpoint by 10% (adjustable) for more than 15 minutes (adjustable)

12) Note: All delays must be verified and tweaked by the BAS contractor based on actual motor drives and actuators response time.

E. AHU VAV BOX CONTROL (Cooling Only Without Demand Controlled Ventilation)
1. Space shall be capable of being scheduled on/off through the control system as required in the AHU Sequence. When the space is scheduled off, the corresponding VAV box damper(s) shall be fully closed.
2. Each zone shall have a cooling setpoint.
3. When the zone is in the cooling mode, the cooling loop output is mapped to the airflow setpoint from the cooling maximum to the minimum airflow setpoints.
4. When the zone is in the deadband mode, the airflow setpoint shall be the minimum airflow setpoint.
5. The VAV damper shall be modulated to maintain the measured airflow at setpoint.

F. AHU VAV BOX CONTROL (Reheat, Dual Maximum Without Demand Controlled Ventilation)
1. Space shall be capable of being scheduled on/off through the control system as required in the AHU Sequence. When the space is scheduled off, the corresponding VAV box damper(s) shall be fully closed.
2. Each zone shall have a cooling setpoint and heating setpoint. The temperature between these two setpoints is the deadband.
3. When the zone is in the cooling mode, the cooling loop output is mapped to the airflow setpoint from the cooling maximum to the minimum airflow setpoints. The hot water valve is closed.
4. When the zone is in the deadband mode, the airflow setpoint shall be the minimum airflow setpoint. The hot water valve is closed.
5. When the zone is in the heating mode, the heating loop shall maintain space temperature at the heating setpoint as follows:
    a. From 0%-50% loop signal, the heating loop output shall reset the discharge temperature from supply air temperature setpoint (e.g., 55°F) to 90°F. Note the upper temperature is limited to prevent stratification during heating.

b. From 50%-100% loop signal, the heating loop output shall reset the zone airflow setpoint from the minimum airflow setpoint to the maximum heating airflow setpoint. The supply air discharge temperature remains at 90°F.

6. The hot water valve shall be modulated using a PI control loop to maintain the discharge temperature at setpoint. Note that directly controlling the hot water valve from the zone temperature PI loop is not acceptable since it will not allow supply air temperature to be under control and limited in temperature to prevent stratification.
7. The VAV damper shall be modulated to maintain the measured airflow at setpoint.
    a. The heating hot water valve shall be closed during unoccupied mode. In the event that the system is in warm-up mode, the valve shall be enabled even though the space would be unoccupied.

G. AHU VAV BOX CONTROL (Reheat, Dual Maximum With Demand Controlled Ventilation)

1. Space shall be capable of being scheduled on/off through the control system as required in the AHU Sequence. When the space is scheduled off, the corresponding VAV box damper(s) shall be fully closed.
2. Each zone shall have a cooling setpoint and heating setpoint. The temperature between these two setpoints is the deadband.
3. When the zone is in the cooling mode, the cooling loop output is mapped to the airflow setpoint from the cooling maximum to the minimum airflow setpoints. The hot water valve is closed.
4. When the zone is in the deadband mode, the airflow setpoint shall be the minimum airflow setpoint. The hot water valve is closed.
5. When the zone is in the heating mode, the heating loop shall maintain space temperature at the heating setpoint as follows:

    a. From 0%-50% loop signal, the heating loop output shall reset the discharge temperature from supply air temperature setpoint (e.g., 55°F) to 90°F. Note the upper temperature is limited to prevent stratification during heating.
    b. From 50%-100% loop signal, the heating loop output shall reset the zone airflow setpoint from the minimum airflow setpoint to the maximum heating airflow setpoint. The supply air discharge temperature remains at 90°F.
6. The hot water valve shall be modulated using a PI control loop to maintain the discharge temperature at setpoint. Note that directly controlling the hot water valve from the zone temperature PI loop is not acceptable since it will not allow supply air temperature to be under control and limited in temperature to prevent stratification.
7. The VAV damper shall be modulated to maintain the measured airflow at setpoint.
8. A proportional-only control loop shall maintain CO2 concentration at 1,000 ppm. The output of this loop (0 to 100%) shall be mapped as follows: The loop output from 0 to 50% shall reset the minimum airflow setpoint to the zone from the design minimum up to the maximum cooling airflow setpoint. The loop output from 50% to 100% will be used at the system level to reset outdoor air minimum. Refer to Demand Controlled Ventilation Sequence for AHU-1 and AHU-2.

9. The heating hot water valve shall be closed during unoccupied mode. In the event that the system is in warm-up mode, the valve shall be enabled even though the space would be unoccupied.

H. Fan Coil Units for Electrical, Telecom, and Elevator Equipment Rooms (FC-1/CU-1 through FC-7/CU-7)

1. The Direct Digital Control system (DDC) shall monitor the the Electrical, Telecom, and Elevator Equipment Rooms as follows:
2. The fan coils shall be able to operate 24/7 and are locally controlled by a local thermostat.
3. The EMS shall monitor space temperature in the space and alarm if the temperature exceeds the following:
    a. Electrical Rooms: 75°F (adjustable)
    b. Telecom Rooms: 75°F (adjustable)
    c. Elevator Machinery Room: 80°F (adjustable)

I. General/Restroom Ventilation (EF-1 and EF-2)

1. The Direct Digital Control system (DDC) shall turn on and off, monitor, trend, and sequence as follows:
    a. EF-1 and EF-2 shall operate whenever AHU-1 or AHU-2 is in operation. Status/alarm of fan operation shall be available through EMS.

1.05 BUILDING REPORTS

A. Provide year-around scheduling incorporating school holidays and vacations as provided by the Owner.

B. Annunciation of events and occurrences on three levels: routine maintenance, low-level alarm condition; high-level alarm condition.

1. Maintenance alarms shall annunciate conditions that require routine maintenance, such as dirty filters, or hours of equipment operation reaching elapsed time for scheduled preventive maintenance.
2. Low-level alarm shall annunciate conditions which reflect inoperability of equipment that would not prevent the HVAC systems from providing service but requires maintenance or repair to re-establish operation such as a failed pump or filter alarm.
3. High-level alarms shall annunciate conditions which require immediate response in order to insure provision of building HVAC, or that reflect a catastrophic failure of equipment.
4. Contractor shall submit to the Engineer for review and approval designation of all conditions for annunciation. All equipment shall be monitored for elapsed time between inspection and service; all status of inoperability shall be monitored; all alarm conditions as indicted in this Section shall be monitored by the DDC system. All conditions as indicated herein shall annunciate via overriding screen display; display and output shall be submitted for review and approval.

C. Trending of system and component operation and completion of trend logs in tabular and graphical format suitable for binding in a weekly, monthly, and yearly report. Reports shall consist of full- page form-fed output with headers, subheadings, dates, times, instrument numbers, etc. Output shall be submitted for review and approval.

1. Weekly report shall consist of the following:
    a. Hourly and daily load for the following systems:

1) Building Energy Use (kBtu/ft2)
2) Building CHW Load (Tons)
3) Building HHW load (Therms)
4) Building water use (Gallons)
5) Building gas usage (CF)
6) Building electrical usage (kWh)

b. Maximum hourly and daily load for the following systems:
1) Building CHW Load (Tons)
2) Building HHW load (MBH)
3) Building electrical maximum demand (kW)

c. Events and occurrences.

2. Monthly report shall consist of the following:
a. Monthly load for the following systems:
1) Building Energy Use (kBtu/ft2)
2) Building CHW Load (Ton-Hours)
3) Building HHW load (Therms)
4) Building water use (Gallons)
5) Building gas usage (CF)
6) Building electrical usage (kWh)

b. Maximum monthly load for the following systems:
1) Building CHW Load (Tons)
2) Building HHW load (MBH)
3) Building electrical maximum demand (kW)

c. Hours of operation in each piece of equipment.
d. Identification of equipment approaching elapsed time for preventative maintenance.
e. Identification of equipment passed elapsed time for preventative maintenance.

3. Yearly report shall consist of the following:
a. Yearly load for the following systems:
1) Building Energy Use (kBtu/ft2)
2) Building CHW Load (Ton-Hours)
3) Building HHW load (Therms)
4) Building water use (Gallons)
5) Building gas usage (CF)
6) Building electrical usage (kWh)

b. Maximum yearly load for the following systems:
1) Building CHW Load (Tons)
2) Building HHW load (MBH)
3) Building electrical maximum demand (kW).

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 23 2113
HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

1. Chilled-water piping.
2. Hot-water heating piping
3. Air-vent piping.
4. Safety-valve-inlet and -outlet piping.

1.3 DEFINITIONS

A. PTFE: Polytetrafluoroethylene.

1.4 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Working pressure is equal to the relief pressure plus the static height of the system and pumping head. The only working pressure mandated by authorities having jurisdictionChilled-Water Piping 125 psig at 200 deg F.
2. Hot-Water Heating Piping 125 psig at 200 deg F.
3. Air-Vent Piping: 200 deg F.
4. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
2. Air control devices.
3. Chemical treatment.
4. Hydronic specialties.

B. Shop Drawings: Detail, at 1/4 scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Welding certificates.

C. Field quality-control test reports.

D. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

B. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.9 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

B. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

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.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Wrought-Copper Fittings: ASME B16.22.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Anvil International, Inc.

b. S. P. Fittings; a division of Star Pipe Products.

C. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53, black steel with plain ends; ERW, grade B, and wall thickness as indicated in Part 3 "Piping Applications" Article.

B. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.

C. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.

D. Forged-Steel Flanges and Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding, fittings.
3. Flanges: Raised face, slip-on or flat.

2.3 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. Hart Industries International, Inc.
   d. Jomar International Ltd.
   e. Matco-Norca, Inc.
   f. McDonald, A. Y. Mfg. Co.
   g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   h. Wilkins; a Zurn company.
2. Description:
   a. Standard: ASSE 1079.
   b. Pressure Rating: 125 psig minimum at 180 deg F, 150 psig , 250 psig .
   c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturer: Subject to compliance with requirements. Provide products by one of the following:
   a. Capitol Manufacturing Company
   b. Central Plastics Company

c. Matco-Norca, Inc.

d. Watts Regulator Co.; a Division of Watts Water Technologies, inc.

e. Wilkins; a Zurn Company

2. Description:

a. Standard: ASSE 1079

b. Factory-fabricated, bolted, companion-flange assembly

c. Pressure Rating: 175 psig

d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

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

a. Advance Products & Systems, Inc.

b. Calpico, Inc.

c. Central Plastics Company

d. Pipeline Seal and Insulator, Inc.

2. Description:

a. Nonconducting materials for field assembly of companion flanges.

b. Pressure rating: 150 psig

c. Gasket: Neoprene or phenolic

d. Bolt Sleeves: Phenolic or polyethylene.

e. Washers: Phenolic with steel backing washers

E. Dielectric Nipples:

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

a. Elster Perfection

b. Grinnell Mechanical Products

c. Matco-Norca, Inc.

d. Precision Plumbing Products, Inc.

e. Victaulic Company

2. Description:

a. Standard: IAPMO PS 66

b. Electroplated steel nipple. Complying with ASTM F 1545.

c. Pressure Rating: 300 psig at 225 deg F.

d. End Connections: Male threaded

e. Lining; Inert and non-corrosive, propylene.

2.4 AIR CONTROL DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amtrol, Inc.
2. Armstrong Pumps, Inc.
3. Bell & Gossett Domestic Pump; a division of ITT Industries.
4. Taco.

B. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

C. Automatic Air Vents:

1. Body: Bronze or cast iron.
2. Internal Parts: Nonferrous.
3. Operator: Noncorrosive metal float.
4. Inlet Connection: NPS ½
5. Discharge Connection: NPS ¼
6. CWP Rating: 150 psig
7. Maximum Operating Temperature: 240 deg F

2.5 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40 mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

B. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig.

C. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

D. Spherical, Rubber, Flexible Connectors:

1. Body: Fiber-reinforced rubber body.
2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
3. Performance: Capable of misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

E. Expansion fittings are specified in Division 23 Section "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2-1/2” and smaller, shall be the following:

1. Type L drawn-temper copper tubing, wrought-copper fittings, and soldered brazed joints.

B. Chilled-water piping, aboveground, NPS 2-12” and smaller, shall be the following:

1. Type L draw-temper copper tubing, wrought-copper fittings, and soldered brazed joints.

C. Hot-water heating piping, aboveground, NPS 3” and larger shall be the following:

1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

D. Chilled-water piping, aboveground, NPS 3” and larger shall be the following:

1. Schedule 40 steel pipe, wrought-steel fittings and wrought-case or forged-steel flanges and flange fittings, and welded and flanged joints.

E. Air-Vent Piping:

1. Inlet: Same as service where installed.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

F. Makeup-water piping installed above ground shall be the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or brazed joints.
2. Condensate-Drain Piping: Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or brazed joints.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

B. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such 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. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS ¾” ball valve, and short NPS ¾” threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Section 230523 "General-Duty Valves for HVAC Piping."

Q. Install unions in piping, NPS 2” and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

S. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

T. Identify piping as specified in Section 230553 "Identification for HVAC Piping and Equipment."

U. Install sleeves for piping penetrations of walls, ceilings, and floors.

V. Install sleeve seals for piping penetrations of concrete walls and slabs.

W. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.

B. Seismic restraints are specified in Section 230549 "Vibration Isolation and Seismic Controls."

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers for individual horizontal heating hot water piping size 21/2” and larger runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal heating hot water piping size 21/2” and larger runs 20 feet or longer, supported on a trapeze.
4. Provide spring hangers to support vertical runs for the first five hangers for all mechanical piping mains connected to pumps.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 7 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. NPS 4: Maximum span, 14 feet; minimum rod size, 1/2 inch.
8. NPS 6: Maximum span, 17 feet; minimum rod size, 1/2 inch.
9. NPS 8: Maximum span, 19 feet; minimum rod size, 5/8 inch.

E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 5 feet ; minimum rod size, 1/4 inch.
2. NPS 1 : Maximum span, 6 feet ; minimum rod size, 1/4 inch.
3. NPS 1-1/2: Maximum span, 8 feet ; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.

6. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.

F. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 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. 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.

D. 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.

E. 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.

F. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual vents at heat-transfer coils and elsewhere as required for air venting. Automatic air vents shall be piped to the nearest code-approved receptor.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Section 230519 "Meters and Gages for HVAC Piping."

E. Install flexible piping connections for all terminal equipment connections and AHU connections.

3.8 CHEMICAL TREATMENT

A. Perform an analysis of makeup water to determine type and quantities of chemical treatment needed to keep system free of scale, corrosion, and fouling, and to sustain the following water characteristics:

1. pH: 9.0 to 10.5.
2. "P" Alkalinity: 100 to 500 ppm.
3. Boron: 100 to 200 ppm.
4. Chemical Oxygen Demand: Maximum of 100 ppm.
5. Corrosion Inhibitor:
    a. Sodium Nitrate: 1000 to 1500 ppm.
    b. Molybdate: 200 to 300 ppm.
    c. Chromate: 200 to 300 ppm.
    d. Sodium Nitrate Plus Molybdate: 100 to 200 ppm each.
    e. Chromate Plus Molybdate: 50 to 100 ppm each.
6. Soluble Copper: Maximum of 0.20 ppm.
7. Tolyiriazole Copper and Yellow Metal Corrosion Inhibitor: Minimum of 10 ppm.
8. Total Suspended Solids: Maximum of 10 ppm.
9. Ammonia: Maximum of 20 ppm.
10. Free Caustic Alkalinity: Maximum of 20 ppm.
11. Microbiological Limits:
    a. Total Aerobic Plate Count: Maximum of 1000 organisms/mL.
    b. Total Anaerobic Plate Count: Maximum of 100 organisms/mL.
    c. Nitrate Reducers: 100 organisms/mL.
    d. Sulfate Reducers: Maximum of zero organisms/mL.
    e. Iron Bacteria: Maximum of zero organisms/mL.

B. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.

C. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.

3.9 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.

4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:
1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:
1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as heating hot water generator.
7. Verify lubrication of motors and bearings.

END OF SECTION

SECTION 23 31 13

METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval 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, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Retain first paragraph below if Contractor is required to assume responsibility for duct construction design.Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. 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 SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
2. Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
3. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 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.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

1.5 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. Access panels.

B. Welding certificates.

C. Field quality-control reports.

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," for hangers and supports.

2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.

3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

D. Exhaust system shall comply with CMC Section 505 and 506. Hot gas exhaust ductwork shall conform to CMC Section 816, 817 and 818. Both systems shall comply also to NFPA 91.

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 AND FLAT-OVAL 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.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

C. 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.

D. 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.
2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

E. 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. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated on the “Duct Schedule” Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the “Duct Schedule” Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. 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.

G. 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. CertainTeed Corporation; Insulation Group.
    b. Johns Manville.
    c. Knauf Insulation.
    d. Owens Corning.
    e. Or approved equal.

    f. Maximum Thermal Conductivity:
        1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
        2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
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. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Aeroflex USA Inc.
    b. Armacell LLC.
    c. Rubatex International, LLC
    d. Or approved equal.

2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

    a. 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).

    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."

C. Insulation Pins and Washers:

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.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick stainless steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

D. 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: 3 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. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. 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).
9. VOC: Maximum 395 g/L.
10. 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."
11. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
12. Service: Indoor or outdoor.
13. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. 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."

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-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. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. 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."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. 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.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.7 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. Hilti Corp.
2. TOLCO; a brand of NIBCO INC.
3. Unistrut Corporation; Tyco International, Ltd.
4. Or approved equal.

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.

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: 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 and flat-oval 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."

1. Space lateral supports a maximum of 40 feet, 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 an evaluation service member of the ICC Evaluation Service.

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 Division 09.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.

C. Contractor shall develop and implement an IAQ Management Plan for the construction and preoccupancy phases of the new building as follows:

1. During construction meet or exceed the recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, and Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3)
2. Protect stored materials on-site and installed absorptive materials from moisture damage.
3. If permanently installed air handlers are used during construction, filtration media with a minimum efficiency reporting value (MERV) of 8 must be used to each return air frille, as determined by ASHRAE Standard 52.2-2012 (with errata but without addenda). Replace air filtration media immediately prior to occupancy.

D. Duct system will be considered defective if it does not pass inspections.

E. Prepare inspection reports.

3.9 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Supply Ducts:

1. Ducts Connected to Variable-Air-Volume Air-Handling Units:
    a. Pressure Class: Positive 4-inch wg.
    b. Minimum SMACNA Seal Class: A.

C. Return Ducts:

1. Ducts Connected to Air-Handling Units:
    a. Pressure Class: Positive or negative 3-inch wg.
    b. Minimum SMACNA Seal Class: A.

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: A

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 3-inch wg.

b. Minimum SMACNA Seal Class: A.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

2. Stainless-Steel Ducts:

a. Exposed to Airstream: Match duct material.

b. Not Exposed to Airstream: Match duct material.

G. Liner:

1. Supply Air Ducts: 1-1/2-inch Fibrous glass, Type I or 1-inch Flexible elastomeric.

2. Return Air Ducts: Fibrous glass, Type I, 1-1/2 inches thick.

3. Supply Fan Plenums: Fibrous glass, Type II 1-1/2 inches thick.

4. Return- and Exhaust-Fan Plenums: Fibrous glass, Type II, [1-1/2 inches thick.

5. Transfer Ducts: Flexible elastomeric, 1 inch 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: Weldeda.

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

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies ductwork accessories such as volume control dampers, back-draft dampers, air turning vanes, flexible duct connections, duct access doors, duct test holes, combination fire smoke dampers and intake vents.

1.2 QUALITY ASSURANCE

A. References: This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

NFPA 90A	Installation of Air Conditioning and Ventilating Systems.
SMACNA	Low Pressure Duct Construction Standards.
UL 33	Heat Responsive Links for Fire-Protection Service.
UL 555	Fire Dampers and Ceiling Dampers.

1.3 ACTION SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 230000.

B. Product Data: For each type of product.

C. 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. Combination fire- and smoke-damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
    d. Wiring Diagrams: For power, signal, and control wiring.

1.4 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.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in 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.

B. Fusible Links: Furnish quantity equal to 10 percent of amount installed

PART 2 - PRODUCTS

2.1 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

B. Fabricate splitter dampers of material same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.

C. Fabricate splitter dampers of single thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod in self aligning, universal joint action flanged bushing with set screw.

D. Fabricate single blade dampers for duct sizes to 12 x 48 inch.

E. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

F. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

G. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends.

H. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.2 REMOTE DAMPER OPERATORS

A. Manufacturer:

1. Young Regulator
2. Approved Equal.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Brass.

D. Cable: Stainless steel.

E. Wall-Box Mounting: Recessed.

F. Wall-Box Cover Plate Material: Stainless Steel.

2.3 BACKDRAFT DAMPERS

A. Manufactures shall be Ruskin, Greenheck or equal.

B. Gravity back-draft dampers, size 18 x 18 inches or smaller, furnished with air moving equipment, may be air moving equipment manufacturer’s standard construction.

C. Fabricate multi-blade, parallel action gravity balanced back-draft dampers of extruded aluminum, with blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.4 AIR TURNING VANES

A. Multi-blade device with blades aligned in short dimension; blades shall have long trailing edges; steel or aluminum construction; with individually adjustable blades, mounting straps. Manufacturer shall be Aero/Dyne or equal (no known equal).

2.5 FLEXIBLE DUCT CONNECTIONS

A. Manufacturer: Ventfrabrics or equal (no known equal).

B. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

C. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd, approximately 6 inches wide, crimped into metal edging strip.

D. Leaded vinyl sheet, minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to **10,000 Hz range.**

2.6 DUCT ACCESS DOORS

Manufacturers shall be Ventfrabrics, Ductmate, Pottorf Company or equal.

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards and as indicated.

B. Review locations prior to fabrication.

C. Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover.

D. Access doors smaller than 12 inches square may be secured with sash locks.

E. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes.

F. Access doors in round ducts shall be Ductmate, United Sheet Metal Type AR-W Peabody, Wind Spiromatic, Spiro-Duct or equal.

G. Access doors with sheet metal screw fasteners are not acceptable.

2.7 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.8 COMBINATION FIRE/SMOKE DAMPERS

A. Manufacturer shall be Greenheck, Ruskin, Pottoff, or equal.

B. Combination Smoke/Fire Dampers shall be furnished and installed at all locations shown on the plans and/or as described on the drawing details.

C. Damper shall meet the requirements of NFPA 90A, 92A, and 92B and further shall be tested, rated and labeled in accordance with the latest edition on UL Standard 555 and 555S. Dampers shall have a UL555 fire rating of 1-1/2 hours and be of low leakage design qualified to UL 555S Leakage Class I.

D. Damper actuator combination shall have a UL 555S elevated temperature rating of 350 degrees Fahrenheit minimum and shall be operational and dynamic rated to operate at maximum design airflow rate at its installed location.

E. Damper shall be supplied with an appropriate actuator installed by the damper manufacturer at the time of damper fabrication. Damper actuator shall be electric type for 120 volt operation.

F. Damper blades shall be 16 gauge galvanized steel 3 Vee type with three longitudinal grooves for reinforcement. Damper frame shall be galvanized steel formed into a structural hat channel shape with reinforced corners. Bearing shall be sintered bronze sleeve type rotating in extruded holes in the damper frame. Blade seals shall be silicone rubber designed to inflate and provide a tighter seal against leakage as pressure on either side of the damper increases. Jamb seals shall be stainless steel compression type with silicone rubber backing. Blades shall be completely symmetrical relative to their axle pivot point, presenting identical resistance to airflow in either direction or pressure on either side of the damper.

G. Damper must be rated for mounting vertically (with blades running horizontally) or horizontally and be UL 555S rated for leakage and airflow in either direction through the damper.

H. Damper shall be supplied with a 165 degree Fahrenheit fusible link. Provide access doors at either side of the combination smoke/fire damper for viewing of the fusible links.

I. The specified combination smoke/fire damper shall meet the requirements for fire dampers, smoke dampers and combination fire smoke dampers established by:

1. National Fire Protection Association NFPA Standard 90A, 92A, 92B and 101
2. Underwriters Laboratories Standard 555 Listing #R-13317
3. Underwriters Laboratories Standard 555S Listing #R-13447
4. California State Fire Marshall CSFM Fire Damper Listing #3225-0981:103
5. California State Fire Marshall CSFM Leakage Smoke Damper Listing #3230-0981:104

J. Smoke Detector will be provided by the electrical contractor to be compatible with the fire alarm system. Mechanical contractor shall install all duct-mounted smoke detectors. Electrical contractor shall connect smoke detector to smoke dampers and fire alarm panel. After installation is complete, electrical contractor shall test and verify that smoke detectors are active and functional.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions.

B. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated.

C. Provide remote damper actuators for volume dampers for inaccessible locations.

D. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment such as air handling units and exhaust fans.

E. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at combination fire/smoke dampers as required for access. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.

F. Provide duct test holes where indicated and required for testing and balancing purposes.

END OF SECTION

SECTION 23 34 23
HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Retain or delete this article in all Sections of Project Manual.Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Centrifugal Roof Ventilators

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations.

B. Operating Limits: Classify according to AMCA 99.

1.4 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.

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 CENTRIFUGAL ROOF VENTILATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Greenheck
2. Loren Cook
3. Twin City Fans

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

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. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
3. 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: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 8 inches.
3. Sound Curb: Curb with sound-absorbing insulation.
4. Pitch Mounting: Manufacture curb for roof slope.
5. Metal Liner: Galvanized steel.

G. Provide with VariGreen ECM

2.2 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.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support suspended units from structure using threaded steel rods and spring hangers with vertical-limit stops having a static deflection of 1 inch. Vibration-control devices are specified in Section 230549 "Vibration and Seismic Control."

C. Install units with clearances for service and maintenance.

D. 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 26030 "Conduit and Wire."

D. Connect wiring according to Section 260530 "Conduit and Wire."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

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.

3.4 ADJUSTING

A. Adjust belt tension.

B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

C. Replace fan and motor pulleys as required to achieve design airflow.

D. Lubricate bearings.

END OF SECTION

SECTION 23 36 00

AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies pressure independent variable air volume boxes, hot water reheat coils and factory furnished bottom access door and controlled by Building Management System (BMS) direct digital control system.

1.2 QUALITY ASSURANCE

A. References: This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

NFPA 90A	Installation of Air Conditioning and Ventilation Systems.
UL 181	Factory-Made Air Ducts and Connectors.

Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

Air terminals shall be certified under ARI Standard 880-94 Certification Program and carry the ARI Seal.

1.3 SUBMITTALS

A. Submit the following under provisions of Section 230000.

B. Submit shop drawings indicating configuration, general assembly, and materials used in fabrication.

1. Submit product data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings which indicate air flow, static pressure, and NC designation, computer generated hot water reheat coil selections meeting design conditions indicated on plans.
2. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of one to 4 inch wg.

1.1 INFORMATIONAL SUBMITTALS

A. Retain "Coordination Drawings" Paragraph below for situations where limited space necessitates maximum utilization for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Coordinate paragraph with other Sections specifying products listed below. Preparation of coordination drawings requires the participatioCoordination 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. Size and location of initial access modules for acoustic tile.

3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

B. Field quality-control reports.

1.2 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals.

1. Submit operation and maintenance data under provisions of Section 230000.
2. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
   a. Instructions for resetting minimum and maximum air volumes.
   b. Instructions for adjusting software set points.

PART 2 - PRODUCTS

2.1 AIR TERMINAL UNITS

A. Manufacturers shall be Titus, Krueger, Price or Envirotec

B. Ceiling mounted variable air volume (VAV) supply air control terminals for connection to low pressure duct, central air systems, with variable volume controls and hot water heating coils as indicated on Drawings. Identify each airflow unit with clearly marked identification label and airflow indicator. Label shall include unit nominal air flow, maximum factory set air flow, minimum factory set air flow, and coil type. Coordinate with direct digital control system manufacturer for installation of VAV box controls.

2.2 VOLUME DAMPER

A. Locate air volume damper and cross-flow airflow measuring device inside unit casing. Construct from extruded aluminum or 20 gage galvanized steel components. Damper shaft shall rotate in a self-lubricating bearing. Nylon bearings are not acceptable.

B. Damper shall incorporate a mechanical stop to prevent over-stroking.

C. Mount manually operated damper quadrant or automatic damper operator, and automatic flow control assembly externally or provide access doors.

D. Externally mounted electric actuator shall position damper normally open as indicated.

2.3 HEATING COILS

A. Hot Water Heating Coil: 1/2 inch copper tube mechanically expanded into aluminum plate fins, leak tested under water to 300 psi with minimum burst pressure of 2000 psi at ambient temperature, factory installed.

B. Fins shall be rippled and corrugated heavy gauge aluminum, mechanically bonded to the tubes.

C. Tubes shall be copper with aluminum wall thickness of 0.016” with male solder header connections.

D. Coil shall be enclosed in a minimum 20 gauge steel casing with slip and drive construction for attachment to metal ductwork. Coils shall be factory installed on the terminal discharge.

E. Capacity, number of rows and circuits: As scheduled on Drawings.

2.4 WIRING

A. Mount electrical components in control box with removable cover. Incorporate single point electrical connection to power source. Provide toggle disconnect switch and 120 volt to 24 volt transformer in each air terminal control box. Refer to Division 26 for additional requirements.

2.5 CONTROLS

A. Automatic Damper Operator: Electric Actuator: 24 volt with high limit.

B. Coordinate with direct digital control system manufacturer for installation of controls.

2.6 TESTS

A. Provide testing of units under provisions.

B. Test run volume dampers and controls. Check sequence of operation and air flow limits at factory prior to shipment.

C. Base performance on tests conducted in accordance with ADC 1062.

D. Maximum Casing Leakage: 10-cfm at 1.5 inch inlet static pressure.

E. Maximum Damper Leakage: 5-cfm at 1.5 inch inlet static pressure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide ceiling access doors or locate units above easily removable ceiling components.

C. Support units individually from structure. Do not support from adjacent ductwork. Refer to 2013 CMC and the latest SMACNA manuals for support details. Refer to specification Section 230549 and drawings for additional requirements.

D. Connect to ductwork in accordance with Section 233113.

E. Provide minimum of 4 ft long, with 1 inch thick lined plenum downstream of units.

F. Install heating coils in accordance with Drawings.

G. Field install variable air volume direct digital controller which is compatible with direct digital control system in accordance with Section 230900. The mechanical contractor shall be responsible to coordinate all controls work with the controls contractor.

3.2 ADJUSTING

A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to minimum flow. Set units with heating coils per schedules on Drawings.

END OF SECTION

SECTION 26 00 00
GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. Basic electrical requirements specifically applicable to Division 26 Sections.

B. Work includes but is not necessarily limited to the following:

1. Labor, materials, services, equipment, and appliances required for completion of tasks as indicated on drawing or in specification or as inherently necessary to provide complete and operational electrical systems including:

a. All temporary construction power including test power, temporary heat and lighting;
b. Incidental items not indicated on the drawings nor mentioned in the Specifications that belong to the work described, or are required to provide complete and operable systems, as though called out here in every detail;
c. Cleaning, cutting, patching, repairing and painting;
d. Testing and commissioning;
e. The Contractor shall coordinate this Section with all other Sections of the Specification.

1.3 DRAWINGS AND SPECIFICATIONS

A. Drawings accompanying these Specifications show intent of Work to be done. Specifications shall identify quality and grade of installation and where equipment and hardware is not particularly specified, Contractor shall provide submittals for all products and install them per manufacturers' recommendations, and in a workmanlike manner.

B. Examine Drawings and Specifications for elements in connection with this Work; determine existing and new general construction conditions and be familiar with all limitations caused by such conditions.

C. In the event of a conflict or inconsistency between items indicated on the plans and/or specifications or with code requirements, the note, specification or code which prescribes and establishes the more complete job or the higher standard prevail.

D. Plans are intended to show general arrangement and extent of Work contemplated. Exact location and arrangement of parts shall be determined after the Owner has reviewed equipment, as Work progresses, to conform in best possible manner with surroundings, and as directed by the Owner's Representative.

E. For purposes of clearness and legibility, the electrical drawings are essentially diagrammatic. The size and location of equipment is shown to scale where possible. The contractor shall verify all conditions, data information as indicated on the drawings and in the specification sections where electrical work interfaces with other trades.

F. Contract Documents are intended to show the scope and general arrangement of the Work under this Contract. Drawings are not intended to be scaled for roughing in measurements or to serve as shop drawings. Where job conditions require minor changes or adjustments in the indicated locations or arrangement of the Work, such changes shall be made without change in the Contract amount.

G. The contractor shall maintain as built drawings to reflect all changes made during construction and any deviations from the electrical drawings. This includes deviations from circuit numbers and any addition, deletion or relocation of fixtures/outlets shown on working drawings.

1.4 UTILITIES

A. Location and sizes of electrical, mechanical and plumbing service facilities are shown in accordance with data secured from existing record drawings and site observations. Data shown are offered as an estimating guide without guarantee of accuracy. Check and verify all data given, and verify exact location of all utility services pertaining to Work prior to excavation or performing Work.

1.5 APPLICABLE REFERENCE STANDARDS, CODES AND REGULATIONS

A. Meet requirements of all state codes having jurisdiction.

B. State of California Code of Regulations:

1. Title 8, Chapter 4. Division of Industrial Safety, Subchapter 5. Electrical Safety Orders (Cal/OSHA):

    a. Low-Voltage Electrical Safety Orders (Sections 2299 - 2599)
    b. High-Voltage Electrical Safety Orders (Sections 2700 - 2989)

2. Title 19, State Fire Marshal Regulations
3. Current California Building Code (CBC), Title 24, Part 2
4. Current California Electrical Code, Title 24, Part 3
5. Current California Mechanical Code, Title 24, Part 4
6. Current California Plumbing Code, Title 24, Part 5
7. Current California Energy Code, Title 24, Part 6
8. Current California Fire Code, Title 24, Part 9

9. Current California Standards Code, Title 24, Part 12

C. Additional Referenced Standards:

1.	ANSI	American National Standards Institute
2.	IEEE	Institute of Electrical and Electronic Engineers
3.	NEMA	National Electrical Manufacturer's Association
4.	NFPA	National Fire Protection Association Standards
5.	UL	Underwriters Laboratories

D. Codes and ordinances having jurisdiction over Work are minimum requirements; but, if Contract Documents indicate requirements, which are in excess of those minimum requirements, then requirements of the Contract Documents shall be followed. Nothing in these drawings and specifications shall be construed to permit work not conforming to governing codes or regulations. Should there be any conflicts between Contract Documents or codes or any ordinances having jurisdiction, report these to the Owner's Representative.

E. Obtain permits, and request inspections from authority having jurisdiction.

1.6 PROJECT AND SITE CONDITIONS

A. The arrangement of and connection to equipment shown on the Drawings is based upon information available and is not intended to show exact dimensions peculiar to a specific manufacturer. The Drawings are, in part, diagrammatic and some features of the illustrated equipment installations may require revision to meet actual equipment installation requirements. Structural supports, housekeeping pads, piping connections and adjacent equipment may have to be altered to accommodate the equipment provided. No additional payment will be made for such revisions or alterations.

B. Examine all Drawings and Specifications to be fully cognizant of all work required under this Division.

C. Examine site related work and surfaces before starting work of any Section.

D. Install Work in locations shown on approved Drawings, unless prevented by Project conditions.

E. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission from the Owner's Representative before proceeding.

1.7 COOPERATION WITH WORK UNDER OTHER DIVISIONS

A. Cooperate with other trades to facilitate general progress of Work. Allow all other trades every reasonable opportunity for installation of their work.

B. Work under this Division shall follow general building construction closely. Set pipe sleeves and inserts and verify that openings for chases and pipes are provided.

C. Work with other trades in determining exact location of outlets, conduits, pipes, and pieces of equipment to avoid interference with lines required to maintain proper installation of Work.

D. Make such progress in the Work to not delay work of other trades.

1.8 DISCREPANCIES

A. The contractor shall check all drawings furnished to him immediately upon their receipt and shall promptly notify the owner of any discrepancies. Figures marked on drawings shall in general be followed in preference to scale measurements. Large scale drawings in general govern small scale drawings. The contractor shall compare all drawings and verify the figures before laying out the work and will be responsible for any errors which might have been avoided thereby. Where no figures or notations are given, the plans shall be followed

B. Omissions from the Drawings or Specifications or the erroneous description of details of work which are manifestly necessary to carry out the intent of the Drawings and Specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or erroneously described details of the work but they shall be performed as if fully and correctly set forth and described in the drawings and specifications.

C. If any part of the Specifications or Drawings appears unclear or contradictory, apply to Owner's Representative for interpretation and decision as early as possible, including during bidding period. Do not proceed with such work without Owner Representatives decision. Beginning work of any Section constitutes acceptance of conditions.

1.9 CHANGES

A. The Contractor shall be responsible to make and obtain approval from the Owner's Representative for all necessary adjustments in piping and equipment layouts as required to accommodate the relocations of equipment and/or devices, which are affected by any approved authorized changes or Product substitutions. All changes shall be clearly indicated on the "Record" drawings.

1.10 SUBMITTALS

A. Refer to Division 01 for additional requirements.

B. The manufacturer, contractor or supplier shall include a written statement that the submitted equipment, hardware or accessory complies with the requirement of that particular specification section.

C. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section.

D. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

E. Note that prior to acceptance of submittals for review, a submittal schedule shall be submitted to the Owner's Representative.

F. Submit all Division 26 shop drawings and product data grouped and referenced by the specification technical section number in one complete submittal package.

G. Shop Drawings:

1. Include installation details of equipment indicating proposed location, layout and arrangement, accessories, piping, and other items that must be shown to assure a coordinated installation.
2. Indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.
3. If equipment is rejected, revise drawings to show acceptable equipment and resubmit.
4. Whenever more than one (1) manufacturer's product is specified, the first named product is the basis of design used in the Drawings and the use of alternate-named manufacturer's products or substitutes may require modifications to the design.
5. The Contractor shall be responsible for all equipment ordered and/or installed prior to receipt of shop drawings returned from the Owner's Representative bearing the Owner's Representative stamp of "Reviewed". All corrections or modifications to the equipment as noted on the shop drawings shall be performed and equipment removed from the job site at the request of the Owner's Representative without additional compensation.
6. Manufacturer's Data: For each manufactured item, provide current manufacturer's descriptive literature of cataloged products, certified equipment drawings, diagrams, performance and characteristic curves if applicable, and catalog cuts.
7. Standard Compliance: When materials or equipment provided by the Contractor must conform to the standards of organizations such as American National Standards Institute (ANSI) or UL, submit proof of such conformance to the Owner Representative for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified. In lieu of the label or listing, submit a certificate from an independent testing organization, which is competent to perform acceptance testing and is approved by the Owner Representative. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard.
8. Certified Test Reports: Before delivery of materials and equipment, certified copies of all test reports specified in individual sections shall be submitted for approval.
9. Certificates of Compliance or Conformance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for this Contract. Pre-printed certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; or "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the

manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance or conformance.

H. The Contractor shall submit all passcodes and passwords for any hardware and software required for the operations and troubleshooting in all systems and components no less than fourteen (14) calendar days prior to Final Completion.

1.11 PROJECT RECORD DOCUMENTS

A. Refer to Division 01 for additional requirements.

1. All changes, deviations and information recorded on the “Project Record Drawings” set during Construction shall be redrafted using the latest version of AutoCAD or Revit, where applicable.
2. Submit completed shop drawings to the Owner prior to completion in digital format.
3. Contractor hand-marked or drafted redlined “Project Record Drawings” will not be accepted.

1.12 PRODUCT ALTERNATIVES OR SUBSTITUTIONS

A. Refer to General Conditions and Division 01 for additional requirements.

1.13 OPERATING INSTRUCTIONS

A. Furnish approved operating instructions for systems and equipment indicated in the technical sections for use by operation and maintenance personnel.

1.14 MANUFACTURER'S RECOMMENDATIONS

A. Where installation procedures or any part thereof are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendations shall be cause for rejection of the equipment or material.

1.15 DELIVERY AND STORAGE

A. Refer to Division 01 for additional requirements.

B. Handle, store, and protect equipment and materials in accordance with the manufacturer's recommendations and with the requirements of NFPA 70B P, Appendix I, titled "Equipment Storage and Maintenance During Construction." Replace damaged or defective items with new items.

1.16 GUARANTEE

A. Except as may be specified under other sections in the Specifications, guarantee all equipment furnished under the Specifications for a period of one year from date of project acceptance against defective workmanship and material and improper installation. Upon notification of failure, correct deficiency immediately and without cost to the Owner.

B. Standard warranty of manufacturer shall apply for replacement of parts after expiration of the above period. Manufacturer shall furnish replacement parts to the Owner for their service agency as directed.

PART 2 - PRODUCTS

2.1 COMPETITIVE PRODUCTS

A. Unless otherwise noted, any reference in the Specification to any article, device, product, material, fixture, form, or type of construction by name, make, or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may at his option propose substitutions for such material in accordance with the substitution procedure outlined in the Contract Documents.

2.2 MATERIALS

A. Provide all new materials and equipment, free from any defects, in first-class condition, and suitable for the space provided. Provide materials and equipment approved by UL authority having jurisdiction approved testing agency, wherever standards have been established by that agency.

B. Where two or more units of the same class of material or equipment are required, provide products of a single manufacturer. Component parts of units or equipment need not be products of the same manufacturer.

C. Unless otherwise indicated, provide materials and equipment which are the standard products of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturers' latest standard design that conforms to these Specifications.

D. Provide materials and equipment with manufacturers' standard finish system, except where otherwise specified. Provide manufacturers' standard finish color, except where specific color is indicated. If manufacturer has no standard color, finish equipment with ANSI Number 61, light gray color.

E. Environmental and Seismic Conditions: Material and Equipment shall be designed to insure satisfactory operation and operational life in the environmental and seismic conditions which will prevail where they are being installed. Electrical equipment and enclosures shall be designed, constructed and certified to withstand external loading conditions as prescribed by the California Building Code for the locations of the equipment. Supplied equipment shall either

be shake table tested and certified or comprehensive seismic calculations shall be provided. All seismic calculations and structural drawings shall bear the seal of a Structural Professional Engineer currently licensed in the State of California. Earthquake design shall be based on the equivalent lateral force analysis procedure (ASCE 7-05 Section 12.8) with the following factors:

1. Location: 33.74765 LAT, -118.19099 LONG
   Site Class E
   S_S = 1.592 g, S_1 = 0.600 g,
   S_{MS} = 1.433 g, S_{M1} = 1.440 g,
   S_{DS} = 0.955 g, S_{D1} = 0.960 g
2. R = 2 (Enclosure Attachment)
   R = 1.5 (Transformer Attachment)
3. CS = 0.51
4. SDC = D
5. V = 52 k (Enclosure and Electrical Equipment)

PART 3 - EXECUTION

3.1 GENERAL

A. Obtain and pay for all permits and inspections, including any independent testing required to verify standard compliance, and deliver certificates for same to the Owner's Representative.

3.2 WORK RESPONSIBILITIES

A. The drawings indicate diagrammatically the desired locations or arrangement of piping, 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 with structural conditions.

B. The Contractor is responsible for the correct placing of Work and the proper location and connection of Work in relation to the work of other trades. Advise appropriate trade as to locations of access panels.

C. In the event changes in the indicated locations or arrangements are necessary, due to developed conditions in the construction or rearrangement of furnishings or equipment, such changes shall be made without extra cost, 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. Where equipment is furnished by others, verify dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.

E. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc. with the

drawings to see that the equipment will fit into the spaces provided without violation of applicable codes.

F. Should any changes to the Work indicated on the Drawings or described in the Specifications be necessary in order to comply with the above requirements, notify the Owner immediately and cease work on all parts of the contract, which are affected until approval for any required modifications to the construction has been obtained from the Owner.

G. Be responsible for any cooperative work, which must be altered due to lack of proper supervision or failure to make proper provisions in time. Such changes shall be under direction of the Owner and shall be made to his satisfaction. Perform all Work with competent and skilled personnel.

H. The electrical drawings do not indicate all fittings, hardware, or appurtenances required for a complete operating installation.

I. Wiring diagrams are not intended to indicate the exact course of raceways.

J. One-line and riser diagrams are only schematics and do not show physical arrangements of equipment.

K. All workmanship, including aesthetic as well as electrical aspects of the Work, shall be of the highest quality consistent with the best practices of the trade.

L. Replace or repair, without additional compensation, any Work, which, in the opinion of the Owner, does not comply with these requirements.

3.3 CLEANING & PAINTING OF EQUIPMENT

A. Refer to Division 09 for additional requirements.

B. Factory Applied:

1. Electrical equipment shall have factory-applied painting systems, which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test, except equipment specified to meet requirements of ANSI C37.20 shall have a finish as specified in ANSI C37.20.
2. Refer to individual sections of this Division for more stringent requirements.

C. Field Applied: Paint electrical equipment as required to touch up, to match finish on other equipment in adjacent spaces, or to meet safety criteria.

D. After installation, all metal finishes shall be polished and cleaned of all dirt, rust, cement, plaster, grease, and paint.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

A. ASTM: American Society of Testing Materials.

B. ICEA: Insulated Cable Engineers Association.

C. IEEE: Institute of Electrical & Electronics Engineers.

D. NEMA: National Electrical Manufacturers Association.

E. NETA ATS: InterNational Electrical Testing Association - Acceptance Testing Specification.

F. VFD: Variable frequency drive.

1.4 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of product, indicating conductor/cable construction, insulation material, thickness of insulation, jacket, cable stranding, and voltage rating of each type of conductor/cable specified, splices and terminations. Indicate date and place of manufacture for each conductor/cable, cable, splice and termination.

B. Manufacturer's ISO certification.

C. Product Cable Schedule: Indicate type, use, location, and termination locations.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Independent Testing Agency.

B. Field quality-control reports. Perform field testing of cables per para 3.8. Submit six (6) copies of field test reports to owner's representative within two (2) weeks of completion of test.

1.6 QUALITY ASSURANCE

A. General Requirements: The low voltage power conductors and cable shall be copper, minimum 600V rated unless otherwise indicated. Aluminum conductors and cables shall not be accepted unless otherwise indicated.

B. Materials and installation shall meet or exceed requirements in the following referenced standards and shall be listed and labelled by UL.

1. ICEA S-95-658/ NEMA WC 70.
2. UL 1072.
3. IEEE.
4. ASTM.
5. NEMA.

C. Conductors and cables shall be of the same manufacturer and shipped to the job site in original unbroken reels.

D. Conductors and cables shall be manufactured with in twelve (12) months of installation. Date of manufacture shall be clearly marked on conductors or conductor reels.

E. Manufacturer shall have minimum ten (10) years experience in the manufacturer of conductors and cables similar to those specified on this project.

F. Manufacturer shall have ISO 9001 and ISO 9002 certification.

G. All conductors and cables shall be new and supplied by a local distributor.

H. If alternate manufacturer of products other than what are specified in this section are submitted, all necessary documents not limited to cut sheets, technical information, test reports from recognized testing labs and factory test reports shall be submitted to the satisfaction of the owner/engineer to ensure quality and conformance to the specifications. Additional testing shall be undertaken if it is concluded by the owner/engineer that the submitted test reports are either insufficient or do not include all tests necessary for product acceptance. The tests shall be conducted by a recognized lab acceptable to the owner/engineer and all tests shall be witnessed by owner's/engineer's personnel. All testing procedures and test results shall be satisfactory to the owner/engineer. Contractor shall be responsible for arranging the tests, for transportation, food and lodging for minimum of one owner's/engineer's representative to witness the test at the testing lab. Include all costs for the above in the bid.

I. Testing: Provide the services of an independent qualified testing laboratory to perform the specified field tests. Notify the University's Representative fourteen (14) days in advance of performance of work requiring testing.

J. Conductors, cables, splices and terminations shall be manufactured within twelve (12) months of installation. Each item shall have a permanent marking on the product or the original manufacturers' package indicating the date of manufacture unless otherwise noted.

K. Testing Agency Qualifications:

1. Testing agency shall be an independent company; shall have been a member of NETA for a minimum of last ten (10) years and has permanent in-house testing engineers and technicians involved with testing of low voltage electrical power conductors and cables similar to those specified on this project.
2. Testing company shall be located with 50 miles radius of the project.
3. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
4. Field Testing technician and supervisor shall have minimum ten (10) years' experience in field testing of low voltage power conductors and cables of the type and rating similar to the conductors and cables to be tested on this project.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

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

1. General Cable Technologies Corporation.
2. Southwire Incorporated
3. Alpha Wire.
4. Belden Inc.
5. Encore Wire Corporation..

B. Conductor Material: Electrical grade, soft drawn annealed copper, 98 percent conductivity, and fabricated in accordance with ASTM and ICEA standards. Minimum size is number 12 for branch circuits, number 14 stranded for control wiring. Aluminum conductors are not permitted. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type XHHW-2.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for Type SO with ground wire.

E. VFD Cable:

1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.

2. Type TC-ER with oversized crosslinked polyethylene insulation, dual spirally wrapped copper tape shields and three bare symmetrically applied ground wires, and sunlight- and oil-resistant outer PVC jacket.
3. Comply with UL requirements for cables in direct burial applications.

F. Provide separate neutral with each branch circuit serving outlets. When dedicated neutrals are provided, use color spiral to match associated phase.

G. Wiring in ceiling spaces used as environmental air plenums shall be plenum-rated or installed in metallic conduit in accordance with CEC Article 300.22. Non-plenum-rated wiring shall not be installed exposed in plenum spaces. in accordance with CEC Article 300.22. Non-plenum-rated wiring shall not be installed exposed in plenum spaces.

2.2 CONNECTORS AND SPLICES

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

1. Ideal Industries, Inc.
2. Ilsco
3. NSi Industries LLC.
4. O-Z/Gedney; a brand of Emerson Industrial Automation.
5. 3M; Electrical Markets Division.
6. TE Connectivity - Raychem.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

C. Copper conductors shall be terminated in copper or bronze mechanical connectors or lugs or tool applied compression connections made of copper for all connections except those on wiring devices.

D. Splices in wires No. 10 and smaller shall be made with twist-on splicing connector in accordance with UL486-C. Connections in wires No. 8 and larger shall be made with compression type connectors in accordance with UL486-A and wrapped with insulated tape in accordance with UL501. Insulating tape shall be applied in a minimum of two layers of half wrap or built to match the overall insulation of the wire.

E. Splices in underground pull boxes shall be made submersible type and made using “3M” Scotch-cast epoxy kits.

F. Pressure type connectors are not permitted.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFD cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway

B. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

E. Feeders Installed below Raised Flooring: Type THHN-2-THWN-2, single conductors in raceway.

F. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

I. Branch Circuits Installed Below Raised Flooring: Type THHN-2-THWN-2, single conductors in raceway.

J. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

K. VFD Output Circuits: Type XHHW-2 in metal conduit with braided shield.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. All conductors and cables shall be installed in a raceway.

B. Before installing conductors and cables in existing conduits, verify the continuity of each conduit; each surface conduit is properly supported per code and clear of any debris.

C. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

D. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

E. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

F. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

G. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

H. Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors].

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

A. Each conductor shall be factory color coded by conductor manufacturer. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage an independent qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance conductors, feeder conductors and the conductors feeding the following critical equipment and services] for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical tests stated in latest NETA Acceptance Testing Specification section 7.3.2 (Inspection and Test Procedures-Cables, Low Voltage-600V Maximum). Certify compliance with test parameters per NETA tables.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

D. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.

2. Results that comply with requirements. Include color scan images.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.

B. Related Sections include the following:

1. Section 260548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of [**five**] <**Insert number**> times the applied force.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Allied Tube & Conduit: Part of Atkore International
    b. Cooper B-Line, Inc.; a division of Eaton Inc.
    c. ERICO International Corporation.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation: A Member of the ABB Group.
    f. Unistrut; Part of Atkore International,
    g. Wesanco, Inc.
3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
6. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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

1) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 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 minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Section 099100 " Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. EMT: Electrical metal tubing

C. ENT: Electrical non-metallic tubing

D. GRC: Galvanized rigid steel conduit.

E. HDPE: High density polyethylene pipe

F. IMC: Intermediate metal conduit.

G. LFMC: Liquidtite flexible metal conduit

H. LFNC: Liquitite flexible non-metallic conduit.

I. RNC: Rigid non-metallic conduit

J. RTRC: Reinforced thermosetting resin conduit

1.4 QUALITY ASSURANCE:

A. Each conduit shall bear manufacturer's trademark and UL label.

B. Each type of conduit and fittings shall be of a single manufacturer. Multiple manufacturer's of the same material are not acceptable.

C. Comply with California Electric Code (CEC)

1.5 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

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

1. Allied Tube & Conduit; a Tyco International Ltd. Co.
2. Electri-Flex Company.
3. O-Z/Gedney; a brand of EGS Electrical Group.
4. Republic Conduit.
5. Robroy Industries.
6. Thomas & Betts Corporation.
7. Western Tube and Conduit Corporation.
8. Wheatland Tube Company; a division of John Maneely Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be UL listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:
   a. Material: Steel.
   b. Type: compression.
3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

J. PVC-Coated Fittings:

1. Fittings shall be Form 8 with a V-Seal tongue-in-groove gasket and supplied with plastic encapsulated stainless steel cover screws. Form 8 fittings shall be UL Type 4X listed and IEC IP69 certified. Fittings shall be from the same manufacturer as the conduit in order to maintain system continuity and warranty. PVC Coated fittings for hazardous locations must be UL 1203 listed.
2.

K. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

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

1. CANTEX Inc.
2. Condux International, Inc.
3. Electri-Flex Company.
4. Lamson & Sessions; Carlon Electrical Products.
5. RACO; a Hubbell company.
6. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. ENT: Comply with NEMA TC 13 and UL 1653.

D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

E. LFNC: Comply with UL 1660.

F. Rigid HDPE: Comply with UL 651A.

G. Continuous HDPE: Comply with UL 651B.

H. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

I. RTRC: Comply with UL 1684A and NEMA TC 14.

J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

K. Fittings for LFNC: Comply with UL 514B.

L. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

M. Solvent cements and adhesive primers 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 METAL WIREWAYS AND AUXILIARY GUTTERS

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

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company.
3. Mono-Systems, Inc.
4. Square D; a brand of Schneider Electric.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1(interior), Type 3R(exterior) unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type (readily accessible,) Screw-cover type (concealed areas) unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be UL listed and labeled as defined in NFPA 70 and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hubbell Wiring Systems
   b. Wiremold / Legrand.
   c. Mono-Systems, Inc.
   d. Panduit Corp.

2.5 BOXES, ENCLOSURES, AND CABINETS

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

1. Cooper Technologies Company; Cooper Crouse-Hinds.

2. EGS/Appleton Electric.
3. Hoffman; a Pentair company.
4. Hubbell Incorporated; Killark Division.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. RACO; a Hubbell Company.
7. Robroy Industries.
8. Thomas & Betts Corporation.
9. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:
1. Material: Cast metal or sheet metal.
2. Type: Fully adjustable or Semi-adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

H. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
1. Listing and Labeling: Paddle fan outlet boxes shall be UL listed and labeled as defined in NFPA 70 and marked for intended location and application.

I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

K. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

L. Device Box Dimensions: 4 inches square by 2-1/8 inches deep and 4 inches by 2-1/8 inches by 2-1/8 inches deep.

M. Gangable boxes are prohibited.

N. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 4 with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

O. Cabinets:

1. NEMA 250, Type 4X galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC. Use EPC-40PVC inside concrete walls and columns only.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R, Type 4.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
    a. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    b. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Concealed in concrete walls and columns: RNC Type EPC-40-PVC.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
7. Damp or Wet Locations: GRC.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after

installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.

4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inchesof enclosures to which attached.

I. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.

2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes with PVC touch-up compound after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly. All installers shall be certified by the manufacturer and be able to present a valid unexpired installer certification card prior to installation beginning.

L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

Q. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than ~~200 lb~~ 250lbs (113 kgs) tensile strength. Leave at least 12 inches of slack at each end of pull wire. Provide acrylic identification tags (2”X4”) at each end indicating the source. Cap underground raceways designated as spare above grade alongside raceways in use.

R. Surface Raceways:

1. Install surface raceway with a minimum 2-inchradius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Expansion-Joint Fittings:

1. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.

b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.

c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, , equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

EE. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

D. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Comply with NFPA 70E and Section 26 0573 "Short Circuit, Coordination and Arc-Flash Study" requirements for arc-flash warning labels.

F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service' feeder and branch-circuit conductors.

1. Color shall be factory applied.
2. Colors for 208/120-V Circuits:
    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.
3. Colors for 240-V Circuits:
    a. Phase A: Black.
    b. Phase B: Red.
4. Colors for 480/277-V Circuits:
    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.
5. Color for Neutral: White.
6. Color for Equipment Grounds: Green.
7. Colors for Isolated Grounds: Green with white stripe.

C. Raceways and Cables Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

D. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

E. Warning labels and signs shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

F. Equipment Identification Labels:

1. Black letters on a white field for equipment connected to normal power and Red letters on a white field for equipment connected to emergency/standby power unless otherwise indicated

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Brady Corporation.
    b. HellermannTyton.
    c. Marking Services, Inc.
    d. Panduit Corp.
    e. Seton Identification Products.

B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Brady Corporation.
    b. HellermannTyton.
    c. Marking Services, Inc.
    d. Panduit Corp.
    e. Seton Identification Products.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyesterflexible label with acrylic pressure-sensitive adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Brady Corporation.
    b. .
    c. Grafoplast Wire Markers.
    d. Ideal Industries, Inc.
    e. Marking Services, Inc.
    f. Panduit Corp.
    g. Seton Identification Products.
2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
3. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.

4. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Brady Corporation.
   b. Grafoplast Wire Markers.
   c. HellermannTyton.
   d. Ideal Industries, Inc.
   e. Marking Services, Inc.
   f. Panduit Corp.
   g. Seton Identification Products.
2. Minimum Nominal Size:
   a. 1-1/2 by 6 inchesfor raceway and conductors.
   b. 3-1/2 by 5 inchesfor equipment.
   c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters and that stay in place by gripping action.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Brady Corporation.
   b. HellermannTyton.
   c. Marking Services, Inc.
   d. Panduit Corp.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Brady Corporation.
   b. Panduit Corp.

2.5 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carlton Industries, LP.

b. HellermannTyton.

c. Ideal Industries, Inc.

d. Marking Services, Inc.

e. Panduit Corp.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

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

a. Brady Corporation.

b. Carlton Industries, LP.

c. emedco.

d. Marking Services, Inc.

C. Tape and Stencil: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background and is 12 inches wide. Stop stripes at legends.

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

a. HellermannTyton.

b. LEM Products Inc.

c. Marking Services, Inc.

d. Seton Identification Products.

D. Floor Marking Tape: 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

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

a. Carlton Industries, LP.

b. Seton Identification Products.

E. Underground-Line Warning Tape:

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

a. Brady Corporation.

b. Ideal Industries, Inc.

c. Marking Services, Inc.

d. Seton Identification Products.

2. Tape:

a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.

b. Printing on tape shall be permanent and shall not be damaged by burial operations.

c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

3. Color and Printing:

a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.

b. Inscriptions for Red-Colored Tapes: "CAUTION BURIED ELECTRIC LINE, HIGH VOLTAGE" .

c. Inscriptions for Orange-Colored Tapes: "CAUTION BURIED TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE" .

4. Tag: Type IID:

a. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.

b. Width: 6 inches.

c. Overall Thickness: 5 mils.

d. Foil Core Thickness: 0.35 mil.

e. Weight: 34 lb/1000 sq. ft..

f. Tensile according to ASTM D 882: 300 lbf and 12,500 psi.

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be inchunless otherwise indicated. If requested by Architect, match Owner’s existing legend type, size etc.

2.6 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

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

a. Brady Corporation.

b. Carlton Industries, LP.

c. emedco.

d. Marking Services, Inc.

e. Seton Identification Products.

2.7 SIGNS

A. Baked-Enamel Signs:

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

a. Carlton Industries, LP.

b. Champion America.

c. emedco.

d. Marking Services, Inc.

2. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.

3. 1/4-inch grommets in corners for mounting.

4. Nominal Size: 7 by 10 inches.

B. Metal-Backed Butyrate Signs:

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

a. Brady Corporation.

b. Champion America.

c. emedco.

d. Marking Services, Inc.

2. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.

3. 1/4-inch grommets in corners for mounting.

4. Nominal Size: 10 by 14 inches.

C. Laminated Acrylic or Melamine Plastic Signs:

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

a. Brady Corporation.

b. Carlton Industries, LP.

c. emedco.

d. Marking Services, Inc.

2. Engraved legend.

3. Thickness:

a. For signs up to 20 sq. in., minimum 1/16 inch thick.

b. For signs larger than 20 sq. in., 1/8 inch thick.

c. Engraved legend with black letters on white face background for equipment connected to normal power and red letters on white face background for equipment connected to emergency/standby power. Verify with Architect if legend has to match Owner's existing signs.

d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.

e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

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

1. HellermannTyton.
2. Ideal Industries, Inc.
3. Marking Services, Inc.
4. Panduit Corp.

B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

H. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

J. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer. Refer to drawings for additional information.

K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

L. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

M. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

N. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

O. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

P. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.

Q. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

R. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

S. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

T. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

U. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

V. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

W. Underground Line Warning Tape:
1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

X. Metal Tags:
1. Place in a location with high visibility and accessibility.
2. Secure using general-purpose UV-stabilized cable ties for all area except use plenum-rated cable ties in plenum areas.

Y. Nonmetallic Preprinted Tags:
1. Place in a location with high visibility and accessibility.
2. Secure using general-purpose UV-stabilized in all areas except use plenum-rated cable ties in plenum areas.

Z. Baked-Enamel Signs:
1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

AA. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.

BB. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.

CC. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil. Stencil legend "DANGER - CONCEALED HIGH-VOLTAGE WIRING" with 3-inch-high, black letters on 20-inch centers.

1. Locate identification at changes in direction, at penetrations of walls and floors, and at 10-foot maximum intervals unless otherwise indicated.

D. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

E. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

F. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Power-Circuit Conductor Identification, More Than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic preprinted tags colored and marked to indicate phase, and a separate tag with the circuit designation.

H. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.

I. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with the conductor designation.

J. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

K. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

L. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

M. Concealed Raceways and Duct Banks, More Than 600 V, within Buildings: Apply floor marking tape to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.

2. Wall surfaces directly external to raceways concealed within wall.

3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

N. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

O. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

P. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Metal-backed, butyrate warning signs.

1. Apply to exterior of door, cover, or other access.

2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

a. Power-transfer switches.

b. Controls with external control power connections.

Q. Arc Flash Warning Labeling: Self-adhesive labels.

R. Operating Instruction Signs: Laminated acrylic or melamine plastic signs.

S. Emergency Operating Instruction Signs: Laminated acrylic or melamine plastic signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

T. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign. Stenciled legend 4 inches high shall also be provided when requested by Architect.
3. Equipment to Be Labeled:
    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Switchgear.
    e. Switchboards.
    f. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    g. Substations.
    h. Emergency system boxes and enclosures.
    i. Motor-control centers.
    j. Enclosed switches.
    k. Enclosed circuit breakers.
    l. Enclosed controllers.
    m. Variable-speed controllers.
    n. Push-button stations.
    o. Power-transfer equipment.
    p. Contactors.
    q. Remote-controlled switches, dimmer modules, and control devices.
    r. Battery-inverter units.
    s. Battery racks.
    t. Power-generating units.
    u. Monitoring and control equipment.
    v. UPS equipment.

END OF SECTION

SECTION 26 05 73

SHORT CIRCUIT, COORDINATION AND ARC FLASH STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes computer-based, fault-current, overcurrent protective device coordination studies and arc flash study. Protective devices shall be set based on results of the protective device coordination study.

1. Coordination of series-rated devices is permitted where indicated on Drawings.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled. Existing to remain items shall remain functional throughout the construction period.

B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

C. Definition of "One-Line Diagram" Paragraph below is from NEMA ICS 19.One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

E. Power System Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

G. SCCR: Short-circuit current rating.

H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. COORDINATION STUDIES

1. Product Data: For computer software program to be used for studies.

2. Other Action Submittals: The following submittals shall be made after the approval process for system protective devices has been completed. Submittals **may** be in digital form if requested by the architect/engineer.

3. Coordination-study input data, including completed computer program input data sheets.
4. Study and Equipment Evaluation Reports.
5. Coordination-Study Report.

B. SHORT CURCUIT STUDIES
1. For computer software program to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals may be in digital form.
   a. Short-circuit study input data, including completed computer program input data sheets.
   b. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.
   c. Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

C. ARC FLASH STUDIES
1. Product Data: For computer software program to be used for studies.
2. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals may be in digital form:
3. Arc-flash study input data, including completed computer program input data sheets.
4. Arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For power systems analysis specialist.

B. Product Certificates: For coordination-study, fault-current-study computer software programs, certifying compliance with IEEE 399.

C. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

D. Power Systems Analysis Software Developer

E. Qualification Data: For Field Adjusting Agency

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For overcurrent protective devices to include in emergency, operation, and maintenance manuals.
1. The following are from the Coordination Study Report:
   a. Final one-line diagram.
   b. Final protective device coordination study.
   c. Coordination study data files.
   d. List of all protective device settings.
   e. Time-current coordination curves.
   f. Power system data.
2. The following are from the Short-Circuit Study Report:

a. Final one-line diagram.

b. Final Short-Circuit Study Report.

c. Short-circuit study data files.

d. Power system data

3. The following are from the Arc Flash Hazard Report:

a. Provide maintenance procedures in equipment manuals according to requirements in NFPA 70E.

b. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

B. Power Systems Analysis Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.

C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

D. Comply with IEEE 399 for general study procedures.

E. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.

2. A member company of NETA.

3. Acceptable to authorities having jurisdiction

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Available Computer Software Developers: Subject to compliance with requirements, companies offering computer software programs that may be used in the Work include, but are not limited to, the following:

B. Computer Software Developers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Operation Technology, Inc. (ETAP)

2. SKM Systems Analysis, Inc.(Power Tools)

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Comply with IEEE 399, IEEE 1584 and NFPA 70E.

B. Analytical features of fault-current-study, device coordination study and arc flash study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:
    a. Arcing faults.
    b. Simultaneous faults.
    c. Explicit negative sequence.
    d. Mutual coupling in zero sequence.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 POWER SYSTEM DATA

A. Gather and tabulate the following input data to support coordination study:

1. Product Data for overcurrent protective devices specified in other electrical Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Impedance of utility service entrance.
3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:
    a. Circuit-breaker and fuse-current ratings and types.
    b. Relays and associated power and current transformer ratings and ratios.
    c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
    d. Generator kilovolt amperes, size, voltage, and source impedance.
    e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
    f. Busway ampacity and impedance.

g. Motor horsepower and code letter designation according to NEMA MG 1.

4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

a. Special load considerations, including starting inrush currents and frequent starting and stopping.

b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.

c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.

d. Generator thermal-damage curve.

e. Ratings, types, and settings of utility company's overcurrent protective devices.

f. Special overcurrent protective device settings or types stipulated by utility company.

g. Time-current-characteristic curves of devices indicated to be coordinated.

h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.

i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.

j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

3.3 FAULT-CURRENT STUDY

A. Calculate the maximum available short-circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:

1. Switchgear and switchboard bus.

2. Medium-voltage controller.

3. Motor-control center.

4. Distribution panelboard.

5. Branch circuit panelboard.

B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.

C. Calculate momentary and interrupting duties on the basis of maximum available fault current according to IEEE 551.

D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 241 and IEEE 242.

1. Transformers:

a. ANSI C57.12.10.

b. ANSI C57.12.22.

c. ANSI C57.12.40.

d. IEEE C57.12.00.

e. IEEE C57.96.

2. Medium-Voltage Circuit Breakers: IEEE C37.010.

3. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.

4. Low-Voltage Fuses: IEEE C37.46.

E. Study Report:

1. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.

2. Show interrupting (5-cycle) and time-delayed currents (6 cycles and above) on medium-voltage breakers as needed to set relays and assess the sensitivity of overcurrent relays.

F. Equipment Evaluation Report:

1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.

3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

3.4 COORDINATION STUDY

A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.

1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.

2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.

3. Calculate the maximum and minimum ground-fault currents.

B. Comply with IEEE 241 and IEEE 242 recommendations for fault currents and time intervals.

C. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.

b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.

c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

D. Motors served by voltages more than 600 V shall be protected according to IEEE 620.

E. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers

F. or from listed standards indicating conductor size and short-circuit current.

G. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:

a. Device tag.

b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.

c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.

d. Fuse-current rating and type.

e. Ground-fault relay-pickup and time-delay settings.

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

a. Device tag.

b. Voltage and current ratio for curves.

c. Three-phase and single-phase damage points for each transformer.

d. No damage, melting, and clearing curves for fuses.

e. Cable damage curves.

f. Transformer inrush points.

g. Maximum fault-current cutoff point.

H. Completed data sheets for setting of overcurrent protective devices.

3.5 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies: Perform the Short-Circuit andProtective Device Coordination studies prior to starting the Arc-Flash Hazard Analysis.

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573. "Short-Circuit Studies."

2. Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573. "Coordination Studies."

C. Calculate maximum and minimum contributions of fault-current size.

1. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
2. Calculate arc-flash energy at the recommended short circuit values according to IEEE 1584.section 4.5.
3. Calculate arc-flash energy at 38 percent of maximum short-circuit current according to NFPA 70E recommendations.
4. Calculate arc-flash energy with the utility contribution at a minimum and assume no motor contribution.

D. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.

E. Include medium-and low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.

F. Calculate the limited, restricted, and prohibited approach boundaries for each location.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:
1. Fault contribution from induction motors shall not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators shall be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:
1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section 6.9.

3.6 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram, showing the following:
1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.
4. Motor and generator designations and kVA ratings.

5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output Data: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573 "Short-Circuit Studies."

F. Protective Device Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573"Coordination Studies."

G. Arc-Flash Study Output Reports:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:

a. Voltage.

b. Calculated symmetrical fault-current magnitude and angle.

c. Fault-point X/R ratio.

d. No AC Decrement (NACD) ratio.

e. Equivalent impedance.

f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.

g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.

2. Protective device clearing time.

3. Duration of arc.

4. Arc-flash boundary.

5. Restricted approach boundary.

6. Limited approach boundary.

7. Working distance.

8. Incident energy.

9. Hazard risk category.

10. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

3.7 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch (76-by-127-mm) self-adhesive equipment label for each work location included in the analysis.

B. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.

2. Nominal voltage.

3. Protection boundaries.
    a. Arc-flash boundary.
    b. Restricted approach boundary.
    c. Limited approach boundary.
4. Arc flash PPE category.
5. Required minimum arc rating of PPE in Cal/cm squared.
6. Available incident energy.
7. Working distance.
8. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

D. Apply a label to each piece of equipment addresses by the study.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Receptacles and associated device plates.
2. SPD receptacles, 125 V, 20 A.
3. Snap switches and wall-box dimmers.
4. Solid-state fan speed controls.
5. Wall-switch and exterior occupancy sensors.
6. Communications outlets.
7. Toggle switches, 120/277 V,**20** A.
8. Decorator-style devices, **20** A.
9. Pendant cord-connector devices.
10. Cord and plug sets.
11. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

A. AFCI: Arc-fault circuit interrupter.

B. EMI: Electromagnetic interference.

C. GFCI: Ground-fault circuit interrupter.

D. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

E. RFI: Radio-frequency interference.

F. SPD: Surge Protective Device.

G. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.
2. Poke-Through, Fire-Rated Closure Plugs: One for every five floor service outlets installed, but no fewer than two.

1.9 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer. Switches, receptacles and cover plates shall be of the same manufacturer.

B. Comply with National Electrical Manufacturer's Association (NEMA) standards. Furnish products listed and classified by Underwriter's Laboratories Inc. as suitable for purpose specified and shown.

C. Manufacturer shall have a minimum of ten (10) years experience in the production of wiring devices specified and shall have ISO 9001 and 9002 certifications.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
2. Leviton Mfg. Company Inc. (Leviton).
3. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: UL Listed and labeled and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125V, 20A: Comply with NEMA WD1, NEMAWD6 Configuration 5-20R, UL498, and FSW-C-596.

1. Products: Subject to compliance with requirements, provide one of the following manufacturers:
    a. Hubbell; HBL5361 (single), HBL5362 (duplex).
    b. Leviton; 5361 (single), 5362 (duplex).
    c. Pass & Seymour; 5361 (single), 5362 (duplex).
2. Description: Grounded, industrial extra heavy duty specifications grade, back- and side-wired, single-piece grounding brass strap with integral ground, impact-resistant thermoplastic nylon cover and body, smooth face, ~~20A, 125V, duplex~~, with separate grounding screw and NEMA 5-20R plug configurations.

B. Controlled Duplex Receptacles, 125 V, 20A
1. Description: Two pole, three wire and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498.
4. Marking: Shall have permanent marking per CEC 130.5 (d).
5. USB Receptacles: Dual and quad, USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
6. Standards: Comply with UL 1310 and USB 3.0 devices.

2.4 PENDANT CORD-CONNECTOR DEVICES

A. Description:
1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.5 CORD AND PLUG SETS

A. Description:
1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.6 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following manufacturers:

1) Single Pole:

a) Hubbell; HBL1221.
b) Leviton; 1221-2.
c) Pass & Seymour; CSB20AC1.

2) Two Pole:

a) Hubbell; HBL1222.
b) Leviton; 1222-2.
c) Pass & Seymour; CSB20AC2.

3) Three Way:

a) Hubbell; HBL1223.
b) Leviton; 1223-2.
c) Pass & Seymour; CSB20AC3.

4) Four Way:

a) Hubbell; HBL1224.
b) Leviton; 1224-2.
c) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following manufacturers:
   a. Hubbell; HBL1201PL for 120 and 277 V.
   b. Leviton; 1221-LH1.
   c. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.
2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell; HBL2057.
   b. Leviton; 1257.
   c. Pass & Seymour; 1251.
   d. Pass & Seymour; 1251L.

2.7 DECORATOR-STYLE DEVICES

A. Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following manufacturers:

a. Hubbell; DR20.

b. Leviton; 16252.

c. Pass & Seymour; 26252.

B. Toggle Switches, Square Face, 120/277 V, 20 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.

1. Products: Subject to compliance with requirements, provide one of the following manufacturers:

a. Hubbell; DS120 (single pole), DS320 (three way).

b. Leviton; 5621-2 (single pole), 5623-2 (three way).

c. Pass & Seymour; 2621 (single pole), 2623 (three way).

C. Lighted Toggle Switches, Square Face, 120 V, 20 A: Comply with NEMA WD 1 and UL 20.

1. Products: Subject to compliance with requirements, provide one of the following manufacturers:

a. Cooper; 7631 (single pole), 7633 (three way).

b. Hubbell; DS120IL (single pole), DS320 (three way).

c. Leviton; 5631-2 (single pole), 5633-2 (three way).

d. Pass & Seymour; 2625 (single pole), 2626 (three way).

2. Description: With neon-lighted handle, illuminated when switch is "off."

2.8 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.

2. Material for Finished Spaces: Smooth, high-impact thermoplastic 0.04-inch- (1-mm-) thick, brushed brass with factory polymer finish.

3. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Antimicrobial Cover Plates:

1. Contact surfaces treated with a coating that kills 99.9 percent of certain common bacteria within two hours when regularly and properly cleaned.

2. Tarnish resistant.

2.9 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, solid brass with satin finish.

D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for UTP cable complying with requirements in Section 271500 "Communications Horizontal Cabling."

2.10 POKE-THROUGH ASSEMBLIES

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

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Pass & Seymour/Legrand.
3. Square D/Schneider Electric.
4. Thomas & Betts Corporation.
5. Wiremold/Legrand.

B. Description:

1. Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
2. Comply with UL 514 scrub water exclusion requirements.
3. Service-Outlet Assembly: Flush type with four simplex receptacles and space for four RJ-45 jacks complying with requirements in Section 271500 "Communications Horizontal Cabling."
4. Size: Selected to fit nominal 4-inch (100-mm) cored holes in floor and matched to floor thickness.
5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
6. Closure Plug: Arranged to close unused 4-inch (100-mm) cored openings and reestablish fire rating of floor.
7. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, four-pair cables that comply with requirements in Section 271500 "Communications Horizontal Cabling."

2.11 PREFABRICATED MULTIOUTLET ASSEMBLIES

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

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold/Legrand.

B. Description:

1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard finish.

D. Multioutlet Harness:

1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.
2. Receptacle Spacing: 9 inches (230 mm).
3. Wiring: No. 12 AWG solid, Type THHN copper, two circuit, connecting alternating receptacles.

2.12 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. SPD Devices: Blue.
4. Isolated-Ground Receptacles: Orange.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
2. Install hospital-grade receptacles in patient-care areas with the ground pin at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

C. Essential Electrical System: Mark receptacles supplied from the essential electrical system to allow easy identification using a self-adhesive label.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 20-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. Using the test plug, verify that the device and its outlet box are securely mounted.

5. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Test straight-blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz. (115 g).

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports. Submit reports within two (2) weeks of completion of tests.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Nonfusible switches.
2. Receptacle switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Manufacturer's field service report.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.9 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. 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.

E. Comply with NFPA 70.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than 14 days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Construction Manager's and Owner's written permission.
4. Comply with NFPA 70E.

1.11 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 NONFUSIBLE SWITCHES

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

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

E. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Auxiliary Contact Kit: One or Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical or Compression type, suitable for number, size, and conductor material.
7. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.2 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

F. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

G. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

H. Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical orb Compression type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
7. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
8. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
B. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
D. Install fuses in fusible devices.
E. Comply with NFPA 70 and NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. 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.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.

b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.

c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

END OF SECTION

SECTION 26 51 19

LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes the following types of LED luminaires:

1. Cylinder.
2. Downlight.
3. Linear industrial.
4. Recessed, linear.
5. Strip light.
6. Surface mount, linear.
7. Surface mount, nonlinear.
8. Suspended, linear.
9. Suspended, nonlinear.
10. Track Mounted, monopoint.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
6. Photometric data and adjustment factors based on laboratory tests[, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project] [IES LM-79] [and] [IES LM-80].

a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.

2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

3. Include diagrams for power, signal, and control wiring.

C. Samples: For each luminaire and for each color and texture with standard factory-applied finish.

D. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.

1. Include Samples of luminaires and accessories involving color and finish selection.

E. Samples for Verification: For each type of luminaire.

1. Include Samples of luminaires and accessories to verify finish selection.

F. Product Schedule: For luminaires and lamps, refer to light fixture schedule on plans.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.

2. Suspended ceiling components.

3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.

4. Structural members to which equipment and luminaires will be attached.

5. Initial access modules for acoustical tile, including size and locations.

6. Items penetrating finished ceiling, including the following:

a. Other luminaires.

b. Air outlets and inlets.

c. Speakers.

d. Sprinklers.

e. Access panels.

f. Ceiling-mounted projectors.

7. Moldings.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Product Certificates: For each type of luminaire Product Test Reports: For each type of luminaire, for tests performed by DLCand as follows:

1. Test reports complying with LM-79 (IES approved method for electrical and photometric measurements of Solid-State Lighting) providing total luminous flux, luminous intensity distribution, electrical power characteristics, luminous efficacy and color characteristics (CRI, CCT) shall be submitted.
2. Test reports complying with LM-80 (IES approved standard for measuring lumen maintenance of LED light sources) providing lumen maintenance of LED light sources shall be submitted.
3. ISTMT (IN SITU TEMPERATATURE MEASUREMENT TEST) – It is the measure of the LED source case temperature within the LED system (luminaire or lamp or it is the temperature of the LED within the luminaire. This measurement should be performed according to the temperature measurement point (TMP) indicated by the particular LED package manufacturer. The temperature measured within the luminaire shall be within the temperature of the LM-80-08 LED source report.
4. All LED lifetime projections shall be made per TM-21-11 (approved method for taking LM-80 data and making useful LED lifetime projections).

E. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as

defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a [three-step] MacAdam Ellipse to ensure color consistency among luminaires.

E. Mockups: For interior luminaires in room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of luminaires in mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 REFER TO LIGHT FIXTURE SCHEDULE ON PLANS

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."

C. Ambient Temperature: 41 to 104 deg F (5 to 40 deg C).

1. Relative Humidity: Zero to 95 percent.

D. Altitude: Sea level to 1000 feet.

2.3 LUMINAIRE REQUIREMENTS

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. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.

b. Lamp diameter, shape, size, wattage, and coating.

c. CCT and CRI.

C. Recessed luminaires shall comply with NEMA LE 4.

D. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

E. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

F. California Title 24 compliant.

2.4 CYLINDER

A. Lamp:

1. Minimum as noted on the plans.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of **minimum 80** .
4. Rated lamp life of **50,000** hours to L70.
5. Dimmable from 100 percent to 0 percent of maximum light output.
6. Internal driver.
7. User-Replaceable Lamps:
   a. Bulb shape complying with ANSI C78.79.
   b. Lamp base complying with ANSI C81.61.
8. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

B. Housings:

1. Steel housing and heat sink.
2. painted finish.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

D. Diffusers and Globes:

1. Prismatic glass
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Glass: Annealed crystal glass unless otherwise indicated.
4. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

E. With integral mounting provisions.

F. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.5 DOWNLIGHT

A. Lamp:

1. Minimum allowable efficacy of 80lm/W.
2. CRI of minimum 80.
3. Rated lamp life of 50,000 hours to L70.
4. Dimmable from 100 percent to 0 percent of maximum light output.
5. Internal driver.
6. User-Replaceable Lamps:
    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61.
7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

B. Housings:

1. Steel housing and heat sink.
2. painted finish.
3. Universal mounting bracket.
4. Integral junction box with conduit fittings.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

D. Diffusers and Globes:

1. Adjustable lens.
2. Prismatic glass.
3. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
4. Glass: Annealed crystal glass unless otherwise indicated.
5. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

E. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.
4. Recessed luminaires shall comply with NEMA LE 4.

2.6 RECESSED, LINEAR

A. Lamp:

1. Minimum allowable efficacy of 85 lm/W.
2. CRI of minimum 80.
3. Rated lamp life of 50,000 hours to L70.
4. Dimmable from 100 percent to 0 percent of maximum light output.
5. Internal driver.

6. User-Replaceable Lamps:
    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61.
7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

B. Housings:
1. Extruded-aluminum housing and heat sink.
2. Painted finish.
3. With integral mounting provisions.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

D. Diffusers and Globes:
1. Prismatic glass.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Glass: Annealed crystal glass unless otherwise indicated.
4. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

E. Standards:
1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.
4. NEMA LE 4.

2.7 SURFACE MOUNT, LINEAR

A. Lamp:
1. Minimum allowable efficacy of 80 lm/W.
2. CRI of minimum 80.
3. Rated lamp life of 50,000 hours to L70.
4. Dimmable from 100 percent to 0 percent of maximum light output.
5. Internal driver.
6. User-Replaceable Lamps:
    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61.
7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

B. Housings:
1. Steel housing and heat sink.
2. Painted finish.
3. With integral mounting provisions.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

D. Diffusers and Globes:

1. Prismatic glass.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Glass: Annealed crystal glass unless otherwise indicated.
4. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

E. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.8 SURFACE MOUNT, NONLINEAR

A. Lamp:

1. Minimum allowable efficacy of 80 lm/W.
2. CRI of minimum 80.
3. Rated lamp life of 50,000 hours to L70.
4. Dimmable from 100 percent to 0 percent of maximum light output.
5. Internal driver.
6. User-Replaceable Lamps:
   a. Bulb shape complying with ANSI C78.79.
   b. Lamp base complying with ANSI C81.61.
7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

B. Housings:

1. Extruded-aluminum housing and heat sink.
2. Painted finish.
3. With integral mounting provisions.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

D. Diffusers and Globes:

1. Prismatic glass.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Glass: Annealed crystal glass unless otherwise indicated.
4. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

E. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.9 MATERIALS

A. Metal Parts:
1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Steel:
1. ASTM A 36/A 36M for carbon structural steel.
2. ASTM A 568/A 568M for sheet steel.

C. Stainless Steel:
1. 1. Manufacturer's standard grade.
2. 2. Manufacturer's standard type, ASTM A 240/240 M.

D. Galvanized Steel: ASTM A 653/A 653M.

E. Aluminum: ASTM B 209.

2.10 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.11 LUMINAIRE SUPPORT

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, [**12 gage**].

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

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

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaires:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaires:

1. [Attached to structural members in walls] [Attached to a minimum 20 gauge backing plate attached to wall structural members] [Attached using through bolts and backing plates on either side of wall] <Insert means of attachment>.
2. Do not attach luminaires directly to gypsum board.

G. Suspended Luminaires:

1. Ceiling Mount:
   a. Two 5/32-inch diameter aircraft cable supports adjustable to 10 feet in length.
2. Pendants and Rods: Where longer than 24 inches, brace to limit swinging.
3. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
4. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.

3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Comply with requirements for startup specified in Section 260943.16 "Addressable-Luminaire Lighting Controls."

B. Comply with requirements for startup specified in Section 260943.23 "Relay-Based Lighting Controls."

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.

2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION

SECTION 27 05 29

HANGER AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for non-continuous cable support components that provide pathways support to telecommunications cables traveling – Independent Cable Supports l in conduits or other continuous cable supports.
2. Non-continuous cable supports.

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents, Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1. Anywhere cabling Standards conflict with electrical or safety Codes, the Subcontractor shall defer to 2022-CEC and any applicable local codes or ordinances or default to the most stringent requirements listed by either.
2. Knowledge and execution of applicable codes is the sole responsibility of the Subcontractor.
3. Any code violations committed during installation shall be remedied at the Subcontractor's expense.

1.3 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufacturers shall be ISO 9001:2000 and offer RoHS-compliant products.

B. Qualifications – Installer:

1. The contractor shall coordinate the final TMGB connection with the project electrician.
2. At a minimum, seventy-five percent (75%) of the onsite subcontractor-provided field technicians shall be factory-certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall always be available on-site for review for each field technician.

1.4 SUBMITTALS

A. Project Submittals – See Section 270500 Appendix A Project Submittals for contractor requirements for training validation, credentials, scaled shop drawings data sheet, and specialty product sample submittal(s) prior to site work.

B. Closeout Submittals - As-Built Drawings

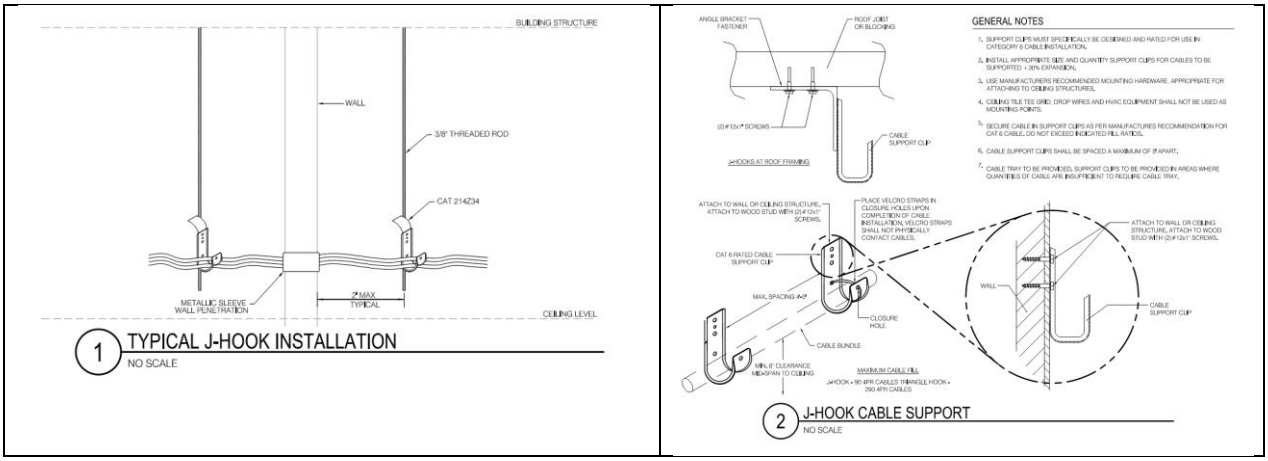
1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit bonding and grounding project work from scaled Shop Drawings in the Revit model in addition to the other Div. 27 & 28 project submittal requirements.
3. Submit as-built drawings a minimum of two (2) weeks after completion of all Division-27 work for A/E and college reference.

1.5 WARRANTY

A. Warranty:

1. The contractor shall provide all extended warranty plans at no cost to the College-IT Project Manager.
2. The contractor shall warranty all workmanship per the manufacturer's required installation and attachment requirements.

PART 2 - PRODUCTS



2.1 NON-CONTINUOUS CABLE SUPPORTS (aka J-Hook, Cable-Saddle, Independent Cable Support, etc.)

A. College -IT Standards and Specifications: Subject to compliance with requirements:

1. Erico – Caddy CableCat Support System
2. Copper/BLine – Cable Hook System
3. CEAS Attachments – Stiffy Series
4. Panduit – Jmod Cable Support System
5. Or A/E Approved Equal.

B. Product Options:

1. The indicated manufacturers shall be the basis of the design, and each component selected shall address the particular infrastructure requirement.
    a. Four-inch (0'4") Cat214z34, two-inch (0'2") J-Hook Supports Cat324z34

C. Description:

1. Non-continuous cable supports shall be available in multiple sizes, styles, and materials.

Rigid supports shall be equipped with flared edges and pre-configured bend radius controls.

2. Provide drop wire supports and threaded rod assemblies in areas where structural mounting surfaces are non-functional or inaccessible.
3. Support assemblies shall provide a bearing surface of sufficient width to comply with the required bend radii of high-performance UTP and optical fiber cables.
4. Non-continuous cable supports sized 1 5/16" and larger shall have a cable retainer strap to contain cables within the hanger. The cable retainer strap shall be reusable.
5. Select approved non-continuous cable supports suitable for specific installation environments and/or air handling (plenum) spaces.

2.2 3/8" THREADED ROD FOR CEILING ATTACHMENT

A. Standards and Specifications: Subject to compliance with requirements:
   1. All Thread Rod
   2. Or Approved Equal

B. Product Options:
   1. The indicated manufacturers shall be the basis of the design, and each component selected shall address the particular infrastructure requirement.
      a. Threaded rod installation to the concrete deck above shall be made via a 3/8" Hilti-KB-TZ2 Expansion anchor.

2.3 1/4" CEILING HANGER (aka Pencil-rod, ceiling-wire) FOR CEILING ATTACHMENT – Impact-shot attachment,

A. College IT Standards and Specifications: Subject to compliance with requirements:
   1. CPI
   2. Or College-IT Approved Equal

B. Product Options:
   1. The indicated manufacturers shall be the basis of the design, and each component selected shall address the particular infrastructure requirement.
      a. Adherence to SEOR and manufacturer's installation requirements are the sole responsibility of the installing contractor.

PART 3 - Description EXECUTION

3.1 EXAMINATION

A. Check actual site conditions before the start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before installing or using products specified in this section.

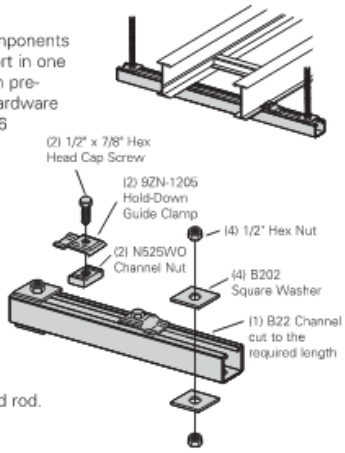
Trapeze Support Kit

B-Line trapeze kits provide the components required for a single trapeze support in one package. These kits are available in pre-galvanized steel with zinc-plated hardware or hot dip galvanized steel with 316 stainless steel hardware.

The SH channel provides the convenience of pre-punched slots, which eliminate the need for field drilling.

The illustrated hardware is sealed in a plastic bag and boxed with the channel, which is pre-cut to the appropriate length as shown in the chart.

Designed for use with 1/2" threaded rod. Order rod separately.

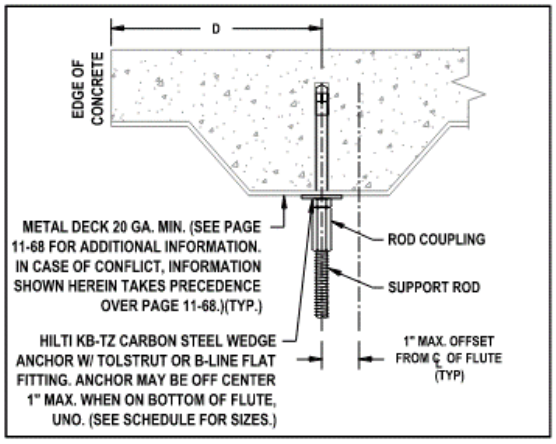


Catalog No.	Tray Width in.	(mm)	Channel Length in.	(mm)	Uniform Load lbs	(kN)
9P-5506-22SH(†)	6	(152)	16	(406)	1600	(7.11)
9P-5509-22SH(†)	9	(229)	18	(457)	1250	(5.56)
9P-5512-22SH(†)	12	(305)	22	(559)	1125	(5.00)
9P-5518-22SH(†)	18	(457)	28	(711)	865	(3.85)
9P-5524-22SH(†)	24	(610)	34	(864)	700	(3.11)
9P-5530-22SH(†)	30	(762)	40	(1016)	590	(2.62)
9P-5536-22SH(†)	36	(914)	46	(1168)	510	(2.27)

• (†) Insert 3/8 for 3/8" threaded rod hardware.

Safety factor of 3.0 on all loads.

HILTI KB-TZ WEDGE ANCHOR IN 3,000 PSI SAND LIGHTWEIGHT CONCRETE OVER METAL DECK - 20 GA (MIN.)



ANCHOR DIA.	'E' MIN. EFFECTIVE EMBED. DEPTH h_{ef}	'D' MIN. EDGE DISTANCE	MIN. SPACING BETWEEN ANCHORS ON SAME FLUTE	ALLOWABLE STRENGTH DESIGN (ASD) MAX. VERTICAL LOAD SINGLE (LB)	DOUBLE (LB)	B-LINE SOLID CHANNEL
3/8"	2"	6 3/4"	12"	210	420	B22
1/2"	2"	6 3/4"	12"	210	420	B22
1/2"	3 1/4"	9 3/4"	12"	377	750	B22A
5/8"	3 1/8"	9 3/8"	12"	288	575	B22A
5/8"	4"	12"	12"	668	1335	B22A

MAX. LOAD INCLUDES OVER STRENGTH FACTOR Ω0=2.5 PER ASCE 7-10, TABLE 13.6-1 TO SATISFY ACI-318-11.

3.2 INSTALLATION

A. Process:

1. Follow the manufacturer's instructions and recommended industry standards and guidelines.
2. The installed non-continuous support system must be an independent support structure for the voice/data communication system.
   a. Cable bundles are to be sized as PoE+++ (90W) for all Cat6A U/UTP CMP cables.
   b. Sleeves are part of the independent cable support solution and shall be included in scaled shop drawings and project costing.
   c. No plastic or composite independent cable supports that do not have a metal strength member above areas with pedestrian foot traffic.

3. Draping cables over other structures in the ceiling is unacceptable. Water pipes, ceiling grids, sprinkler systems, electrical supports, air ducts, or any other in-ceiling structure may not be used for cable support.
4. Sub-contractor-installed supports shall supplement the primary cable support system when any cabling leaves the primary support system or is unsupported for more than three and one-half feet (3.1/2'-0").
5. Independent cable supports shall be located at all changes of direction (30° - 90°). Cables should not change direction over 90° at any point in a cable run.
6. Independent cable supports shall be located no more than 1' from each side of a sleeved barrier (wall). The contractor is responsible for identifying each wall rating for all locations of sleeves before cable rough-in.
7. Non-continuous supports shall be installed with rod stock or threaded rod secured to the slab above to support the telecommunications cable infrastructure parallel to the slab throughout the cable plant unless site conditions dictate a non-parallel installation.
8. Cable must be routed to follow existing corridors and parallel or 90-degree angles from all walls and the cable tray whenever possible.
9. Communication EMT conduit sleeves shall receive conduit waterfall to control the bend radius of the communication cable to a minimum of a 4" radius.
10. All pathways shall avoid electromagnetic interference (EMI). The cable that is distributed in partially enclosed metallic pathways shall be routed with the following minimum clearances:
    a. Four (4) feet from motors or transformers.
    b. One (1) foot from conduit and cables used for electrical power and distribution.
    c. Five (5) inches from fluorescent lighting.

3.3 RE-INSTALLATION

A. No additional burden to the college regarding costs, network downtime, and end-user interruption shall result from re-installing specified components. Scheduling for re-installation work shall be coordinated, in writing, with the college before beginning any re-installation work.

3.4 CLOSEOUT ACTIVITIES

A. Sub-contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the college and A/E team.

B. Sub-contractor to submit all as-built drawings and any test documentation required before acceptance by the A/E and college.

END OF SECTION

SECTION 27 05 33

CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for conduit pathways, back boxes, and pull box enclosures utilized for the distribution and housing of telecommunications cabling and components:
2. Telecom EMT conduit and boxes shall be installed per Chapter 3 of the 2022-CEC. The conduit installation requirements shall include the following:
    a. Shorter distances between pulling points - required cable maximum pulling tensions.
    b. Factory sweeps at changes of direction – required from the cable manufacturer's requirements.
    c. Industry best practices for low-voltage/signal cabling. Cable fill shall follow ANSI-recognized cable quantities, with a maximum fill of 40% for 0.265" outside diameter CMP cable.

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents, Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1. Anywhere cabling Standards conflict with electrical or safety Codes, the Subcontractor shall defer to 2022-CEC and any applicable local codes or ordinances or default to the most stringent requirements listed by either.
2. Knowledge and execution of applicable codes is the sole responsibility of the Subcontractor.
3. Any code violations committed during installation shall be remedied at the Subcontractor's expense.

1.3 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufacturers shall be ISO 9001:2000 and offer RoHS-compliant products.

B. Qualifications – Installer:

1. The contractor shall coordinate the final TMGB connection with the project electrician.
2. At a minimum, seventy-five percent (75%) of the onsite subcontractor-provided field technicians shall be factory-certified within 12 months by the manufacturer of the

selected telecommunications system components being installed. Proof of certification shall always be available on-site for review for each field technician.

1.4 SUBMITTALS

A. Project Submittals – See Section 270500 Appendix A Project Submittals for contractor requirements for training validation, credentials, scaled shop drawings data sheet, and specialty product sample submittal(s) prior to site work.

B. Closeout Submittals - As-Built Drawings

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit bonding and grounding project work from scaled Shop Drawings in the Revit model in addition to the other Div. 27 & 28 project submittal requirements.
3. Submit as-built drawings a minimum of two (2) weeks after completion of all Division-27 work for A/E and college reference.

1.5 WARRANTY

A. Warranty:

1. The contractor shall provide all extended warranty plans at no cost to the college-IT Project Manager.
2. The contractor shall warranty all workmanship per the manufacturer's required installation and attachment requirements.

PART 2 - PRODUCTS

2.1 CONDUIT AND BACKBOXES

A. EMT/IMT Conduit

1. Wheatland Tube
2. Appleton
3. Crouse-Hinds
4. Or approved equal.

B. RMC Conduit

1. American Conduit
2. Electro Flex
3. Or approved equal.

C. Pull Boxes

1. Hoffman Engineering Co (aka NVent)
2. Or approved equal.

D. Back Boxes

1. Hubbell Raco
2. Or approved equal.

2.2 TELECOMMUNICATIONS CONDUIT AND BACKBOXES

A. Electrical Metallic Galvanized Tubing and Fittings with a natural finish for all conduits not exposed: ANSI C80.3 with compression-type fittings.

B. Communication EMT conduit sleeves shall receive conduit waterfall to control the bend radius of the communication cable to a minimum of a 4" radius.

C. Indoor Pull boxes: Galvanized steel, screw cover pull box. Grey polyester powder coat finishes inside and out. NEMA Type 1. Pull boxes will be sized per 2022-CBC code to accommodate the number of EMT conduits shown on Telecom drawings with adequate clearances, access, and cable management space.

D. Supporting devices: U-channel trapeze assemblies, 3/8", 1/2", & 5/8" Threaded rods, clamps, conduit straps, C-clamps, and retainers.

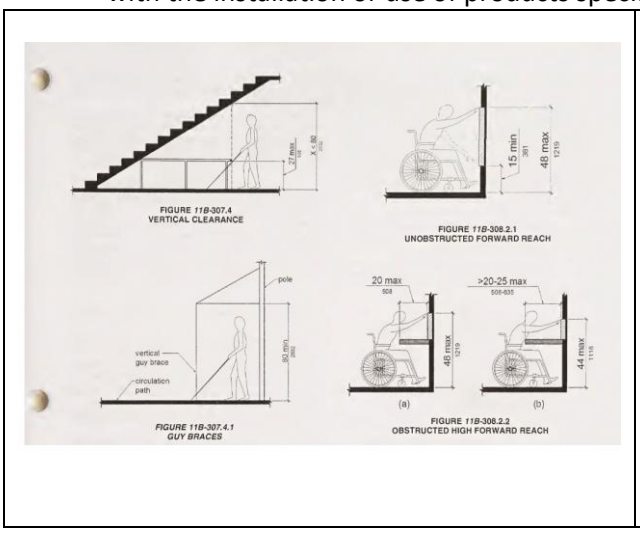
E. Fasteners: 3/8" Carbon steel expansion anchors with 2 ½" embed into the concrete slab for pull box U-channel support attachment to a concrete slab. The anchors must be tested and approved under dual load conditions: Hilti Kwikbolt 2, Ramset/Redhead Trubolt. Or approved equal.

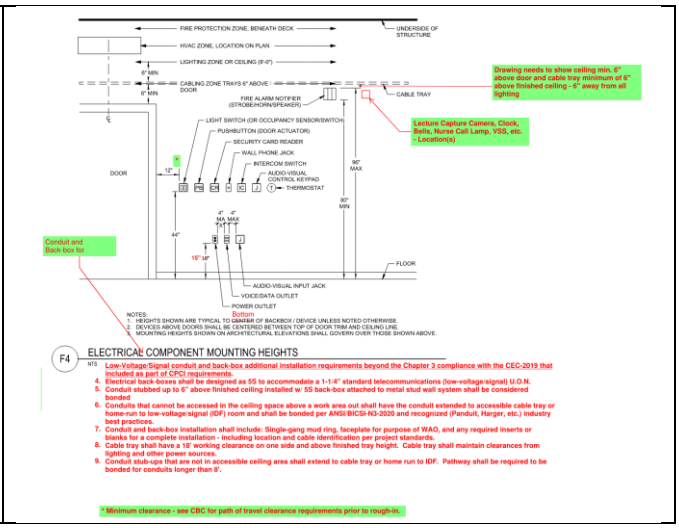
F. U-channel systems: 16-gauge steel channels. Provide fittings and accessories that match the U-channel of the same manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions before the start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with the installation or use of products specified in this section.





3.2 INSTALLATION

A. Pull boxes:

1. Install Pull boxes in easily accessible locations.
2. Install Horizontal cabling boxes immediately above suspended ceilings.
3. A pull box should not be used in lieu of a bend.

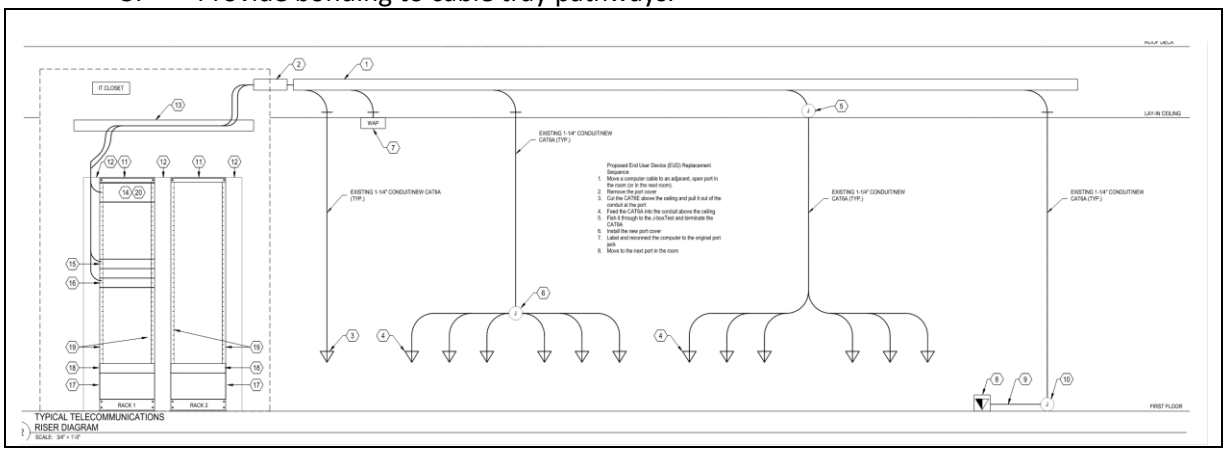
4. Conduits that enter the pull box from opposite ends with each other should be aligned.
5. For direct access to a box located above inaccessible ceilings, provide a suitable, marked, hinged access panel (or equivalent) in the ceiling. This access panel can also serve as the cover for the box.
6. Install conduit radius waterfall for all EMT conduit sleeves entering the telecommunication room or through main pathway fire-rated walls, quantity as shown on drawings.
7. Pull box sizing table:

Table 5.12
Typical space requirements for pull boxes having conduit enter at opposite ends of the box

Conduit Trade Size ≈ mm (Trade Size)	Box Width ≈ mm (in)	Box Length ≈ mm (in)	Box Depth ≈ mm (in)	Box Width Increase for Each Additional Conduit ≈ mm (in)
27 (1)	100 (4)	400 (16)	75 (3)	50 (2)
35 (1-1/4)	150 (6)	508 (20)	75 (3)	75 (3)
41 (1-1/2)	200 (8)	686 (27)	100 (4)	100 (4)
53 (2)	200 (8)	900 (36)	100 (4)	125 (5)
63 (2-1/2)	250 (10)	1067 (42)	125 (5)	150 (6)
78 (3)	300 (12)	1220 (48)	125 (5)	150 (6)
91 (3-1/2)	300 (12)	1370 (54)	150 (6)	150 (6)
103 (4)	375 (15)	1525 (60)	200 (8)	200 (8)

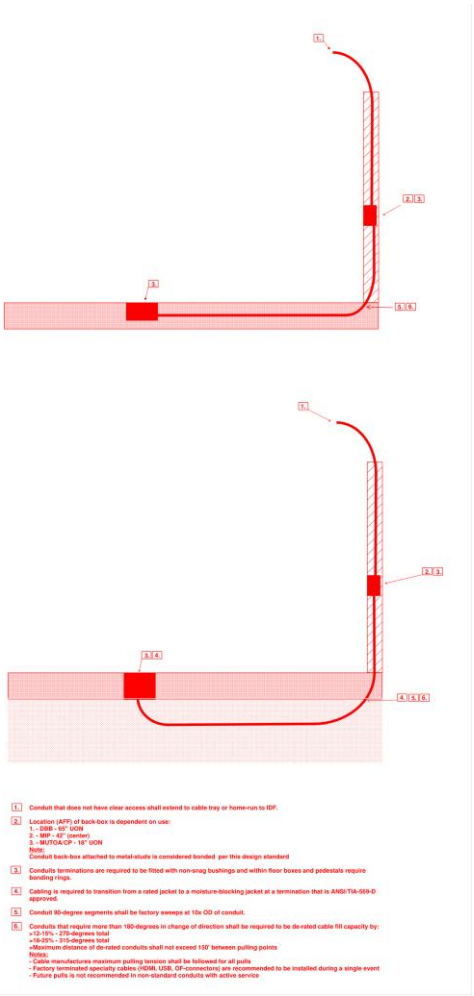
B. Back Boxes

1. Provide 4-11/16" H X 4-11/16" W X 2-1/8" D outlet back boxes at all telecom outlet locations shown on drawings. Provide (1) 1-1/4" conduit from back box to telecom room or pull box except as otherwise noted. All connectors and couplings shall be zinc-plated steel set screw type. Die-cast zinc fittings are not to be used. Provide bushing on the ends of all conduits. Provide pull string in all conduits.
2. Provide single gang plaster ring on all communications outlet back boxes unless indicated otherwise.
3. Provide bonding to cable tray pathways.

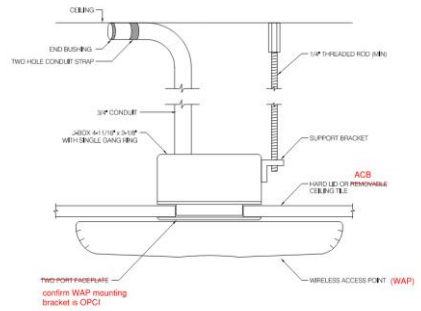


KEYNOTES

1. NEW WIRE BASKET STYLE CABLE TRAY FOR HORIZONTAL TELECOMMUNICATIONS CABLING MOUNTED ABOVE LAY-IN CEILING. PROVIDE SIZE PER MANUFACTURERS RECOMMENDATION BASED ON TOTAL CABLE COUNT AND SPACE SUPPORT TO NOT EXCEED MAXIMUM LOADING.
2. PROVIDE NEW HILTI SPEED SLEEVE OR EQUIVALENT SIZED PER THE TOTAL NUMBER OF CAT 6A CABLES ROUTED TO THE SPACE AND RATED FOR THE EXISTING WALL ASSEMBLY. CONTRACTOR SHALL SUBMIT SPECIFIC COMPONENTS BASED ON THE ACTUAL NUMBER OF DATA CIRCUITS BEING PROVIDED.
3. NEW TELECOMMUNICATIONS OUTLET BOX WITH EXISTIING 1-1/4" EMT STUB UP TO NEAREST ACCESSIBLE CEILING SPACE. REFER TO DETAILS ON SHEET T-501 AND SCHEDULE ON SHEET T-701 FOR ADDIONAL INFORMATION.
4. NEW TELECOMMUNICATIONS OUTLET. DATA CABLES TO BE ROUTED TO JUNCTION BOX TO BE STUBBED UP TO ACCESSIBLE CEILING SPACE.
5. EXISTING CEILING MOUNTED JUNCTION BOX FOR DATA CABLES, PROTECT IN PLACE. ROUTE CABLES FOR TELECOMMUNICATIONS OUTLET THROUGH WALL TO FURNITURE SYSTEM. PROVIDE PROPER WIRE MANAGEMENT.
6. EXISTING RECESSED JUNCTION BOX FOR FURNITURE SYSTEM DATA CABLES TO BE ROUTED TO ACCESSIBLE CEILING SPACE, PROTECT IN PLACE.
7. EXISTING WIRELESS ACCESS POINT WITH TELECOMMUNICATIONS OUTLET ABOVE CEILING, PROTECT IN PLACE.
8. NEW COMBINATION POWER/DATA IN-FLOOR WIREWAY DEVICE. COORDINATE FINAL FINISHES WITH COR PRIOR TO COMMENCEMENT OF ANY WORK.
9. EXISTING IN-FLOOR WIREWAY SEGMENT FOR POWER WIRING AND DATA CABLES. CONNECTS POWER/DATA DEVICE TO WALL BASE TRIM.
10. EXISTING WALL BASE TRIM TRANSITIONS CABLING AT THE WALL, PROTECT IN PLACE.
11. NEW 4 POST EQUIPMENT RACK, FREESTANDING, STEEL, PROTECT IN PLACE. TELECOMUNICATIONS CHANEL RACK, 19" RAILS, #12-24 TAPED EIA HOLE PATERN, 30" DEP CHANEL MINIMUM, 7' HIGH, 45RU, WHITE.
12. NEW 6" VERTICAL WIRE MANAGEMENT SYSTEM, PROTECT IN PLACE.
13. NEW 12" LADDER STYLE HORIZONTAL CABLE TRAY MOUNTED ABOVE RACKS, PROTECT IN PLACE. COORDINATE WITH LIGHTING FIXTURE LOCATIONS.
14. NEW 4U OPTICAL FIBER TERMINATION SHELF WITH (2) NEW 12F SM AND (2) NEW 12F MM WITH CABLE MANAGEMENT IN BREAKOUT ENCLOSURE WITH CAPACITY FOR FOR 48 STRANDS SM OPTICAL FIBER AND 48 STRANDS MULTI-MODE FIBER.
15. NEW CAT 6A 48 PORT DATA PATCH PANEL. CONTRACTOR TO SUBMIT NEW RACK ELEVATION FOR VA/AE REVIEW PRIOR TO COMMENCING WORK.
16. NEW CAT 6A48 PORT VOICE PATCH PANEL. CONTRACTOR TO SUBMIT NEW RACK ELEVATION FOR VA/AE REVIEW PRIOR TO COMMENCING WORK.
17. NEW 5KW RACK-MOUNTED 208 V UNINTERRUPTIBLE POWER SUPPLY (UPS) WITH NEMA 20A L21-20P INPUT AND L21-20R OUTPUT. SEE T-502 FOR MORE DETAILS.
18. NEW "ZONEIT" 30A 3-PHASE PDU BASE UNIT, REQUIRES (2) 30A 3-PHASE WYE CIRCIRCUITS WITH L21-30R RECEPTACLES. SEE T-502 FOR MORE DETAILS.
19. NEW ORTRONICS POWER DELIVERY UNIT (PDU), BASIS OF DESIGN RO-MM20PDUMB1D2W-B OR EQUAL. SEE T-502 FOR MORE DETAILS.
20. PROVIDE NEW FIBER CANS IN THE TELECOM ROOMS WILL BE RACK MOUNTED, AND STACKED.

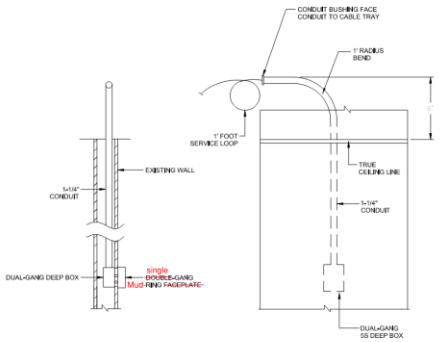


1. Conduit that does not have clear access shall extend to cable tray or home-run to IDF.
2. Location (AFF) of back-box is dependent on use:
   1 - DRB - 60" UON
   2 - MIP - 42" (center)
   3 - MUTOA/CP - 18" UON
   Note:
   Conduit back-box attached to metal-studs is considered bonded per this design standard
3. Conduits terminations are required to be fitted with non-snag bushings and within floor boxes and pedestals require bonding rings.
4. Cabling is required to transition from a rated jacket to a moisture-blocking jacket at a termination that is ANSI/TIA-569-D approved.
5. Conduit 90-degree segments shall be factory sweeps at 10x OD of conduit.
6. Conduits that require more than 180-degrees in change of direction shall be required to be de-rated cable fill capacity by:
   >12-15% - 270-degrees total
   >19-25% - 315-degrees total
   -Maximum distance of de-rated conduits shall not exceed 150' between pulling points
   Notes:
   - Cable manufactures maximum pulling tension shall be followed for all pulls
   - Factory terminated specialty cables (HDMI, USB, DP-connectors) are recommended to be installed during a single event
   - Future pulls is not recommended in non-standard conduits with active service



1 CEILING MOUNTED WIRELESS ACCESS POINT
NO SCALE

Notes:
1). Cable(s) terminated in 2-port surface jack assembly or field terminated plug requires MFG 10G Testing
2). Provide (1) Cat6A 10G 6" Equipment-Cord and (1) Cat6A 10G 10' Patch-Cord per WAP Connection



3 TYPICAL OUTLET CONCEALED CONDUIT TO ACCESSIBLE CEILING
NO SCALE

Notes:
1). Back Box shall be placed to meet access requirements of this project
2). Back Box w/ (1) Stick of Conduit is considered bonded by attached to metal stud
3). Work Area Outlet that in not in accessible ceiling area shall be required for conduit to extend to cable tray or home run to IDF. Includes additional bonding requirements.

C. Conduit support and bracing:

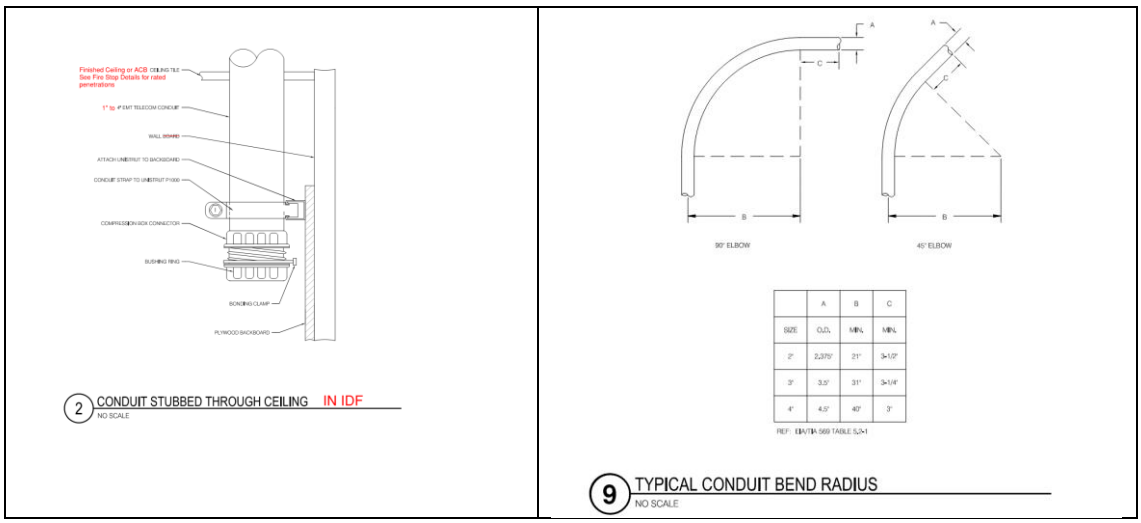
1. Coordinate layout and installation of conduits and pull boxes with other trade conditions to ensure adequate clearances, access, and cable management.
2. Install and provide support for EMT conduits and pull boxes in accordance with the latest edition of the NEC code, as well as all state and local codes and requirements. Coordinate installation and location with existing conditions. Notify and get the A/E Representative's approval before installing conduits and pull boxes where the location needs to deviate from the contract documents.
3. Install conduits above ceilings at height to provide access to pull. Install conduits and pull boxes level and square and at proper elevations. Ensure adequate clearances, access, and cable management.
4. Use fittings and support devices compatible with conduits and pull boxes suitable for use and location. The strength of each support shall be adequate to carry present and future loads multiplied by a safety factor of at least four.
5. Install individual and multiple trapeze hangers and riser clamps as necessary to support the conduits. Provide U-bolts, clamp attachments, and other hardware needed for hanger assemblies and for securing hanger rods and conduits. Space supports for conduits on maximum 10-foot centers.
6. Provide and install expansion or deflection fittings for conduits runs at all instances at seismic or expansion joints to allow for movement in any direction.

D. Conduit routing bends and radius guidelines:

1. If the conduit has an internal diameter of 2 inches or less, the bend radius must be at least 6 times the internal conduit diameter.
2. If the conduit has an internal diameter of more than 2 inches, the bend radius must be at least 10 times the internal conduit diameter.
3. Conduit bends should be smooth, even, and free of kinks or other discontinuities that may have detrimental effects on pulling tension or cable integrity during or after installation.
4. If a conduit run requires more than two 90-degree bends, provide a pull box between sections with two bends or less.
5. If a conduit run requires a reverse bend (between 100 degrees and 180 degrees), insert a pull point or pull box at each bend with an angle from 100 degrees to 180 degrees.
6. Consider an offset as equivalent to a 90-degree bend.
7. A pull box shall not be used as a 90-degree bend.
8. Communication EMT conduit sleeves shall receive conduit waterfall to control bend radius of the communication cable to a minimum of a 4" radius.
9. Achieve the best direct route with no bend greater than 90 degrees or an aggregate of bends more than 180 degrees between pull points or pull boxes.
10. Contain no continuous sections longer than 100 ft.
11. Pull points or pull boxes should be inserted for runs that total more than 100 ft. in length so that no segment between points/boxes exceeds the 100 ft. limit.

12. Withstand the environment to which they will be exposed.
13. Conduits should not be routed through areas where flammable material may be stored or over or adjacent to boilers, incinerators, hot-water lines, and steam lines.
14. Keep conduits at least 6’ away from parallel runs of steam, hot water pipes, or mechanical ductwork.

E. Conduit Terminations



1. Join conduits with fittings designed and approved for the purpose. Make the joints tight without protruding lips that can snag cable pulling inside the conduits.
2. Where conduits are terminated with locknuts and bushings, align the conduit to enter squarely and install the locknuts with dished part against the box. Use two locknuts, one inside and one outside the box.
3. Ream all conduit ends and fit them with an insulated bushing to eliminate sharp edges that can damage cables during installation or service.
4. Conduits that enter a telecom room should terminate near the corners to allow for proper cable racking.
5. Terminate conduits that protrude through the structural floor 3 inches above the surface.
6. Maintain the integrity of all fire stop barriers for all floor or wall penetrations.

F. Provide grounding and bonding for conduits and pull boxes as indicated by NEC code and instructed by the manufacturer.

G. Conduits shall be clearly labeled at both ends designating the opposite locations(s) served. The numbering scheme shall be a room number plus a suffix to guarantee uniqueness, e.g., 143-1. Labeling must be machine-generated.

H. Conduit Protection:

1. Remove burrs, dirt, and construction debris from conduits and pull boxes.
2. Conduits should be left capped for protection.

3. Provide final protection and maintain conditions in a manner acceptable to the **<Client>** Representative to ensure that coatings, finishes, and pull boxes are without damage or deterioration at completion. Repair damage to galvanized finishes with zinc-rich paint recommended by the manufacturer.

3.3 ACCEPTANCE

A. All specified conduits and pull boxes indicated on the drawings and specifications shall be complete.

B. Specified shop drawings and product submittals shall have been submitted for review, and all review comments and deficiencies shall have been resolved. Final shop drawings and product submittals shall have been submitted, reviewed, and found to meet the requirements of the specifications.

C. Issues and deficiencies identified in field reports and punch lists shall have been resolved. Final as-built drawings shall have been submitted, reviewed, and found to meet the requirements of the specifications.

D. The sub-contractor shall provide written notice of the final completion of the telecom infrastructure. Upon receipt, the A/E Representative will review/observe the completed installation. Once the A/E Representative is satisfied that all work is in accordance with the Contract Documents, the Sub-contractor will be notified in writing.

3.4 RE-INSTALLATION

A. No additional burden to the college regarding costs, network downtime, and end-user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the A/E before beginning any re-installation work.

B. CLOSEOUT ACTIVITIES

C. Sub-contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the College and A/E team.

D. Sub-contractor to submit all as-built drawings and any test documentation required before acceptance by the A\E.

END OF SECTION

SECTION 27 05 53

IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications information for identification of the various components of the telecommunications infrastructure and pathway system.
2. Labeling and identification.

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

A. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1. Anywhere cabling Standards conflict with electrical or safety Codes, the Subcontractor shall defer to 2022-CEC and any applicable local codes or ordinances or default to the most stringent requirements listed by either.
2. Knowledge and execution of applicable codes is the sole responsibility of the Subcontractor.
3. Any code violations committed during installation shall be remedied at the Subcontractor's expense.

1.3 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufacturers shall be ISO 9001:2000 and offer RoHS-compliant products.

B. Qualifications – Installer:

1. The contractor shall coordinate the final TMGB connection with the project electrician.
2. At a minimum, seventy-five percent (75%) of the onsite subcontractor-provided field technicians shall be factory-certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall always be available on-site for review for each field technician.

1.4 SUBMITTALS

A. Project Submittals – See Section 270500 Appendix A Project Submittals for contractor requirements for training validation, credentials, scaled shop drawings data sheet, and specialty product sample submittal(s) prior to site work.

B. Closeout Submittals - As-Built Drawings

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit bonding and grounding project work from scaled Shop Drawings in the Revit model in addition to the other Div. 27 & 28 project submittal requirements.
3. Submit as-built drawings a minimum of two (2) weeks after completion of all Division-27 work for A/E and **<Client>-IT** reference.

1.5 WARRANTY

A. Warranty:
1. The contractor shall provide all extended warranty plans at no cost to the **<Client>**-IT Project Manager.
2. The contractor shall warranty all workmanship per the manufacturer's required installation and attachment requirements.

PART 2 - PRODUCTS

2.1 IDENTIFICATION LABELS

A. Basis-of-Design Product: Subject to compliance with requirements:
1. Panduit – Thermal Transfer
2. Brady Label System
3. Or **<Client>**-IT Approved Equal

B. Product Options:
1. The indicated manufacturers shall be the basis of the design, and each component selected shall address the infrastructure requirements.

C. Description:
1. In new installations (Greenfield), the Subcontractor shall develop and submit a labeling strategy based on the TIA 606 Circuit Designation and Labeling Standard for approval.
2. All labels shall be machine-manufactured by a labeling machine. Handwritten labels will not be accepted for final labeling.
3. The labeling scheme intends to be TIA/EIA 606-B compliant.
4. the sub-contractor is responsible for acquiring, understanding, and utilizing the **<Client>**'s labeling scheme for all voice data communications system components.
5. the sub-contractor is responsible for providing labels sized to show the **<Client>**'s labeling scheme in readable font size while still matching the specified hardware identification dimensions.
6. All labeling information shall be recorded on the as-built drawings, and all test documents shall reflect the appropriate labeling scheme.

D. Indoor Copper and Fiber optic cables and grounding conductors:
1. The cable sheaths shall be labeled with laser-printed polyester self-laminating wrap-around labels sized to fit the **<Client>**'s labeling scheme in readable font size.

E. Horizontal cable outlet housings and faceplates:

1. Cable termination connectors at each position on the outlet housing shall be labeled with laser-printed polyester labels inserted into the outlet housing labeling window.

F. Copper patch panels:

1. The patch panels shall be labeled on the front and rear top left corner with a laser-printed polyester self-laminating label sequentially identifying the patch panel.

G. Copper patch termination blocks:

1. The termination blocks shall be labeled on the front rows with the termination block designation strip colored per the BICSI requirements identifying the copper cable pairs.

H. Fiber optic termination panels and housings:

1. The panels and housings shall be labeled on the outside front and rear top left corner with a laser-printed polyester self-laminating label sequentially identifying the panel.
2. Cable termination identifier and fiber positions inside the termination panels shall be made using the manufacturer's provided label card behind the plastic panel.

I. Equipment racks:

1. Bakelite plastic label engraved with rack label scheme attached to the front and rear-facing top angle bracket.
2. Label shall be adhesive backed for secure placement. Optional mounting with self-tapping screws will be at the discretion of **<Client>**-IT.

J. Equipment cabinets:

1. Bakelite plastic label engraved with cabinet label scheme attached to the top front and rear facing the cabinet frame.
2. Label shall be adhesive backed for secure placement. Optional mounting with self-tapping screws will be at the discretion of **<Client>**-IT.

K. Indoor Conduits and pull-boxes:

1. Each conduit section shall be labeled on the outside facing and unobstructed view with a laser-printed polyester self-laminating label sequentially identifying the conduit and its origin and termination end (to and from).
2. Each pull-box shall be labeled on the outside door panel facing an unobstructed view with a laser-printed polyester self-laminating label sequentially identifying the pull-box and building location.

PART 3 - EXECUTIONEXAMINATION

A. Check actual site conditions before the start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with the installation or use of products specified in this section

3.2 INSTALLATION

A. Process:

1. The **<Client>** -provided labeling scheme is intended to comply with TIA/EIA 606-B standard for labeling and administration of a cable plant. It is the responsibility of the sub-contractor to acquire, understand, and utilize the **<Client>**-IT's labeling scheme for all components of the voice data communications system, including, but not limited to:
2. Indoor Horizontal copper and fiber optic cables (Identify at both ends within 6-inches of termination).
3. Indoor copper and fiber optic backbone cables (Identity at both ends within 12-inches of the point that the cable enters termination panels/blocks, within 12- of the point that the cable enters or exits pull-boxes, wall, and floor sleeves.
4. Workstation outlets, faceplates, and individual outlet connectors.
5. Termination panels.
6. Termination blocks.
7. Racks, cabinets, and equipment enclosures. (front and rear).
8. Indoor conduit pathways and pull-boxes.
9. Grounding conductors and ground bars.
10. Label each component with a specified label at an unobstructed view location and where it is accessible for administration.

3.3 RE-INSTALLATION

A. No additional burden to the **<Client>** regarding costs, network downtime, and end-user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the **<Client>** before beginning any re-installation work.

3.4 CLOSEOUT ACTIVITIES

A. Sub-contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the **<Client>** and A/E team.

B. Sub-contractor to submit all as-built drawings and any test documentation required before acceptance by the **<Client>**-IT.

END OF SECTION

SECTION 27 08 00

COMMISSIONING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications information for identification of the various components of the telecommunications infrastructure and pathway system.
2. Copper cable test device.
3. Optical fiber test device.
4. Coax test device.

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

A. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1. Anywhere cabling Standards conflict with electrical or safety Codes, the Subcontractor shall defer to 2022-CEC and any applicable local codes or ordinances or default to the most stringent requirements listed by either.
2. Knowledge and execution of applicable codes is the sole responsibility of the Subcontractor.
3. Any code violations committed during installation shall be remedied at the Subcontractor's expense.

1.3 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufacturers shall be ISO 9001:2000 and offer RoHS-compliant products.

B. Qualifications – Installer:

1. The contractor shall coordinate the final TMGB connection with the project electrician.
2. At a minimum, seventy-five percent (75%) of the onsite subcontractor-provided field technicians shall be factory-certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall always be available on-site for review for each field technician.

C. NPI Testing Guidance:

1. The installer should always meet the end user's testing and testing-documentation requirements.

2. The following section outlines installer testing recommendations and requirements.
    a. Always refer to TIA standards or the Corning Optical Communications document LANscape® Solutions Recommended Fiber Optic Test Guidelines for questions.
    b. It is recommended that on-the-reel testing be performed to verify that received cables are not damaged.
    c. It is recommended that place/non-terminated cables be tested to ensure it was not damaged during installation.
    d. It is mandatory that Tier One testing be completed on all installed fiber optic systems.
    e. Tier Two testing for fiber optic systems > 300 feet will be performed.
    f. Tier Two testing is optional for lengths shorter than 300 feet unless required by the end user.
3. Testing documentation should include both optical and non-optical data.
    a. Optical Data
        1) Tier One testing documentation will include:
            a) Date of testing.
            b) Name of personnel involved.
            c) Description of test equipment to include the model number and serial number.
            d) Calibration date of test equipment.
            e) Fiber ID.
            f) Reference method used.
            g) Link loss results.

    b. Tier Two testing documentation will include:
            a) Date of testing.
            b) Name of personnel involved.
            c) Description of test equipment to include the model number and serial number.
            d) Calibration date of test equipment.
            e) Fiber ID.
            f) Trace file.
            g) Tested wavelengths.

D. Non-Optical Data
    1. Bill of Materials of installed products.
    2. Route diagrams.

3. Cable sheath markings.
4. Splice plans (if applicable).
5. Connector labeling schemes.
6. Cable data sheets/reel numbers

E. An electronic and hard copy of all testing documentation will be provided to the end user within 30 days of project completion.

F. A copy of all documentation will be maintained by the installer for the duration.

1.4 SUBMITTALS

A. Project Submittals – See Section 270500 Appendix A Project Submittals for contractor requirements for training validation, credentials, scaled shop drawings data sheet, and specialty product sample submittal(s) prior to site work.

B. Closeout Submittals - As-Built Drawings

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit bonding and grounding project work from scaled Shop Drawings in the Revit model in addition to the other Div. 27 & 28 project submittal requirements.
3. Submit as-built drawings a minimum of two (2) weeks after completion of all Division-27 work for A/E and **<Client>** reference.

1.5 WARRANTY

A. Warranty:

1. The contractor shall provide all extended warranty plans at no cost to the **<Client>**-IT Project Manager.
2. The contractor shall warranty all workmanship per the manufacturer's required installation and attachment requirements.

PART 2 - PRODUCTS

2.1 COPPER CABLE TESTER

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Fluke - Versiv

B. Product Options:

1. The indicated manufacturers shall be the basis of the design, and each component selected shall address the particular infrastructure requirement.
    a. Fluke DSX CableAnalyzer

C. Description:

1. Must meet or exceed TIA Level IV compliant network cable-testing device certification by an independent laboratory, such as Intertek, to verify high speed, TIA/EIA T568 compliant cables.

2. Copper test equipment must be capable of certifying Category-3, Category-5e, Category-6, and Category-6A UTP links or channels independent of termination hardware configuration (RJ 45 port or 110-style) for each level of performance.
3. Provide full 2-way Autotest of Category-3, 5E, 6 and 6A twisted pair links.
4. All test equipment shall be capable of storing complete frequency sweep data for all tests and printing color graphical reports for all swept measurements.

D. Accessory Products:
1. Interface Adapters
2. TIA Category-3, 5E,6 and 6(A): 100 ohm
3. Category/Class E permanent link adapters for TIA Cat 3, 5E, 6, and 6A unshielded and shielded cables.
4. DSX CableAnalyzer - VERSIV

2.2 COAXIAL CABLE TESTER

A. Manufacturer List:
1. Fluke
2. Gepco

B. Product Options:
1. Select an analyzer to comprehensively Autotest each connection and record results verifying compliance with industry standards and manufacturer specifications.
a. DSX or Equal Digital Cable Analyzer.

C. Description:
1. The tester's Autotest function shall test and record cable resistance, length, impedance, insertion loss, and propagation delay. Additionally, the tester shall provide a TDR function that provides extended troubleshooting capabilities.
2. All test equipment shall be capable of storing complete frequency sweep data for all tests and printing color graphical reports for all swept measurements.

D. Materials: High-impact plastic case with a shock-absorbing over-mold.

E. Accessory Products:
1. Interface Adapters
a. DSX-Coax Interface Adapters

2.3 OPTICAL FIBER TESTER

A. Manufacturer List:
1. Fluke

B. Product Options:
1. Select an analyzer to comprehensively certify each optical fiber connection and record results verifying compliance with TIA/EIA performance standards and manufacturer specifications.
a. Versiv CertiFiber Pro Optical Loss Test Set

C. Description:

1. The optical fiber source shall permit complete end-to-end testing of Multimode, Single-mode, and LOMMF optical fiber cabling fully compliant with industry standards and manufacturer recommendations.
2. Available source types and wavelengths shall be as follows:
    a. Multimode - 850nm LED and 1300nm LED.
    b. Single-mode – 1310nm FP Laser and 1550nm FP Laser.
    c. LOMMF – 850nm VCSEL and 1310nm FP Laser.
3. The built-in power meter shall be calibrated to read 850, 1310, and 1550nm wavelengths.
4. All test equipment shall be capable of storing complete frequency sweep data for all tests and printing color graphical reports for all swept measurements.

D. Accessory Products:

1. Interface Adapters
    a. DSX Fiber Modules, including Multimode, Single-mode, and LOMMF adapters.

PART 3 - EXECUTIONEXAMINATION

A. Check actual site conditions before the start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installing or using products specified in this section.

B. Verify telecommunications cabling is installed and supported, terminated, mounted in an appropriate housing, or terminated on the applicable component and labeled before certification testing and documentation.

C. Verify certification tester universal interface adapters and manufacturer patch cords that enable permanent link verification are in new condition, not indicating any twisting or kinking resulting from incorrect storage of the tester interface adapters.

D. Optical fiber patch cords shall be inspected to ensure connector surfaces are clean and free of defects that may affect testing results.

3.2 TESTING

A. Process:

1. Certification test 100% of the installed cabling plant, including all backbone and horizontal four (4) pair UTP/MTP/STP copper, multi-pair UTP, and optical fiber connections.
2. Follow manufacturers' instructions and recommended industry standards and guidelines to complete all TIA/EIA 568 testing procedures to verify performance levels.
3. All testing will utilize industry standard Method B parameters.
4. All optical fiber certification testing shall include dual frequency bi-directional reports.
5. Follow manufacturer requirements for self-calibration procedures.
6. Update tester software to show specific project information, including but not limited to:
7. Date and time of testing

8. Project name
9. Field technician's name
10. Cable identification number
11. Cable manufacturer, type, and part number

B. Repair:

1. Any connections failing to meet referenced standards or more stringent performance requirements stated above must be removed and replaced with connections that prove, in additional testing, to meet or exceed the performance standards set forth.

3.3 CLOSEOUT ACTIVITIES

A. Sub-contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the **<Client>** and A/E team.

B. Sub-contractor to submit all as-built drawings and any test documentation required before acceptance by the **<Client>**-IT

END OF SECTION

SECTION 27 11 19

TERMINATION BLOCKS AND PATCH PANELS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for wall and rack/cabinet-mounted blocks, termination panels, and patch panel components utilized to terminate various telecommunications infrastructure cabling and connectivity.
2. Copper horizontal cabling Patch Panels.
3. Optical Fiber Termination panels.
4. Optical Fiber – Ultra-Low-Loss Modules

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1. Anywhere cabling Standards conflict with electrical or safety Codes, the Subcontractor shall defer to 2022-CEC and any applicable local codes or ordinances or default to the most stringent requirements listed by either.
2. Knowledge and execution of applicable codes is the sole responsibility of the Subcontractor.
3. Any code violations committed during installation shall be remedied at the Subcontractor's expense.

1.3 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufacturers shall be ISO 9001:2000 and offer RoHS-compliant products.

B. Qualifications – Installer:

1. The contractor shall coordinate the final TMGB connection with the project electrician.
2. At a minimum, seventy-five percent (75%) of the onsite subcontractor-provided field technicians shall be factory-certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall always be available on-site for review for each field technician.

1.4 SUBMITTALS

A. Project Submittals – See Section 270500 Appendix A Project Submittals for contractor requirements for training validation, credentials, scaled shop drawings data sheet, and specialty product sample submittal(s) prior to site work.

B. Closeout Submittals - As-Built Drawings

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit bonding and grounding project work from scaled Shop Drawings in the Revit model in addition to the other Div. 27 & 28 project submittal requirements.
3. Submit as-built drawings a minimum of two (2) weeks after completion of all Division-27 work for A/E and **<Client>** reference.

1.5 WARRANTY

A. Warranty:

1. The contractor shall provide all extended warranty plans at no cost to the **<Client>**-IT Project Manager.
2. The contractor shall warranty all workmanship per the manufacturer's required installation and attachment requirements.

PART 2 - PRODUCTS

2.1 COPPER HORIZONTAL CABLING PATCH PANELS

A. Manufacturer List:

1. CommScope-Systimax
   a. Systimax 360 GigaSPEED X10D- Category 6A 48 Port (Flat)
   b. Systimax 360 GigaSPEED X10D- Category 6A 48 Port (Angled)

	
360-IPR-1100-E-GS6-2U-48	360-IPR-1100A-E-GS6-2U-48

B. Product Options:

1. CommScope – Systimax – U/UTP Cat6A X10D - Only

C. Description:

1. Unless otherwise noted, All patch panels must be rack/cabinet mountable within industry standard TIA/EIA 19" mounting rails.
   a. Patch-panel shall be provided with cable strain relief on the rear of each panel included and confirmed by cable count(s).

b. (1) 2RU are required for above the top patch-panel, between each patch-panel, and below the last patch-panel – for flat patch-panels

c. (1) RU are required for above the top patch-panel, between each (5) patch-panel, and below the last patch-panel – for angled patch-panels

2. All patch panels are to provide adequate space for individual port labeling on the front and cable/connector labeling on the back.

3. All installed station cable patch panels shall be Category 6A forty-eight (48) port patch panels.

4. Unless otherwise noted on drawings, All multi-pair backbone OSP cables terminated in a TR shall be terminated on a BEC protection block—Reference Division 270526 specification.

5. The performance criteria for the patch panels must meet or exceed the performance parameters for frequency, attenuation, near-end cross-talk (NEXT), attenuation to cross-talk ratio (ACR), power sum NEXT (PS-NEXT), power sum ACR (PS-ACR), equal level far end cross-talk (ELFEXT), power sum far end cross-talk (PS-FEXT), and return loss (RL) as outlined in TIA/EIA 568 standards.

D. Accessory Products:

1. Provide any accessory products related to the patch panels to provide a complete and functional infrastructure system.

2. Where required, provide Edge block out device to safely secure access to unused ports and deter vandalism to jacks.

3. Provide all required mounting hardware, fittings, and cables.

2.2 OPTICAL FIBER TERMINATION PANELS

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Corning - Edge

B. Product Options:

1. The indicated manufacturers: Corning Optical shall be the basis of the design, and each component selected shall address the particular infrastructure requirements.

Ordering Information					
Part Number	Height	Dimensions (W x D x H)	Packaging Dimensions (W x D x H)	Shipping Weight	Number of Panels per Housing
EDGE-01U	1U	432 mm x 561 mm x 44 mm	565 mm x 657 mm x 171 mm	9.3 kg (20.4 lb)	8
EDGE-01U-SP	1U	432 mm x 561 mm x 44 mm	565 mm x 646 mm x 171 mm	8.2 kg (18 lb)	12
EDGE-02U	2U	432 mm x 561 mm x 88 mm	565 mm x 660 mm x 216 mm	10.9 kg (24 lb)	24
EDGE-04U	4U	432 mm x 561 mm x 177 mm	565 mm x 660 mm x 305 mm	16.8 kg (37 lb)	48

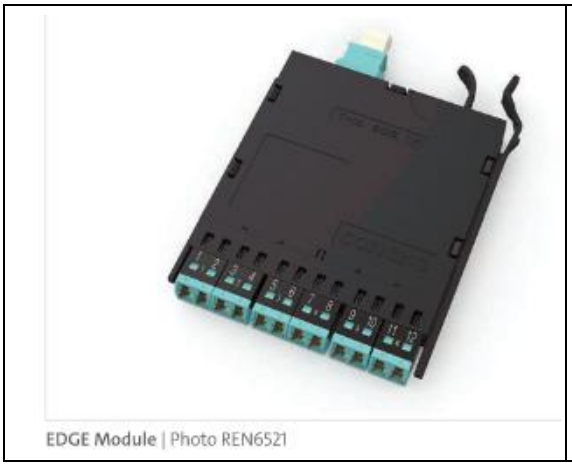
C. Description:

1. 19-inch Rack-mountable fiber optic termination shelf with a maximum of 12-panel slots with integrated splicing for termination inside Telecom rooms.

2. Minimum 1U rack units' height, maximum 4U rack units'.

3. Optical fiber termination panel housings shall be provided for cross-connecting or inter-connecting purposes between OSP, Indoor riser backbone, and/or distribution cables and the active network electronic switches, as noted in drawings.
4. Single-mode termination: Fusion splice both ends of each single-mode fiber optic strand onto factory connectorized single-mode pigtails mounted in connector housings assembled by the single-mode fiber optic cable manufacturer.
    a. Single-Mode splice-on Connector is acceptable.
5. Multimode termination: Terminate both ends of each multimode fiber optic strand onto field installable anaerobic type connectors.
6. All optical fiber housings shall be complete factory-provided assemblies containing all components, including APC-LC duplex connector modules and internal/external bend radius, strain relief, and cable clamp components provided in a housing with an accessible rear access hatch.
7. All optical fiber patch panel trays and associated bulkhead inserts shall have factory numerical labeling included in the design and presentation to the user side of the panel.
8. The optical fiber patch panel bulkheads that house the terminating modules for the fiber backbone cabling and any horizontal optical fiber cabling shall accept TIA 568-C standard-compliant LC-connectors compatible with the terminated optical fiber strands.

D. Accessory Products:
1. Provide any accessory products related to the optical fiber termination panels to provide a complete and functional infrastructure system.

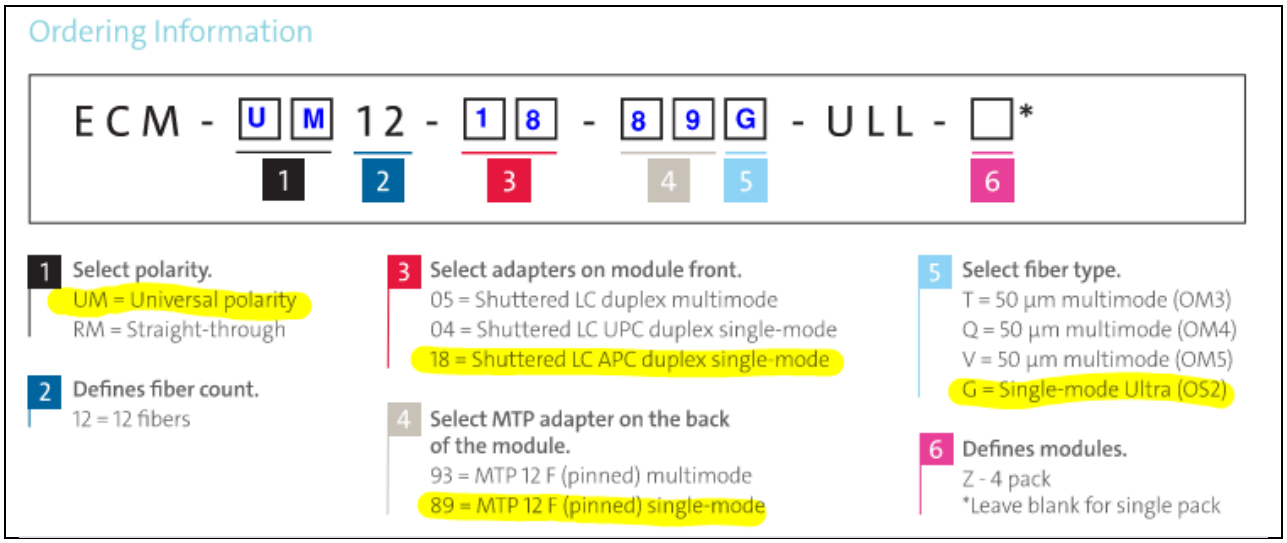


EDGE Module | Photo REN6521

Splice Cassette, 12 F, LC Duplex, OM4 | Photo LAN4849

2.3 OPTICAL FIBER CASSETTES – MPO CONNECTION

A. Basis-of-Design Product: Subject to compliance with requirements:
1. Corning – EDGE MTP to LC Module



B. Product Options:

1. The indicated manufacturers: Corning Optical shall be the basis of the design, and each component selected shall address the particular infrastructure requirements.
2. OS2 EDGE ultra-low-loss modules are specified to 0.60dB
3. Connection to optical fiber backbone shall be a Corning Optics factory MPO-tails to be fusion spliced to the backbone cable.

2.4 OPTICAL FIBER CASSETTES – EDGE MULTI-SPLICE (FIELD FUSION SPLICE)

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Corning – EDGE-CS12-AF-POORE

Ordering Information

Part Number	Polarity	Adapter Type Front	Adapter Color Front	Fiber category	Splice Protection
EDGE-CS12-AD-P00QE	Telcordia	Shuttered LC	Aqua	50 µm MM (OM4)	Heat-shrink
EDGE-CS12-AE-P00RE	Telcordia	Shuttered LC	Blue UPC	SM (OS2)	Heat-shrink
EDGE-CS12-AF-P00RE	Telcordia	Shuttered LC	Green APC	SM (OS2)	Heat-shrink
EDGE-CS12-AD-P00QE-CSP	Telcordia	Shuttered LC	Aqua	50 µm MM (OM4)	Crimp
EDGE-CS12-AE-P00RE-CSP	Telcordia	Shuttered LC	Blue UPC	SM (OS2)	Crimp
EDGE-CS12-AF-P00RE-CSP	Telcordia	Shuttered LC	Green APC	SM (OS2)	Crimp

2.5 XXXX

PART 3 - EXECUTIONEXAMINATION

A. Check actual site conditions before the start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installing or using products specified in this section. Examples of work that must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. The telecommunications rooms are the size shown on the project drawings.

3. Adequate clearances of doors, riser spaces, and ceilings for all components of the telecommunications system.

4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 INSTALLATION

A. Process:

1. Install all optical fiber and category copper termination panels/panels under the guidelines of the manufacturer's recommended instructions and per all TIA/EIA 568 standards and manufacturer-approved industry practices as shown in the drawings.

2. The contractor shall verify the installation and performance parameters of all installed cable termination panels through ANSI/TIA 568 testing procedures.

3. Label all cable termination panels to identify each port and each specific panel in accordance with the TIA/EIA 606 labeling scheme approved by the **<Client>**.

B. Installation description:

1. The contractor shall use existing cabling management pathways and place cable like with like, maintaining original segregation strategies for separating fiber and copper cables and any separation necessary between different types of copper cables.

2. Cables shall be dressed neatly within patch management pathways with care taken to maintain a minimum bend radius of not less than one times the cord outer diameter for copper and not less than a 1" bend radius for fiber jumpers as per ANSI/TIA 568

3. The contractor shall verify the installation and performance parameters of all installed cable termination panels through ANSI/TIA 568 testing procedures.

4. Label all cable termination panels to identify each port and each specific panel in accordance with the TIA/EIA 606 labeling scheme approved by the **<Client>**.

3.3 RE-INSTALLATION

A. No additional burden to the **<Client>** regarding costs, network downtime, and end-user interruption shall result from the re-installation of specified components due to manufacturer defects or contractor poor performance. Scheduling for re-installation work shall be coordinated, in writing, with the **<Client>**-IT before beginning any re-installation work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the **<Client>** and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required before acceptance by the **<Client>**-IT

END OF SECTION

SECTION 27 11 23

CABLE MANAGEMENT AND OVERHEAD LADDER (TYPE) RACK FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

Universal Runway
Traditional pathway solution for distribution over racks in equipment rooms. Note that cross-members are fixed in place.

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for cable management components utilized inside each telecommunications distribution space to support the management of horizontal workstation cabling, backbone cabling, and patch cords.
2. Vertical Cable Management
3. Horizontal Cable Management
4. Cable Runway System

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1. Anywhere cabling Standards conflict with electrical or safety Codes, the Subcontractor shall defer to 2022-CEC and any applicable local codes or ordinances or default to the most stringent requirements listed by either.
2. Knowledge and execution of applicable codes is the sole responsibility of the Subcontractor.
3. Any code violations committed during installation shall be remedied at the Subcontractor's expense.

1.3 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufacturers shall be ISO 9001:2000 and offer RoHS-compliant products.

B. Qualifications – Installer:

1. The contractor shall coordinate the final TMGB connection with the project electrician.
2. At a minimum, seventy-five percent (75%) of the onsite subcontractor-provided field technicians shall be factory-certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall always be available on-site for review for each field technician.

1.4 SUBMITTALS

A. Project Submittals – See Section 270500 Appendix A Project Submittals for contractor requirements for training validation, credentials, scaled shop drawings data sheet, and specialty product sample submittal(s) prior to site work.

B. Closeout Submittals - As-Built Drawings

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit bonding and grounding project work from scaled Shop Drawings in the Revit model in addition to the other Div. 27 & 28 project submittal requirements.
3. Submit as-built drawings a minimum of two (2) weeks after completion of all Division-27 work for A/E and **<Client>** reference.

1.5 WARRANTY

A. Warranty:

1. The contractor shall provide all extended warranty plans at no cost to the **<Client>**-IT Project Manager.
2. The contractor shall warranty all workmanship per the manufacturer's required installation and attachment requirements.

PART 2 - PRODUCTS

VERTICAL CABLE MANAGEMENT

A. Basis-of-Design Product: Subject to compliance with requirements:

1. CPI
   a. F-Series - Ring Cable Manager (for 24" wide cabinet)
      1) Part Number 39127-703
   b. Motive System 2-Post Cable Manager 6" and 10"
      1) 6" Part Number 32620-703
      2) 10" Part Number 32622-703

B. Product Options:

1. The indicated manufacturers shall be the basis of the design, and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. All new Server Room/BDF/IDF cabinets and racks shall include vertical cable management as noted in the drawings.
2. All vertical cable management on cabinets and racks shall be the full height of available rack units unless otherwise noted in the drawings.
3. Vertical cable management shall be placed on the cabinets' left and right sides, located on the front and rear of the cabinet. A total of four (4) vertical Ring Cable managers per cabinet.
4. All components of the cable management system shall be black in color.

D. Accessory Products:

1. Provide any accessory products related to the wire management components to provide a complete and functional infrastructure system.

HORIZONTAL CABLE MANAGEMENT

E. Manufacturer List:

1. CPI
   a. Motive System
      1) 2 Unit -Part Number 35431-702
      2) 1 Unit -Part Number 35432-701

F. Product Options:

1. The indicated manufacturers shall be the basis of the design, and each assembly selected shall address the particular infrastructure requirements.

G. Description:

1. Where required, all horizontal cable management on 19" relay racks shall be provided in rack unit dimensions as noted in the drawings.
2. Horizontal managers must have sufficient depth and surfaces to allow for the category-copper cables to bend radiuses—single-sided horizontal managers to be a maximum of 8.2" deep.
3. Horizontal cable managers shall be single-sided and shall provide sufficient depth to allow for category copper and fiber bend radii internally and when entering and/or leaving the wire management frame.
4. Horizontal cable management shall have dual-hinged, removable covers.
5. Transition cable management shall be two rack unit (2 RU) deep upper jumper tray provided with a one-and-a-half inch (1.5") bend radius component compliant with TIA/EIA bend radius requirements.
6. All components of the cable management system shall be black in color.

H. Accessory Products:

1. Provide any accessory products related to the wire management components to provide a complete and functional infrastructure system.

LADDER RACK

I. Manufacturer List:

1. CPI

a. Ladder Rack

1) 18" Part Number 10250-718

2) 12" Part Number 10250-712

b. Ground Cable Support

1) Part Number 11268-001

J. Product Options:

1. The indicated manufacturers shall be the basis of the design, and each assembly selected shall address the particular infrastructure requirements.

K. Description:

1. The ladder rack routing system shall consist of pathway sections, splice connectors, sidewalls, waterfalls, supports, end caps, mounting brackets, and accessories designed to route and manage copper, fiber optic, grounding, or power cables.
2. The pathway sections shall be provided in 12" (305 mm) widths.
3. The ladder rack shall be fastened using the proper hanging and connecting hardware and secured in a manner consistent with recommended weight load spacing recommendations.
4. All ladder racks will be connected and supported by the ladder rack manufacturer's splice, junction, wall angle, and tri-angle type braces per industry standards and authority having jurisdiction to meet local seismic codes.
5. All overhead ladder trays will be grounded and bonded per TIA standards.
6. Ladder rack sections will be supported every 4 feet; ladder racks spanning over areas that will not attach to a cabinet, rack, or wall will be supported by threaded rods ceiling mount kits provided by ladder rack manufacturers.

PART 3 - EXECUTION

EXAMINATION

A. Check actual site conditions before the start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installing or using products specified in this section. Examples of work that must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. The telecommunications rooms are the size shown on the project drawings.
3. Adequate clearances of doors, riser spaces, and ceilings for all components of the telecommunications pathway.
4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

A Two- or Four-Post Racks
Identify equipment support requirements and space limitations

B Cable Runway and Pathway
Provide flexible support for horizontal, vertical, and backbone pathways

C Cable Management and Accessories
Ensure proper bend radii and easy moves, adds and changes with space-saving, tool-less products

D Other Considerations:
- For safety, be sure there is proper electric equalization with bonding busbars and bonding wires
- To reliably deliver, remotely monitor and control power to equipment
- To protect equipment in seismic areas, select structural bracing for racks and runway

Resources
For a list of recommended and maximum cable fill values for all of CPI's cable management and cable pathway products, visit chatsworth.com/cable-fill.

INSTALLATION

B. Process:

1. The primary cable transport system shall be the overhead cable runway system inside telecom spaces, as shown in the drawings. The contractor-installed cable runway system shall include all components to complete the installation, whether indicated in the contract documents or implied by the design.
2. Install all vertical and horizontal cable management per the manufacturer's recommended installation instructions, as indicated in the drawings.

3. All cable bundles inside the telecommunications rooms shall be secured with Velcro™ cable wraps; plastic wire ties are unacceptable.
4. Cable ties and Velcro™ wraps shall not be pulled tight enough to kink the cable jacket.
5. Coordinate the cable runway rungs with the vertical cable manager locations to provide an unobstructed opening above the vertical cable managers or cabinet top openings.
6. Install radius runway drop-out fittings at all cable runway grids where cable bundles enter or exit the cable runway system. Multiple drop-out fittings must be placed next to each other to accommodate large cable bundles. Install drop-out wing sections at the ends of the waterfall drop-out fittings to ensure cable radius requirements are met where cables exit or enter the cable runway grid from the sides of the runway stringers.
7. Install radius runway drop-out fittings at all instances on both sides above the front end of vertical cable managers of the cable runway to accommodate patch cord routing in both directions.
8. Install ground cable support fittings to the underside of the upper-level cable runway grids to provide a separate pathway for all #6AWG telecom ground cables routed to the telecom ground bars. Neatly bundle ground cables together with Velcro strips and lay inside the ground cable support fitting pathway; lash ground cable bundles to every second fitting with Velcro strips; reference specification section 270526.
9. Open-ended cable runway sections shall be closed with runway termination kits.
10. Support vertical cable runway sections (if required) to the plywood backboards with runway hold-down clamp kits.
11. Install all components of the cable runway system under the codes, standards, guidelines, and manufacturer recommendations.
12. Vertical support to the slab above shall be provided if a cable runway section spans a distance greater than four (4) feet.
13. Diagonal braces and threaded rod stiffeners shall be installed as additional structural support assembly as required by the Seismic Requirements for Non-Structural Components for all structural bracing and support of telecommunications equipment.

RE-INSTALLATION

C. No additional burden to the **<Client>** regarding costs, network downtime, and end-user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the **<Client>** before beginning any re-installation work.

CLOSEOUT ACTIVITIES

D. The contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the **<Client>** and A/E team.

E. The contractor is to submit all as-built drawings and any test documentation required before acceptance by the **<Client>**.

END OF SECTION

SECTION 27 15 13

COPPER HORIZONTAL CABLE FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for four-pair U/UTP copper horizontal workstation cabling to distribute network signals from telecommunications distribution spaces to work area outlet locations.
2. Category 6A CMP-rated, Four-Pair Copper Cabling.
3. RG6 Coaxial CMP-rated Cabling.

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1. Anywhere cabling Standards conflict with electrical or safety Codes, the Subcontractor shall defer to 2022-CEC and any applicable local codes or ordinances or default to the most stringent requirements listed by either.
2. Knowledge and execution of applicable codes is the sole responsibility of the Subcontractor.
3. Any code violations committed during installation shall be remedied at the Subcontractor's expense.

1.3 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufacturers shall be ISO 9001:2000 and offer RoHS-compliant products.

B. Qualifications – Installer:

1. The contractor shall coordinate the final TMGB connection with the project electrician.
2. At a minimum, seventy-five percent (75%) of the onsite subcontractor-provided field technicians shall be factory-certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall always be available on-site for review for each field technician.

1.4 SUBMITTALS

A. Project Submittals – See Section 270500 Appendix A Project Submittals for contractor requirements for training validation, credentials, scaled shop drawings data sheet, and specialty product sample submittal(s) prior to site work.

B. Closeout Submittals - As-Built Drawings

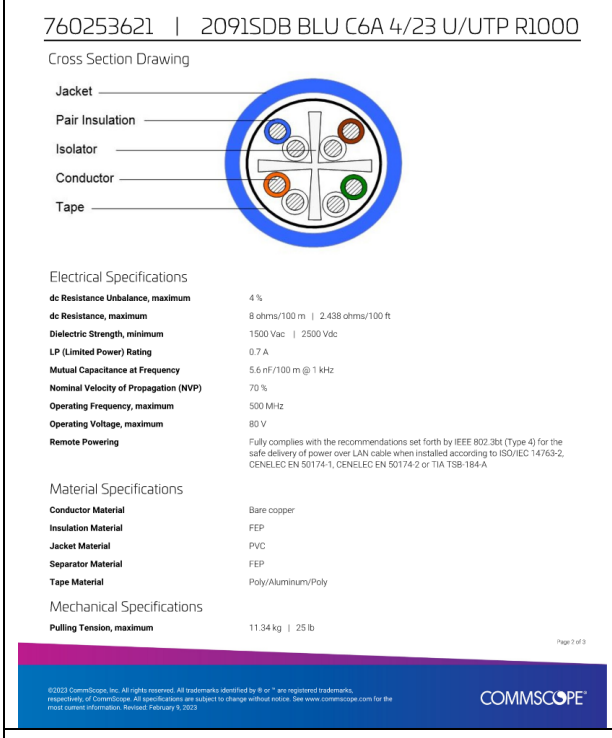
1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit bonding and grounding project work from scaled Shop Drawings in the Revit model in addition to the other Div. 27 & 28 project submittal requirements.
3. Submit as-built drawings a minimum of two (2) weeks after completion of all Division-27 work for A/E and **<Client>** reference.

1.5 WARRANTY

A. Warranty:

1. The contractor shall provide all extended warranty plans at no cost to the **<Client>**-IT Project Manager.
2. The contractor shall warranty all workmanship per the manufacturer's required installation and attachment requirements.

PART 2 - PRODUCTS



760253621 | 2091SDB BLU C6A 4/23 U/UTP R1000

Cross Section Drawing

Jacket
Pair Insulation
Isolator
Conductor
Tape

Electrical Specifications

dc Resistance Unbalance, maximum	4 %
dc Resistance, maximum	8 ohms/100 m | 2.438 ohms/100 ft
Dielectric Strength, minimum	1500 Vac | 2500 Vdc
LP (Limited Power) Rating	0.7 A
Mutual Capacitance at Frequency	5.6 nF/100 m @ 1 kHz
Nominal Velocity of Propagation (NVP)	70 %
Operating Frequency, maximum	500 MHz
Operating Voltage, maximum	80 V
Remote Powering	Fully complies with the recommendations set forth by IEEE 802.3bt (Type 4) for the safe delivery of power over LAN cable when installed according to ISO/IEC 14763-2, CENELEC EN 50174-1, CENELEC EN 50174-2 or TIA TSB-184-A

Material Specifications

Conductor Material	Bare copper
Insulation Material	FEP
Jacket Material	PVC
Separator Material	FEP
Tape Material	Poly/Aluminum/Poly

Mechanical Specifications

Pulling Tension, maximum	11.34 kg | 25 lb

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COMMSCOPE®

(760253621) 2091SD Cat6A

760178129 | 1592A BLK C6A 4/23 F/UTP R1000

Inner Jacket Thickness	0.457 mm | 0.018 in
Jacket Thickness	0.686 mm | 0.027 in
Conductor Gauge, singles	23 AWG

Cross Section Drawing

Outer Jacket
Shield
Inner Jacket
Pair Insulation
Separator
Conductor
Flooding Compound
Drain wire

Electrical Specifications

dc Resistance Unbalance, maximum	5 %
dc Resistance, maximum	9.38 ohms/100 m | 2.859 ohms/100 ft
Dielectric Strength, minimum	1500 Vac | 2500 Vdc
Mutual Capacitance at Frequency	6.0 nF/100 m @ 1 kHz
Nominal Velocity of Propagation (NVP)	62 %
Operating Frequency, maximum	500 MHz
Operating Voltage, maximum	80 V
Remote Powering	Fully complies with the recommendations set forth by IEEE 802.3bt (Type 4) for the safe delivery of power over LAN cable when installed according to ISO/IEC 14763-2, CENELEC EN 50174-1, CENELEC EN 50174-2 or TIA TSB-184-A
Safety Voltage Rating	300 V

Material Specifications

Conductor Material	Bare copper
Drain Wire Material	Tinned copper

Page 2 of 3

COMMSCOPE®

(760178129) 1592A Cat6A

2.1 FOUR PAIR CATEGORY 6A CMP CABLING

A. Basis-of-Design Product: Subject to compliance with requirements:

1. CommScope Systimax 2091SD (760253621)
   a. Category 6A CMP Rated

2. **<Client>**-IT approved CommScope equal (substitution requires approval from Greg Smith in writing prior to procurement).

B. Product Options:

1. The indicated manufacturers shall be the basis of the design, and each component selected shall address the particular infrastructure requirements.

C. Description:

1. All category-6A performance four (4) pair cables shall consist of eight (8) twenty-four (23) gauge, or greater, thermoplastic insulated solid twisted conductors that utilize the industry standard color code designations.
2. The performance criteria for four (4) pair cables shall be above and beyond specific EIA/TIA 568-C.2 standards for the particular cable's rating and shall show stable performance with documented electrical characterization out to 500 MHz.
3. Four (4) pair cables must perform over and above each current specification parameter for the latest published twisted pair, 10Gb performance cable solution.
4. Cables shall be rated per the installation environment as required by the local AHJ and local codes.
5. Select an appropriate cable construction, including external jacket properties, when installing cables in aerial, outdoor, underground, and corrosive environments.
6. Cable to be run continuously without splices.

D. Accessory Products:

1. The indicated manufacturers shall be the basis of the design, and each component selected shall address the particular infrastructure requirements.

2.2 FOUR PAIR CATEGORY 6A OSP CABLING

A. Basis-of-Design Product: Subject to compliance with requirements:

1. CommScope Systimax 2091SD (760253621)
   a. Category 6A CMP Rated
2. **<Client>**-IT approved CommScope equal

B. Product Options:

1. The indicated manufacturers shall be the basis of the design, and each component selected shall address the particular infrastructure requirements.

C. Description:

1. Category-6A 10GX performance - as listed in 2.1 above -

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to the start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before installing or using products specified in this section. Examples of work that must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. The telecommunications rooms are the size shown on the project drawings.
3. Adequate clearance of doors, riser spaces, and ceilings for all components of the telecommunications system.
4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 INSTALLATION

A. Process:

1. Install all horizontal station cabling per the manufacturer's installation requirements and **<Client>**-IT Standards and Specifications. These requirements are based on ANSI/TIA 568D-Series and BICSI methodologies. IDF schedules by symbol shall be used to identify end devices and their quantities as indicated in the project drawings.
2. Locations requiring horizontal cable shall be, but not limited to, CCTV, Elevator control panels, work area outlet, and WiFi.
3. Install all cables with proper attention to bend radii, pulling method, attachment method, and pulling forces. All cable shall be pulled using an appropriate measuring device to ensure that the specified pulling-tension (force on cable) is not exceeded, as noted in BICSI installation guidelines. Also, refer to the cable manufacturer's specifications for exact cable requirements per the particular cable type.
4. All cables shall be visually inspected for insufficient bend radius during and after pulling. Damaged cables, or those installed under questionable methods and/or circumstances, shall be replaced at no additional cost to the owner.
5. The contractor shall ensure that all TIA/EIA and industry standards are met regarding the maximum stripping length of cable jackets. No four (4) pair UTP cables shall have more than three-eight inch (3/8") of cable jacket removed beyond the termination points.
6. Install the horizontal cabling with attention to aesthetic means and methods when routing cabling within IT spaces. All horizontal cabling shall terminate in their respective floor serving technology space; specifically, cables from floor outlets must terminate in their corresponding floor telecom room.
7. All cabling distributed horizontally through metal stud framing shall have plastic protective bushings inserted to protect cables prior to installation.
8. All cables shall be clearly labeled on both ends and in an accessible location no more than six inches (0'-6") from the cable ends.
9. The owner reserves the right to specify a new location for any outlet or equipment without increasing contractor unit cost – providing that the new location is specified prior to roughing-in of technology cable and is not farther than ten (10) feet away from the original location specified.
10. Communication EMT conduit sleeves shall receive conduit waterfall to control the bend radius of the communication cable to a minimum of a 4" radius.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network downtime, and end-user interruption shall result from re-installing specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner prior to beginning any re-installation work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the Owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the Owner.

END OF SECTION

SECTION 27 15 43

FACEPLATES AND CONNECTORS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for horizontal workstation cable termination components and outlet housing components. Includes wall-mount, floor-mount, and ceiling-mount components to support the various workstation outlets throughout the cabling plant.
2. Copper Category 6A Connectors U/UTP
3. Single-Mode Optical Fiber Pigtail Connector Assemblies/Splice-On Connectors
4. Outlet Housing Components (faceplates etc.)

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents, Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.3 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufacturers shall be ISO 9001:2000 and offer RoHS-compliant products.

B. Qualifications – Installer:

1. The contractor shall coordinate the final TMGB connection with the project electrician.
2. At a minimum, seventy-five percent (75%) of the onsite subcontractor-provided field technicians shall be factory-certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall always be available on-site for review for each field technician.

1.4 SUBMITTALS

A. Project Submittals – See Section 270500 Appendix A Project Submittals for contractor requirements for training validation, credentials, scaled shop drawings data sheet, and specialty product sample submittal(s) prior to site work.

B. Closeout Submittals - As-Built Drawings

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit bonding and grounding project work from scaled Shop Drawings in the Revit model in addition to the other Div. 27 & 28 project submittal requirements.

3. Submit as-built drawings a minimum of two (2) weeks after completion of all Division-27 work for A/E and owner reference.

1.5 WARRANTY

A. Warranty:

1. The contractor shall provide all extended warranty plans at no cost to the owner-IT Project Manager.
2. The contractor shall warranty all workmanship per the manufacturer's required installation and attachment requirements.

PART 2 - PRODUCTS

2.1 COPPER UTP CONNECTORS

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Systimax: Category UTP Category 6A Connectors.
2. CommScope series MGS600 cat6A jacks. Colors to be coordinated with the owner.
3. Or owner-IT approved equal.

B. Product Options:

1. The manufacturers noted above shall be the only manufacturers acceptable to the owner and A/E.

C. Description:

1. All UTP connectors shall be rated to perform at or above the current TIA/EIA performance parameters of the UTP cabling it is terminating within the communications system.
2. All UTP connectors shall have an eight (8) position, eight (8)-conductor module that accepts RJ-45 plugs.
3. When utilized as part of a channel or permanent link, all high-performance modular outlet connectors shall not decrease the horizontal cable elevated performance transmission requirements before and after installation as specified in ANSI/TIA/EIA 568-Series Commercial Building Telecommunications Cabling Standard (horizontal cable section) in all noted performance parameters.

D. Accessory Products:

1. Provide any accessory products related to the UTP connectors required to provide a complete and functional infrastructure system.
2. Port RJ-45 jack *block-out-device* to safely secure access to unused ports and deter vandalism to jacks.
3. Provide all required mounting hardware, fittings, and cables.

2.2 COPPER UTP CEILING CONNECTORS

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Systimax: Category UTP Category 6A Connectors.
2. Or owner-IT approved equal.

B. Product Options:

1. The manufacturers noted above shall be the only manufacturers acceptable to the owner and A/E.

2. CommScope product number 760234921

2.3 SINGLE MODE OPTICAL FIBER PIGTAIL CONNECTORS ASSEMBLIES

A. Manufacturer List:

1. Corning Optical

B. Product Options:

1. The manufacturers noted above shall be the only manufacturers acceptable to the owner and A/E.

2. The owner's optical fiber solution shall be a single manufacturer end-to-end solution

C. Description:

1. Single-mode Optical fiber factory terminated pigtail connector assemblies housed in the manufacturer's connector panels.

2. Corning-approved fusion splice on the connector is acceptable.

3. Duplex LC-style connectors. I layer-2 backbone only with dB <.1 loss.

4. Maximum insertion loss across mated pair shall be less than 0.3 dB, tested per FOTP-171 Method A. Typical Insertion loss should be a maximum of 0.15 dB. Minimum return loss shall be less than 60.5 dB, tested per FOTP-171. The typical return loss should be 60 dB.

5. Pigtails shall have a minimum of 2 meters of attached cordage.

6. Pigtails shall be assembled and tested by the connector manufacturer.

D. Accessory Products:

1. Provide any accessory products and tool kits related to the termination of the optical fiber connectors to provide a complete and functional infrastructure system.

2.4 MULTIMODE OPTICAL FIBER CONNECTORS (FIELD TERMINATE)

A. Manufacturer List:

1. Corning Optics

a. Anaerobic adhesive

2.5 OUTLET HOUSING COMPONENTS

A. Manufacturer List:

1. Systimax

B. Product Options:

1. The manufacturers noted above shall be the only manufacturers acceptable to the owner and A/E.

C. Description:

1. All outlet housings at the various technology outlet locations shall provide the designated number of modular insert ports as indicated in the drawings.

2. All flush-mounted faceplates shall be provided per the port configurations shown on the telecom drawings.
3. Faceplates for wall-mounted phones shall be one (1) port single gang faceplates that have wall-mount lugs allowing vertical phone mounting.
4. Faceplates for flush floor-mounted outlets shall be coordinated with the floor box or poke-thru device that will be selected and installed outside the scope of this section.
5. System furniture faceplates shall be capable of fitting in the furniture system selected by the owner. Furniture faceplates shall be provided per the port configurations shown on the telecom drawings. Furniture faceplate extenders shall be used (if required) to maintain proper bend radii within the furniture raceway/pathway.
6. Surface-mounted boxes shall be capable of the quantity of outlet jack requirements at each outlet location indicated in the drawings.
7. All outlet-housings shall provide a clear TIA/EIA 606-A labeling location for the individual outlet port and the entire outlet housing location unless otherwise indicated in the project drawings.

D. Accessory Products:
1. Provide any accessory products related to the workstation outlet housing components required to provide a complete and functional infrastructure system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions before the start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installing or using products specified in this section. Examples of work that must be checked include, but are not limited to:
1. Electrical requirements (conduit installation and capacity)
2. The telecommunications rooms are the size shown on the project drawings.
3. Adequate clearance of doors, riser spaces, and ceilings for all components of the telecommunications system.
4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 INSTALLATION

A. Process:
1. Install all connectors and couplers under the guidelines of the manufacturers' recommended instructions and per all TIA/EIA 568 series standards, BICSI guidelines, and manufacturer-approved industry practices.
2. The trade contractor shall verify the installation and performance parameters of all installed couplers and connectors through TIA/EIA 568 series testing procedures.
3. The color of all outlet housing components shall be coordinated with the owner OAR before purchase and installation.

4. All technology outlets located on walls shall be flush mounted, level, and plumb.
5. All technology outlets shall be mounted at right angles and parallel to the floor unless installation requirements or design dictate otherwise.
6. Install blank inserts in outlet housing spaces that must be filled with cable termination modules. Blank inserts shall match the workstation housing color unless otherwise indicated in the drawings.
7. All outlets located in systems furniture may be served from a wall adjacent to the furniture cluster or a floor box. If the cable is exposed before entering the furniture raceway, install spiral wrap tubing to protect the cable per the manufacturer's recommendations.
8. All outlet housings and each individual utilized port must be labeled per the owner-IT-approved labeling scheme.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network downtime, and end-user interruption shall result from re-installing specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner before beginning any re-installation work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required before acceptance by the owner.

END OF SECTION

SECTION 271619 - PATCH CORDS FOR COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provides specifications for Category 6A and optical fiber horizontal cable patching to distribute network signals.
2. Copper Category 6A Patch Cords UTP.
3. Optical Fiber Patch Cords.

1.2 RELATED DOCUMENTS

A. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.

B. Architectural, mechanical, electrical, and all technology drawings.

C. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1. Anywhere cabling Standards conflict with electrical or safety Codes, the Subcontractor shall defer to 2022-CEC and any applicable local codes or ordinances or default to the most stringent requirements listed by either.
2. Knowledge and execution of applicable codes is the sole responsibility of the Subcontractor.
3. Any code violations committed during installation shall be remedied at the Subcontractor's expense.

1.3 QUALITY ASSURANCE

A. Qualifications – Manufacturer

1. Component manufacturers shall be ISO 9001:2000 and offer RoHS-compliant products.

B. Qualifications – Installer:

1. The contractor shall coordinate the final TMGB connection with the project electrician.
2. At a minimum, seventy-five percent (75%) of the onsite subcontractor-provided field technicians shall be factory-certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall always be available on-site for review for each field technician.

1.4 SUBMITTALS

A. Project Submittals – See Section 270500 Appendix A Project Submittals for contractor requirements for training validation, credentials, scaled shop drawings data sheet, and specialty product sample submittal(s) prior to site work.

B. Closeout Submittals - As-Built Drawings

1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
2. Submit bonding and grounding project work from scaled Shop Drawings in the Revit model in addition to the other Div. 27 & 28 project submittal requirements.
3. Submit as-built drawings a minimum of two (2) weeks after completion of all Division- 27 work for A/E and owner reference.

1.5 WARRANTY

A. Warranty:

1. The contractor shall provide all extended warranty plans at no cost to the owner-IT Project Manager.
2. The contractor shall warranty all workmanship per the manufacturer's required installation and attachment requirements.

PART 2 - PRODUCTS

2.1 COPPER U/UTP PATCH CORDS

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Systimax: Category 6A U/UTP

B. Product Options:

1. The indicated manufacturers shall be the basis of the design, and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. Category UTP Copper patch cords for equipment patching (RJ-45 to RJ-45 Cords): Modular RJ45 male plug connectors equipped with (8) eight gold anodized pins shall be factory terminated at each end of the patch cords. Modular plug connectors will be snag-free in design or will utilize a molded plastic boot to cover the modular plug tab. Category 6A UTP cords shall be 26 AWG.
2. All patch cords shall conform to the requirements of the EIA/TIA 568D standard performance parameters and shall also guarantee headroom margin above the minimum EIA/TIA 568D standard NEXT and PSNEXT requirements; and shall provide positive ACR to 5000 MHz-km as part of the connectivity system.
3. All copper UTP patch cords shall have stranded conductors that match the EIA/TIA 568D performance characteristics of the category cable specified.

4. Patch cord performance levels shall be equal to or greater than the performance level of the installed UTP cabling system.
5. All copper patch cord lengths for patching inside the telecom rooms are to be provided appropriate to patching from network equipment ports to the copper patch-panels ports within the Data Center and IDF.

D. Accessory Products:

1. Provide any accessory products related to the UTP connectors required to provide a complete and functional infrastructure system.
2. Port RJ-45 patch cord lock-in device to safely secure access to patched cords and deter accidental removal to the network connection.
3. Provide all required mounting hardware, fittings, and cables.

2.2 SMALL FORM-FACTOR - COPPER U/UTP PATCH CORDS

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Systimax: Category 6A U/UTP.

B. Product Options:

1. The indicated manufacturers shall be the basis of the design, and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. Category UTP Copper patch cords for equipment patching (RJ-45 to RJ-45 Cords): Modular RJ45 male plug connectors equipped with (8) eight gold anodized pins shall be factory terminated at each end of the patch cords. Modular plug connectors will be snag-free in design or will utilize a molded plastic boot to cover the modular plug tab. Category 6A UTP cords shall be 28 AWG.
2. All patch cords shall conform to the requirements of the EIA/TIA 568D standard performance parameters and shall also guarantee headroom margin above the minimum EIA/TIA 568D standard NEXT and PSNEXT requirements; and shall provide positive ACR to 5000 MHz-km as part of the connectivity system.
3. All copper UTP patch cords shall have stranded conductors that match the EIA/TIA 568D performance characteristics of the category cable specified.
4. Patch cord performance levels shall be equal to or greater than the performance level of the installed UTP cabling system.
5. All copper patch cord lengths for patching inside the telecom rooms are to be provided appropriate to patching from network equipment ports to the copper patch-panels ports within the Data Center and IDF.

D. Accessory Products:

1. Provide any accessory products related to the UTP connectors required to provide a complete and functional infrastructure system.
2. Port RJ-45 patch cord lock-in device to safely secure access to patched cords and deter accidental removal to the network connection.
3. Provide all required mounting hardware, fittings, and cables.

2.3 OPTICAL FIBER PATCH CORDS

A. Basis-of-Design Product: Subject to compliance with requirements:

1. Corning

B. Product Options:

1. The indicated manufacturers shall be the basis of the design, and each assembly selected shall address the particular infrastructure requirements.

C. Description:

1. All optical fiber patch cords shall conform to the requirements of the EIA/TIA 568C.3-1 standard performance parameters for the single-mode optical fiber, cable type, connector, and polish, as noted for the backbone fiber.
2. All optical patch-cords shall have a push-pull strain relief boot and a duplex clip.
3. All optical fiber patch cord lengths are to be provided appropriate to patching from network equipment ports to the optical fiber patch-panel ports within the Data Center and IDF.
4. The contractor is responsible for verifying lengths and counts of optical fiber patch cords with the Client-IT before purchase.
5. All single-mode patch cord colors are to be industry-standard yellow and provided in a duplex configuration.
6. Any optical fiber patch cords purchased without written authorization by the Client-IT are purchased at the contractor's own risk.

D. Accessory Products:

1. Provide any accessory products related to the optical fiber connectors required to provide a complete and functional infrastructure system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check actual site conditions prior to the start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before installing or using products specified in this section. Examples of work that must be checked include, but are not limited to:

1. Electrical requirements (conduit installation and capacity)
2. The telecommunications rooms are the size shown on the project drawings.
3. Adequate clearances of doors, riser spaces, and ceilings for all components of the telecommunications system.
4. Examine and compare the telecommunications drawings and specifications with the drawings and specifications of other trades. Report any discrepancies between them to the A/E and obtain written instructions for changes or revisions.

3.2 INSTALLATION

A. Process:

1. Install all horizontal cables per the manufacturer's recommended installation instructions under the guidelines of TIA/EIA 568 C and BICSI.
2. Category 6 equipment Patch cords: Provide (2) copper patch cords (one for each end of the cable termination) for every Category cable installed.
3. Fiber Optic Equipment Patch Cords: Provide (2) fiber optic LC duplex patch cords (one for each end of fiber termination) for every pair of fiber strands installed.
4. All patch cord lengths are to be provided appropriate to a patch from rack-mounted network equipment ports to the rack-mounted horizontal station outlet patch panel ports within the Data Center/IDF and from the workstation outlet to the computer/or other IP end device NIC card/RJ45 port.
5. Provide new, sealed patch cords in lengths, colors, and counts approved in writing by the owner.
6. the communication contractor will be responsible for providing installation of all Category 6A and Fiber patch cords per direction and coordination of the owner-IT dept.

3.3 RE-INSTALLATION

A. No additional burden to the owner regarding costs, network downtime, and end-user interruption shall result from re-installing specified components. Scheduling for re-installation work shall be coordinated, in writing, with the owner prior to beginning any re-installation work.

3.4 CLOSEOUT ACTIVITIES

A. Contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the owner and A/E team.

B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the owner-IT.

END OF SECTION 271619

SECTION 275126

ASSISTIVE LISTENING SYTEM

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Assistive-listening Systems

- Assistive-listening systems shall be provided in accordance with **CBC Section 11B-219** and shall comply with ***CBC Section 11B-706***.
- ***Per CBC Section 11B-219.3***, the minimum number of receivers to be provided shall be equal to 4% of the total number of seats, but in no case less than two. 25 % minimum of receivers provided, but no fewer than two, shall be hearing-aid compatible in accordance with ***CBC Section 11B-706.3***.
- 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***
- ***Per April 2020 DSA Code Appeal interpretation***, school facilities may use the following alternate provision; For each school, provide 2 portable assistive listening systems, each with a transmitter and a minimum of 2 receivers for use in classrooms without audio amplification. The assistive listening receivers and transmitter shall be stored in the school site administration office until requested. In addition, provide an assistive listening system for assembly areas such as multi-purpose rooms, cafeterias, lecture halls or other assembly areas. If the room has no fixed seating, calculate the number of seats using 7 SF per occupant. Provide 4% of assistive listening receivers for total number of seats in each assembly area, but no less than 2. The assistive listening receivers should be stored in or near the assembly area.

B. The work under this section includes all final design, all labor, material, equipment, supplies, labor, testing, and accessories required to furnish and install a complete Assistive Listening System (ALS) as indicated on the drawings and as specified herein.

1. In each assembly area, where audible communication is integral to the use of the space, an Assistive Listening System shall be provided in assembly areas, including conference and meeting rooms. Assistive listening systems shall be provided in accordance with CBC Sections 11B-219 and 11B-706.
2. Permanently installed assistive listening systems are required in areas if (1) they accommodate at least 50 persons or if they have audio-amplification systems and (2) they have fixed seating.

3. Assembly areas without fixed seating, portable assistive listening systems are permitted. Where a portable ALS is used, an adequate number of electrical outlets or other supplementary wiring necessary to support a portable ALS shall be provided.

C. All installed ALS system(s) on this project shall conform to the 2022 California Building Code and revised 2010 ADA Standards described in the final rules for Title II (28 CFR part 35) and Title III (28 CFR part 36). In addition the system shall comply with:

1. 2010 Americans with Disabilities Act (Section 706)
2. 2018 International Building Code (Section 1108.2)

D. It is the intent of the Drawings and Specifications, provide and install a complete, fully operational, and tested system.

E. All miscellaneous system components including, but not limited to, cables, termination equipment, mounting hardware, portable transmitter and receiver chargers, ear speakers, lanyards, antennas, patch panels, and any other related items shall be furnished and installed complete under this section, such that the system shall perform all functions listed herein in compliance with all of the specified requirements.

F. The Assistive Listening System shall include, but not be limited to, the following subsystems / products:

1. Listen Technologies, or Owner approved equal.

1.02 RELATED WORK

A. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and sections of Divisions 1 and 27 of these specifications.

1.03 GENERAL REQUIREMENTS

A. The Contractor shall hold a valid State of California C-7 Low-Voltage license, shall have completed at least ten (10) projects of equal scope, shall have been in business of furnishing and installing systems of this scope and magnitude for at least five (5) years, and capable of being bonded to assure the Owner of performance and satisfactory service during the guarantee period.

B. The Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work.

C. All work shall be performed under the supervision of a company accredited by the basic equipment manufacturer and such accreditation must be presented.

D. The installing Contractor shall be a factory authorized distributor and warrantee station for the brand of equipment offered and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment.

E. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment. The Contractor shall furnish a letter from the manufacturer of all major equipment, which certifies that the installing Contractor is the Authorized Distributor and that the equipment has been installed according to factory intended practices. The Contractor shall also furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.

F. All communication systems supplied shall be listed by Underwriter's Laboratories under UL Standard 1459. A copy of the UL listing card for the proposed system shall be included with the Contractor's submittal.

G. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment with the most current software package available at the time of installation. At the time of Owner Acceptance of the installation, all equipment shall include any and all updated software revisions. In addition, when the software is available in disk format, a backup copy of the most up to date revision, in disk format, shall be handed to the Owner at the completion of the project.

1.04 QUALITY ASSURANCE

A. In order to maintain a high degree of quality assurance, the Contractor shall, without exception, use the parts and supplies as specified in this specification.

B. For any proposed substitution, a complete descriptive, technical and cost comparison, and test report package shall be submitted to the Owner for review ten (10) working days prior to the bid date. Final approval of the substitution item shall be at the option of the Owner, and written notice of the status of the proposed alternative will be supplied to all bidders prior to the final bid date. The Owner or its representative must approve any proposed substitution item in writing. The Owner reserves the right to require a complete sample of any proposed equal item and may, if necessary, request a sample tested by an independent testing consultant to prove equality. The decision of the Owner regarding equality of proposed equal items will be final.

C. It is the intent of these specifications to establish a standard of quality for labor and material to be installed. The Base Bid shall include materials as specified - without exception. Proposed substitutions, if approved in writing by the Owner, shall be listed on the bid form in addition to the specified materials.

D. Approved equal status does not imply final acceptance. Final acceptance of a substitution item shall be made by the Owner prior to the award of bid to the successful Contractor, after reviewing the bid information.

E. If a substitution item is given final acceptance by the Owner, the Contractor shall reimburse the Architect for any additional engineering charges and shall pay all charges of other trades resulting from the substitution, at no cost to the Owner.

F. If a substitution item is given final acceptance by the Owner, the Contractor shall pay all charges (including travel, lodging, meals, etc.) required to provide factory certification, equal to that of a Factory Authorized Distributor of the substituted item, for two (2) selected Owner's representatives. This training shall occur at the primary factory of the substituted item in question and shall allow the selected Owners representatives to provide any and all Factory / Manufacturer Approved repairs, services, software upgrades, etcetera, without affecting any available or applicable Manufacturer Warranties.

1.05 SUBMITTAL AND MANUAL

A. Comply with all requirements of the General Conditions, Supplementary Conditions and applicable sections of Divisions 1 and 27 of these specifications.

B. Additional requirements of this section are:

1. Within fifteen (15) calendar days after the date of award of the Contract, the Contractor shall submit three (3) copies of the complete submission to the Architect for review.
2. The submission shall consist of five (5) major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.
3. The first section shall be the "index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.
4. The second section shall include a copy of the Contractor's valid C-7 California State Contractors license, a list of ten (10) projects of equal or greater scope, and a list of proposed instrumentation to be used by the Contractor. In addition, provide a written notice guarantying the provision of the requested warranty.
5. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets.
6. The fourth section shall contain an original factory data sheet for every component in the specifications. Contractor shall identify part numbers to be used on the project, by either drawing a circle around the part number, or drawing a bold arrow pointing at the part number.
7. The fifth section shall contain a designation schedule for each ALS system component and complete 1/8" = 1'-0" scale drawing showing system wiring plans and all component locations.

C. Failure to comply with all of the requirements listed above will result in the rejection of the entire submittal package.

D. The Contractor shall provide two (2) copies of an "Operating and Servicing Manual" for the system. The manuals shall be bound in flexible binders. All data shall be printed material or typewritten. Each manual shall include the following: Instructions necessary for the proper operation and servicing of the system; complete as-built installation drawings of the system; a wiring destination

schedule for each circuit leaving for each piece of equipment; a schematic diagram of major components with replacement numbers.

1.06 GENERAL SYSTEM PRODUCT, INSTALLATION AND OVERALL SYSTEM WARRANTY

A. Prior to Owner acceptance, the Contractor shall provide to Owner, a manufacturer's product and performance warranty. This will require a submittal of the required pre-job certification registration forms as well as the required project closing information. The Owner will only acknowledge acceptance upon submittal of a valid manufacturer's warranty by Contractor to the Owner.

B. The warranty shall commence from the date of final written acceptance by the Owner.

C. All conditions for obtaining the manufacturer's warranty shall be the sole responsibility of the Contractor.

D. All portable and stationary transmitters and receivers shall be warranted by the manufacturer to be free from defects in workmanship and material under normal use and conditions for the useful lifetime of the product (limited lifetime warranty) from date of purchase.

E. Stationary infrared (IR) radiators shall be warranted by the manufacturer to be free from defects in workmanship and material under normal use and conditions for three (3) years from date of purchase.

F. Noise cancelling microphones shall be warranted by the manufacturer to be free from defects in workmanship and material under normal use and conditions for one (1) year from date of purchase.

G. Charging/Carrying cases shall be warranted by the manufacturer to be free from defects in workmanship and material under normal use and conditions for one (1) year from date of purchase.

H. Headsets, ear speakers, ear buds, and neck loops shall be warranted by the manufacturer to be free from defects in workmanship and material under normal use and conditions for ninety (90) days from date of purchase.

I. The Contractor shall maintain a competent service organization and shall, if requested, submit a service maintenance agreement to the Owner after the end of the warranty/guarantee period.

J. A typewritten notice shall be posted at the AV equipment rack(s) and shall indicate the firm, address and telephone number to call when service is necessary. The notice shall be mounted in a neatly finished metal frame with a clear plastic window and securely attached to the inside of the equipment cabinet door, or room door.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. All equipment listed herein will be by Listen Technologies, or Owner approved equal.

B. It is the responsibility of the bidder to ensure that the proposed product meets or exceeds every standard set forth in these specifications and the equipment's technical data sheets.

C. The functions and features specified are vital to the operation of this facility. Therefore, inclusion of a component's manufacturer in the list of acceptable manufacturers does not release the Contractor from strict compliance with the requirements of this specification.

D. All basic electronic equipment (not including cable) specified herein shall be produced by a single manufacturer of established reputation and experience who shall have produced similar apparatus for at least three (3) or more years and who shall be able to refer to similar installations rendering satisfactory service.

2.02 PRODUCTS:

The following is to be used as a guide, and are to be included, but not limited to, in the system(s) to be supplied.

A. Fixed/Permanent Systems: Provide one fixed system for each room with occupancy levels of 50 seats or greater as per ADA guidelines.

B. Wireless Networked Audio System: Provide one system in the Multipurpose Room.

C. Portable Systems: Provide a minimum of 3 complete portable systems for this building project (one per floor) with accessories as described below.

2.03 PORTABLE ALS EQUIPMENT

A. Provide the following Listen Technologies equipment for operation with the fixed voice reinforcement systems or portable systems as described below.

B. The transceiver and receivers shall be operating on a digital 1.9 GHz unlicensed PCS band utilizing Frequency-Hopping Spread Spectrum (FHSS) techniques allowing interference free one-way communication. The device shall employ a multiply layer security protocol consisting of a 40-bit (pin free) group subscription, 32-bit authentication and a 64-bit encryption scheme enabling secure conversations. It shall be easy to pair and form groups via Near-field communication (NFC), Docking Station or Software Suite. It shall be simple to operate with a Power and Volume Up and

Down buttons. It shall allow up to 10 simultaneous groups to operate in the same area. It shall be powered via a removable non-proprietary rechargeable lithium-ion.

C. Transmitter/receiver set product – Listen Technologies ListenTALK #LKS-8-A1 including charging case.

1. One #LK-1 transmitter/transceiver and microphone and 3 #LKR-11 receiver units and headsets. Provide one additional #LKR-11 receiver unit for a total of 4 receivers as compliant with CBC.
2. Portable charging carrying case #LA-483 and one LA-423-01 4-port USB charger.
3. The receiver shall have 57 user-selectable channels.
4. Provide for Each Portable Transmitter:
   a. One #LA-365 Li-Ion Battery
   b. One Headset with Boom Microphone #LA-451 or equal
   c. Omni Conferencing Microphone #LA-277 or equal
   d. One Line/Mic Y Cable #LA-263 or equal
5. Provide for Each Portable Receiver Pro:
   a. One #LA-365 Li-Ion Battery
   b. One Breakaway lanyard #LA-445-BK or equal
   c. One Universal Ear Speaker #LA-401 or equal
   d. One Inductive Neck Loop #LA-166

2.04 FIXED ALS EQUIPMENT, RF-BASED

A. Provide Listen Technologies iDSP digital FM equipment kit #LT-31-072-D for operation with the fixed voice reinforcement systems only as described below.

B. Base Station #LT-800-072-01 3-channel transmitter for fixed installations including the following with the additional accessories listed:

1. The receiver shall have on/off, FM volume, Aux volume, Monitor volume, test tone on/off, Super Quiet Companding Technology on/off, Contour and channel up/down controls and an FM reception LED on the front panel. The front panel shall include a 2-digit channel LED display.
2. The receiver must have installer controls and ports on the back panel which include: antenna port; transmitter power settings; (2) mix outputs; (2) unbalanced audio inputs, selectable between +10 dBu and -10 dBu; (1) balanced XLR/¼" audio input, selectable between microphone, microphone with phantom power, and line level; and a separate DC jack to power the transmitter.
3. A minimum of 25% of all receivers (but no fewer than 2) shall be hearing aid compatible. Use neck-loop inductive lanyard #LA-430.
4. The channel display shall have an indicator light illuminated when the main power is off. The size of the receiver must be 20.3 (W) x 1.75 (H) x 20 (D) cm/8.0 (W) x 1.75 (H) x 8.0 (D) in. and weigh 1.4kg/3lbs.
5. The receiver must operate on 72 MHz band, or other operating band approved by FCC for assistive listening devices.The receiver shall have 57 user-selectable, 72 MHz FCC compliant, approved channels.

2.05 RECEIVERS, RF-BASED

A. Quantity as required based on occupancy levels (but no less than 4 per room), provide #LR-3200-072 intelligent digital receivers shall have 57 user-selectable, 72 MHz FCC compliant, approved channels.

B. Provide for Each Portable Receiver:

1. One Breakaway lanyard #LA-445-BK or equal
2. One Universal Ear Speaker #LA-401 or equal
3. One Inductive Neck Loop #LA-430

2.06 ACCESSORIES (FIXED AND PORTABLE RF SYSTEM):

A. One (1) Dante 1-channel output adapter.

B. One Line/Mic Y Cable #LA-263 or equal

C. Miscellaneous transmitter equipment to include the following:

1. Universal Transmitter Antenna – provide a standard or large area antenna as required to generate a signal to receivers located at any point in the instructional space covered by the dedicated transmitter. Listen #LA-122.

D. Sixteen-station charging case #LA-311 with the following capabilities:

1. The charger must be capable of storing or recharging up to 16 transmitters or receivers at once.
2. The charger must have an external UL- and CSA-approved wall transformer that plugs directly into the charging unit itself. It must have a pocket to contain the power wall transformer during storage. There must be no on/off switch.
3. The charging circuitry must be fully automatic and be capable of recharging the transmitter/receiver batteries in 14 hours maximum when 500mA/Hr batteries are used.
4. The charger must be capable of recharging NiCad batteries without the need for removal of the batteries from the transmitter/receiver.
5. The charger must have a large, foam-lined storage space for accessories, a locking lid, and a handle.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. The wiring of the system shall be executed in accordance with the drawings and the equipment manufacturer's wiring diagrams. Should any variations in these requirements occur, the Contractor shall notify the architect before making any change(s). It shall be the responsibility of the factory-authorized distributor of the approved equipment to install the equipment and guarantee the system to operate as per plans and specifications.

B. Furnish all transmitters, receivers, headsets, batteries, charging stations, conduit, junction boxes, conductors, equipment plugs, terminal strips, antennas, antenna cables, mounts, etc., and labor to install a complete and operable system.

C. The cables within the rack or cabinets shall be carefully wrapped and strapped with Velcro tie straps. Nylon type “zip ties” or tie-raps are prohibited.

D. All cables shall be numbered for identification at both ends using machine-generated labels. Hand written labels are prohibited. Cable numbering shall be provided on final as-built drawings.

E. Splices of conductors are not permitted.

F. The labor employed by the Contractor shall be regularly employed in the installation and repair of assistive listening systems and shall be acceptable to the Owner and architect to engage in the installation and service of this system.

G. The Contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished and free of all dirt, dust, smudges, spots, fingerprints, and etcetera. The Contractor shall remove all debris and rubbish occasioned by the electronic systems work from the site. The Contractor shall thoroughly clean all buildings of any dirt, debris, rubbish, marks, etc., caused by the performance of this work.

H. The ALS system must meet all 2022 California Building Codes, ADA Standards, local and other prevailing codes.

I. All cabling installations shall be performed by qualified technicians.

J. Plenum rated cable may be run exposed above ceilings, provided the cabling is supported independent of other utilities such as conduits, pipes, and the ceiling support systems. The cables shall not be laid directly on the ceiling panels. The cable jacket composition must meet local and all other prevailing fire and safety codes.

K. All firewalls penetrated by structured cabling shall be sealed by use a non-permanent fire blanket or other method in compliance with the current edition of National Fire Protection Association (NFPA) and the National Electric Code (NEC) or other prevailing code. The Contractor must not use concrete or other non-removable substance for fire stopping on cable trays, wireways or conduits. Contractors who use this method will be required to replace all cables affected and provide the original specified access to each effected area.

L. All equipment racks shall be bolted to the floor by the Contractor once the Owner determines the exact location for each rack. The earthquake mounting brackets that come with each relay rack kit

shall be screwed to studs, not drywall. All equipment shall be serviceable in the racks final location – the need to unbolt racking equipment to access or service equipment is not acceptable.

M. Lubricant shall be used for all outside plant cable and inner-duct placement. The Contractor shall verify the acceptability of the lubricant to be used with the cable manufacturer, prior to using such a lubricant. Ensure all surfaces are thoroughly cleaned when complete. Lubricants that harden after installation are prohibited.

3.02 SPECIFIC SYSTEM INSTALLATION REQUIREMENTS

A. Install antennas where indicated on plans, or as directed by the manufacturer, to provide complete coverage in all areas required for assistive listening. Contractor shall be responsible to determine final antenna location in the field. Provide all components (cables, connectors, mounts, antennas, etc.) as required for a complete and fully functioning system. Include all costs in base bid.

B. Install 3.5mm audio output jack and supporting components (cables, connectors, back box, trim plate, etc.) for connection to the audio-amplification system. 3.5mm audio output jack to provide connection for use of portable assistive listening system.

C. The installer shall, upon completion of the system, orient all antennas, adjust all controls, etc., to provide a system operating at maximum capability.

D. Submit block diagram and shop drawing of installed equipment and system(s).

E. 120-Volt AC receptacle will be supplied by the Electrical Contractor.

3.03 GENERAL TESTING REQUIREMENTS

A. Provide all instruments for testing and demonstrating in the presence of the Owner's inspector that the frequency response of all transmitters/receivers is as stated in the factory data sheets. Check all circuits and wiring to verify they are free of shorts and grounds. Demonstrate the proper use and functions of the entire system and components.

3.04 FINAL ACCEPTANCE

A. The Owner or Owner's representative may visit the site during the installation of the system to ensure that correct installation practices are being followed.

B. The Owner or Owner's representative will conduct a final job review once the Contractor has finished the job. This review will take place within one week after the Contractor notifies the Owner.

C. Two (2) copies of all certification data and drawings for all identifications shall be provided to the Owner seven (7) days prior to the Owner's scheduled review date.

D. The Owner or Owner's representative will review the installation and certification data prior to system acceptance.

E. The Owner or Owner's representative may test some of the systems features to ensure that the certification data is correct. If a substantial discrepancy is found, the Owner reserves the right to have an independent consultant perform a certification of the entire system. If such a procedure is undertaken, the cost of the testing will be billed back to the Contractor.

F. In the event that repair, or adjustments are necessary, the Contractor shall make these repairs at his own expense. All repairs shall be completed within seven (7) calendar days from the time they are discovered.

G. The Contractor shall provide not less than eight (8) hours for site instruction of personnel in the operation and maintenance of the installed systems. This instruction time shall be divided as directed by the Owner.

H. The Contractor shall hand to the Owner a copy of any applicable installation specific software configurations in disk format.

END OF SECTION

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SECTION 280500

COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Part 1 Includes:

1. Related Documents
2. Summary and related sections
3. References
4. Definitions
5. System Description and General Responsibilities
6. Coordination
7. Quality Assurance
8. Submittals
9. Delivery, Storage, and Handling
10. Site Conditions
11. Sequencing and Scheduling
12. Warranty
13. Extra Materials

B. Part 2 Includes:

1. Product Options and Substitutions
2. Materials and Equipment
3. Equipment Modification
4. Fabrication
5. Source Quality Control
6. Firestopping/Sealant Materials

C. Part 3 Includes:

1. Examination
2. Installation
3. Field Quality Control

4. Cleaning
5. Training

D. Related Sections:

1. 28 13 00 Physical Access Control System
2. 28 23 00 Video Surveillance System

1.03 REFERENCES

A. Codes compliance - Comply with the established project edition of the following codes as applicable:

1. National Fire Alarm Codes (NFPA 72) NFAC
2. All Local, State, County or Federal codes and ordinances

B. Standards Compliance - Comply with the following standards as applicable:

1. American National Standards Institute ANSI
2. American Society for Testing and Materials ASTM
3. Electronics Industry Association EIA
4. Electrical Testing Laboratories ETL
5. Federal Communications Commission FCC
6. Institute of Elect. and Electronics Engineers IEEE
7. National Electrical Contractors Association NECA
8. National Electrical Manufacturers Association NEMA
9. National Fire Protection Association NFPA
10. Occupational Safety Health Act OSHA
11. Underwriter's Laboratories UL

1.04 DEFINITIONS

A. By Others or By Other Trades: By persons or parties other than the Division 28 Contractor. In this context the words “by others or by other trades” shall not be interpreted to mean “not in contract (NIC)”.

B. Certified: Equipment has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards and found to be safe for use in a specified manner; production is periodically inspected by a nationally recognized testing laboratory; and it bears a label, tag, or other record of certification.

C. Concealed: Not visible or readily accessible such as, embedded in masonry or other construction installed behind wall furring with double partitions or above hung ceilings, in crawl spaces, in shafts.

D. Conveniently Accessible: Capable of being serviced without climbing or crawling under or over obstacles, and with adequate working clearance both front and back.

E. Damage: Visible or invisible abuse that negatively affects performance or appearance and creates defective materials or workmanship.

F. Defective Materials or Workmanship: Operational failures, performance below minimum requirements, evidence that the system will not be reasonably maintainable, errors in documentation, abnormal operations, unsafe conditions, or similar unsatisfactory performance.

G. Contractor: Company holding the contract or agreement with the Owner or its representative. The Contractor may, when permitted, sub-contract Work described in this Section to which the term contractor may apply.

H. Exposed: Not concealed.

I. Failure: Any deviation from intended system operation and performance, as determined by the Contract Documents and subsequent submittals and the Owner's Representative.

J. Furnish: Purchase and deliver to the Project site complete with every necessary appurtenance, support, and accessory required for operation.

K. Install: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the Project.

L. Labeled: Equipment embodies a valid label, symbol, or other identifying maker of a nationally recognized testing laboratory such as Underwriters' Laboratories, Inc., the laboratory makes periodic inspections of the production of such equipment, and the labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.

M. Listed: Equipment is mentioned in a list which is published by a nationally recognized laboratory which makes periodic inspection of the production of such equipment or states that such

equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.

N. Nationally Recognized Testing Laboratory: A testing laboratory which is approved, in accordance with OSHA regulations, by the Secretary of Labor.

O. Provide: Furnish and install, completely ready for use, including all accessories required for operation.

1.05 SYSTEM DESCRIPTION AND GENERAL RESPONSIBILITIES

A. The work to be performed under this contract includes the furnishing of all labor, materials, and equipment for a video surveillance system and a physical access control system. Work shall include all provisions of new electronics controls systems, including, physical access control and video surveillance.

B. Combined Prescriptive and Performance Design Requirements

1. Division 28 includes a combination of prescriptive and performance specifications. Compliance with the performance specifications, as well as coordination and integration of the prescription requirements, will require substantial design work on the part of the Contractor.
2. The performance requirements are intended to establish overall system performance requirements, satisfy the operational requirements, and establish the inter-coordination requirements for the Division 28 systems.
3. The prescriptive requirements establish the minimum quality, characteristics, and types of components, equipment, and materials to be used to achieve the stated system performance requirements. The Contractor is advised, however, that prescriptive specifications have not been provided to satisfy all of the specified performance requirements.
4. The Contractor shall carefully consider all of the requirements for each of the Division 28 systems when preparing its bid. Any questions regarding the intent of these requirements, the scope of the systems or their coordination requirements must be submitted in writing prior to bidding in accordance with the Instructions to Bidders. The Contractor shall have no claim for either extra compensation or extra time on the grounds that it did not understand the scope or the requirements of the Division 28 work, and/or the coordination requirements of the Division 28 work with the work of the other Divisions.
5. Compliance with the project requirements will be progressively monitored and adjusted through the submittal process, installation period, and pperformance verification testing.

C. Drawing Interpretation

1. The Drawings are diagrammatic and indicate the general arrangement of systems and equipment unless indicated otherwise by dimensions or detail drawings. The Drawings installation and schematic diagrams and symbols to outline the Work to be provided. These

drawings do not have any dimensional significance nor do they delineate every item required for the intended Work. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete Work are excluded.

2. The Work shall be provided in accordance with the intent expressed on the Drawings and Specifications, and in conformance with the actual building architectural and structural conditions. When in conflict, field conditions take precedence over the Contract Documents.
3. The meaning of abbreviations shall be the same whether in lower case letters or without periods.
4. The use of words in the singular shall not be considered as singular where other indications denote that more than one item is referred to.
5. Details that appear on the Contract Documents which are specific with regard to the dimensioning and positioning of the Work, are intended only for the purpose of establishing general feasibility. They do not replace engineering or field coordination by the contractor for the Work.

D. Provide all parts and equipment for a complete and operational system for the Work of Division 28 as described herein and shown on the drawings.

E. Furnish and install all trenching and backfill, duct banks, conduits, raceways, sleeves, boxes, gutters, shelves, enclosures, shelf and enclosure supports, backboards, pull ropes (in unused or spare conduits) required to make all systems fully operational, including components not shown on the Drawings, but necessary for fully operational systems.

F. Furnish, install, terminate, test, dress, and identify all wire and cable required to make systems fully operational, including all wire and cabling not shown on the Drawings, but necessary for fully operational systems.

G. Recognize that the Work entails integration between individual systems, as well as the design and implementation of many system and component interfaces. Take full responsibility for the complete design, installation, and performance of the total integrated system, including integration between systems and various interfaces, in order to achieve the specified operational features and system performance requirements.

H. Fully test the systems, demonstrate their satisfactory operation, and train maintenance and operating personnel, as specified in this Section and the Sections governed by this Section.

1.06 COORDINATION

A. Coordinate with the Owner and all other trades as required to ensure that the entire Work of this Project will be carried out in an orderly, complete, and coordinated fashion.

B. Coordinate installation of lighting and ventilation in all equipment rooms and control stations to avoid any possible interference and to enhance system function.

C. Coordinate with the Work of all applicable Divisions and Drawings for the required electrical and mechanical control interfaces to the work of this section.

D. If applicable, provide coordination drawings of security device plate mounting templates and internal frame conduits to the hollow metal frame manufacturer/supplier to facilitate frame preparation for electronic devices. Rework all frames for which device mounting has not been coordinated at Contractor's expenses.

E. If applicable, obtain product data and wiring schematic information from the Division 8 and 11 Contractors/manufacturers for all approved locking and door monitoring hardware. Coordinate with the Contractors to properly wire, terminate and test all electrically controlled and monitored door/gate hardware.

1.07 QUALITY ASSURANCE

A. Division 28 requires contractors with similar work experience and specific licenses and certifications to perform the work of this section. Contractors must be certified or licensed at the time of bid where Manufacture certification or licensure is required. Required licenses and certifications shall be submitted the contractor's bid package.

B. The Division 28 contractor shall have had experience in the design and installation of similar systems of similar project sizes and similar integration as this project to be considered qualified.

C. The Contractor shall be responsible for all costs incurred including costs incurred by the Owner and its representatives for failure to provide the experience and key personnel as specified.

1. Deductive change orders may be issued as a result of the failure to properly engineer the work prior to construction or improperly installed work that results in costs incurred to the Owner. Examples of incurred costs are rejection of submittals for failure to follow specifications or failure to properly engineer the work; re-inspection of rejected work.

D. The Division 28 contractor shall maintain a local service center with qualified service technicians for the duration of the Warranty.

E. The Division 28 Contractor shall have an active C-7 or C-10 contractor's license, as required by the project scope, issued by the State of California.

F. Key Project Personnel must have work experience with projects of similar size and complexity. Systems experience shall be demonstrated for the Key Project Personnel. Résumés of prospective key personal shall be submitted within 30 days of contract award.

1. Project Manager Qualifications
   a. Five years' experience with projects of similar size and complexity.
2. The approved Project Manager shall represent the Contractor at all times in all project matters and shall be responsible for the administrative work including but not limited to, the following:
   a. Representation at all project meetings.
   b. Progress schedule and progress reporting.
   c. Payment schedule of values and pay requests.
   d. Representation and management of all employees and sub-contractors.
   e. Conduction of on-site performance and acceptance testing.
3. The approved Project Engineer shall be qualified and shall be responsible for technical work including but not limited to, the following:
   a. Preparation and signature of all engineering, shop drawings, and product data submittals.
   b. System fabrication, field installation work, and testing.
4. Consider all qualification and experience materials submitted as binding. Obtain the Owner's approval in writing prior to any deviations from the minimum requirements in organization, personnel, work plan, quality control plan, procurement plan or other declaration within the qualification submittal. Key project personnel substituted prior to or during the Work must meet the specification requirements and obtain the Owner's approval.

G. Regulatory Requirements and Standards:

1. Obtain and pay for all permits and inspections required by all legal authorities and agencies having jurisdiction for the Work. The certificates of all such permits and inspections shall be delivered to the Owner.

1.08 SUBMITTALS

A. Submit under provisions of Division 1, Submittals.

B. Contractor is advised that approval or acceptance of product data or shop drawing submittals does not release the contractor from providing all necessary documentation per submittal requirements, nor does it obviate contractor from additional design and coordination throughout the project.

C. Work Plan

1. Submit a work plan for all work to be performed in the existing facility within 15 days of the Notice to Proceed.

D. CPM Schedule

1. Submit a Critical Path Method Schedule within 30 days of the Notice to Proceed.
2. At a minimum show tasks by area such as by building, by floor or other appropriate designations.
3. Include tasks that are not part of the work of this section but that may affect this section such as work by other trades or contractors or Owner review time.
4. Include tasks that are not part of the work of this section but that may affect this section such as work by other trades or contractors or Owner review time.

E. Submittal Matrix

1. Prepare a matrix of submittals by type vs. section of all submittals to be made by the Division 28 contractor within 30 days of the Notice to Proceed.
2. Utilize the list of required submittals listed at the end of this section as a starting point. Add columns for expected delivery dates and each specification section. If a listed submittal is not required for a specific section, indicate such with an "N/A" or other means in the column and row cross point.

F. Schedule of Values

1. Submit a Schedule of Values (SOV) based on the CPM schedule and Submittal Matrix that reflect the value of the systems and installation of work for this Division.
2. That approved SOV will be used as a basis for progress payments.

G. Product Data:

1. Product data is required for all materials and equipment. Include complete bill of materials for each section with the product data submittal.
2. Cross-reference submitted items to the Specifications using their related sections and paragraph numbers.
3. Submit complete product data for the all system components in a single, bound submittal of one or more volumes. Provide a table of contents and labeled divider tabs for each section. Partial submittals for individual sections will be returned without review.
4. Include descriptive literature, catalog cuts, illustrations, schematics, technical data sheets, and test data necessary for the Owner's Representative to ascertain that proposed equipment and materials comply with specification requirements. Include manufacturer's name, model, catalog or part numbers. Catalog cuts shall be legible and shall clearly identify equipment being submitted.
5. Include required calculations, I/O points lists, system zone schedules, and other tabular data as necessary to clarify system sizing and configuration. Do not, however, consider such submittals as a substitute for complete shop drawings.
6. Disclosure of Product Deviations: Specifically identify and tabulate any and all deviations from the contract documents including all system functions and features. Reference the corresponding specification sections and paragraph/article numbers. All variances and deviations will be reviewed for acceptance or rejection. It will be the Contractor's sole responsibilities to comply with all other contract requirements not revealed in the disclosure of product deviations.

H. Shop Drawings:

1. Shop drawings are required for all systems and component assemblies.

2. AutoCAD ".dwg" files of the Contract Drawings may be made available upon request. These files may be used as a first step in the preparation of shop drawings. Do not consider the drawing plots from such files as a substitute for the shop drawings that are to be prepared by the contractor.
3. Shop drawings will not be accepted or considered unless they are submitted as a complete package for each specification section. Partial submittals covering less than a whole system or with incomplete interfaces to other systems will be rejected.
4. Standard manufacturer's drawings may not be used as shop drawings unless specifically modified for use on this project.
5. Each drawing requires a unique drawing number and revision level. Revisions shall per be dated and referenced per submittal number. Delta numbers and clouds on the drawings shall be used in all instances where changes have been made to the pervious submittal.
6. At a minimum, include the following shop drawings:
    a. Floor Plans: Scaled drawings showing equipment and device locations in plan view. Include wire and cable types and quantities, raceway sizing and routing. Routing information shall indicate where rated assemblies are penetrated. Separate into as many plan series as needed to prevent overlapping information. These drawings shall be fully coordinated with other trades prior to submittal. Show relationships to adjacent surrounding structures.
    b. Equipment and Control Room Plans and Elevations: Scaled, dimensioned drawings showing security equipment layouts in security equipment rooms, electrical/security closets, and control rooms. Include electrical J-boxes and receptacles, power, conduit sizing and routing, metal gutters, wiring ducts, cable trays, and supports. Indicate all other non-security cabinets, enclosures, and equipment within the room. All constraints and clearance requirements shall be shown in dimensioned drawings.
    c. Cabinet, Enclosure, and Rack Elevations: Scaled, dimensioned drawings for each system equipment cabinet, enclosure, and rack showing component and equipment mounting, wire and cable routing and separation, connector and terminal block locations and labeling, and all necessary fabrication details.
    d. System Block Diagrams: Single line block diagrams showing the general relationship between system components and the interconnection between systems. Use these drawings as a reference for the Single line diagrams and point-to-point diagrams by cross-referencing the shop drawing number of those diagrams on these drawings.
    e. Single Line Diagrams: Interconnection diagrams for the riser and trunk wiring between equipment cabinets, enclosures racks and major components. Use the same equipment designations as the floor plans and block diagrams.
    f. Point-to-Point Diagrams: Drawings which show the wiring of each component or device of each individual system. Include details of power supply, grounding, shielding, shield grounding, surge protection, fusing, connector pin-outs, terminal assignments, and similar wiring and connection details. Use the same component and device designations as the floor plans and other shop drawings.
    g. Device Installation Diagrams: Details which show the installation and wiring termination of each field device in each individual system. Include settings for dipswitches, jumpers, addresses, port assignments, etc. of all devices.
    h. All other shop drawings necessary to install, fabricate, locate, identify, test, service, and repair the systems provided.

7. Shop drawings approved by the Owner's Representative OR by the Consultant Engineer is not a release from Contract requirements as defined by the Drawings, Specifications, and governing codes and regulations.

I. Samples:

1. Field Samples:
   a. Wires and Cables: Submit a one (1) foot sample length of each wire and cable type to be used with the cable identification clearly shown.
   b. Submit all required samples along with the product data submittal for review and approval prior to installation.
   c. If all wire samples cannot be submitted at the same time, submit samples with a complete list of all cables to be used noting samples which have been submitted. Update the list with each subsequent sample submittal.
2. Devices/Equipment:
   a. If required by Owner, submit sample assemblies of each of the following devices or equipment along with the product data submittal for review and approval by the Owner's Representative:
      1) Substituted products if requested by Owner.
      2) Custom component, board, equipment or assembly.
3. Disposition: Submitted samples become property of the Owner and will not be returned.
4. Approval of any custom or modified assemblies shall be required. Submit technical information with samples.

J. Test Procedures:

1. Initial Performance Testing: Submit test procedures, forms, and checklists for point-by-point testing. Include a listing for each individual system, each control station and control panel, each equipment room, and each major system component. At a minimum, forms shall include columns for operational/non-operational status, remarks, workmanship, and date corrected. Submit a sample format for approval by the Owner's Representative a minimum of 20 days prior to testing.
2. Performance Verification Testing: Submit test forms which are identical to or similar to the accepted Initial Performance Testing forms. Obtain approval from the Owner's Representative for any changes in test procedure or forms.

K. Test Results:

1. Performance Verification Testing: Submit completed test results prior to or with the request to have the project declared substantially complete by the Owner.

L. Record (As-Built) Documents:

1. Maintain a current record set of as-built drawings on the job and as construction and installation progress, show the actual installed location of all items, material, and equipment.
2. Accurately record actual routing of all conduits including sizes and types.
3. The as-built drawings shall be available to the Owner's Representative for review and will be required for evaluation of progress payments.

4. Submit as-built shop drawings created from the approved shop drawings and updated from the site as-built drawing set and any other drawings required to depict the as-built conditions of the installed work.

M. Operational Manuals:

1. Submit the required quantity of identical manuals, which shall contain the Theory of Operation, start up, shut down and emergency procedures, and the manufacturer's operating instructions.
2. Subdivide the manual by section with tab dividers. Provide a table of contents which identifies each section and the contents therein.
3. Submit an electronic copy.

N. Maintenance Manuals:

1. Submit a complete set of maintenance documents as described in this Section. For documents of sizes greater than 11 x 17 inches, prints and electronic copy shall be furnished.
2. Manuals shall include the following as a minimum requirement:
   a. Technical system description.
   b. System schematics.
   c. Detailed wiring diagrams to identify cabling, termination, and routing.
   d. Panel assembly drawings to identify location of components, terminal strips, and equipment as required to correlate with system drawings.
   e. Descriptions and drawings as required to maintain equipment from the board to the component level.
   f. Description of software and user programmable functions. Procedures for user programmable functions shall be included.
   g. A complete electronic copy of each unique system program.
3. For systems where the program resides on electronic media or other similar storage medium, furnish a copy of the media, or similar medium, to the Owner's Representative.
4. Where multiple systems are combined into a single integrated system, documentation shall include a description of the integrated system and the details of the interfaces between systems.
5. Provide a list of current telephone numbers and addresses of all material vendors and equipment manufacturers who have supplied components in this Project. Include separate service telephone list and purchasing telephone list cross-referencing with each component.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Protect all materials and equipment from damage during storage at the site and throughout the construction period. Protect equipment and materials during shipment and storage against physical damage, dirt, dust, moisture, cold, rain, and any foreign substances that may damage the equipment.

B. Prevent damage from rain, dirt, sun and ground water by storing the equipment on elevated supports and covering them on all sides with securely fastened protective rigid or flexible waterproof coverings.

C. Protect conduit by storing it on elevated supports and capping the ends with suitable closure material to prevent dirt accumulation.

D. Protect all fabricated and/or installed materials and equipment against dust, dirt, moisture, physical damage, metal debris, and any foreign substances that may damage the equipment.

E. Protect painted surfaces with removable heavy Kraft paper, sheet vinyl or equal, installed at the factory and removed prior to final inspection.

1. Replace equipment determined by the Owner's Representative to be damaged. Repaint and finish damaged paint on equipment and materials with the same quality of paint and workmanship used by manufacturer so that repaired areas are not obvious.

1.10 SITE CONDITIONS

A. Site Investigation

1. Prior to commencement of work, the Contractor shall perform a site survey of all related existing systems and submit any potential problems of the design documents that may increase the installation cost of the project.
2. Survey all locations where work is to be performed and verify existing conditions prior to shop drawing submittals.

B. Coordination with Security Personnel

1. The owner will assign a contact person for the contractor to coordinate day to day activities and access into areas. Coordinate all system interruptions and scheduled down time with the contact person.

C. Security Requirements

1. Any special security requirements will be provided by the Owner. See Division 1.

1.11 SEQUENCING AND SCHEDULING

A. General Requirements:

1. Do not begin the project without the Owner's acceptance of proposed key project personnel for the Division 28 Work.
2. Prepare, review, and coordinate with the Owner's Representative an approved construction (CPM) work schedule. Schedule work in areas and at times that will not interfere with scheduled activities as defined by the Owner's Representative.

3. Provide weekly short term (4-week schedule) updates to Owner's Representative showing day to day progress and impact to occupied areas.
4. Do not procure any equipment without accepted product data submittals. Do not perform any field installation without accepted shop drawings. Do not begin any extensive software development or programming without accepted system, operational narratives, the required Owner's coordination, and user's requirements.
5. Pre-assemble control electronics, control panels, racks, and cabinets off-site as most practical.
6. Install system control equipment, control panels, cabinets, racks, and consoles only after major construction in the area in which they are to be installed has been completed and areas have been cleaned, painted, and sealed.
7. After systems installation and prior to point-by-point performance testing, thoroughly pre-test all devices and device wiring for proper performance. Then, thoroughly pre-test each system function in each state or condition under every operating mode.

B. Coordinate all work in the existing facility with the facility contact person.

1.12 WARRANTY

A. The Contractor is to provide a warranty of the work provided under this contract (including, but not limited to, software, hardware, and peripheral equipment) as a system, including interfaces to work by others for one year from the date of Acceptance of the Work. Specific Division 28 sections may require longer warranty periods. Divisions of work among various suppliers, vendors, installers, subcontractors, and other parties will not be recognized or accepted.

B. Extended Warranty: Provide itemized pricing for an Extended Service and Warranty for years 1, 2, and 3 after the initial warranty period. Describe whether all parts and labor are included in this offering.

C. Guarantee to repair and replace defective materials or workmanship during the warranty period including labor and materials.

D. An emergency maintenance (Warranty) request shall be defined as a system or portion of a system failure that affects building safety, security, and operation of critical components, including any access controlled door, which by failing, prevents entry into a building space through other means or direction. Failure of a single component (i.e., duress button, access controlled door which does not prevent access to a space through other means or direction, camera, or monitor) is not considered an emergency maintenance request.

E. Respond within four hours to an emergency maintenance request. Provide a twenty-four hour telephone contact number (24 hours per day, 365 days per year). Service response time is defined as the period between the placing of a service request and the arrival of a qualified technician capable servicing the problem on-site.

F. Maintain a sufficient parts inventory within 50 miles of the project during the warranty period to meet the guaranteed system repair times.

G. Repair and make operational any defective materials or workmanship resulting from an emergency maintenance request within an 8-hour period from the time of the initial arrival of service personnel at the site. Correct non-emergency defective materials or workmanship within four (4) calendar days of receiving notice of the defect.

H. Where the equipment manufacturer's warranty covers a longer time period than that required by these Specifications, the manufacturer's warranty shall govern.

1.13 EXTRA MATERIALS

A. Prior to Acceptance of the Work, deliver to the Owner all spare parts and extra materials required in each Section. All spare parts and extra materials shall be brand new in their original shipping boxes or packages and shall have one year material warranty remaining at the time of delivery. Extra materials shall be available to the Contractor to use as immediate replacements during the warranty period. All extra materials used for the warranty requirements shall be replaced by the Contractor.

B. Special Tools:

1. Provide three of each type of security screw bits used.
2. Provide minimum of one of any specialty tools used.

PART 2 PRODUCTS

2.01 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Comply with the General and Supplementary Conditions and Division 1 Specifications.

B. The products named in this section and the sections governed by this section establish minimum qualities that substitutions must meet to be considered acceptable. The specified products have

also been used in preparing the drawings and specifications, and therefore establish the basis for equipment sizing, wire and cable design, power consumption, and other design parameters.

C. Substitution requests, if permitted, will be considered only if submitted in strict accordance with the followings:

1. Cross-reference submitted items to the Specifications using their related Section and paragraph number.
2. Submit complete product data, descriptive literature, catalog cuts, illustrations, schematics, technical data sheets, and test data necessary for the Owner's Representative to ascertain that proposed equipment and materials comply with specification requirements. Include manufacturer's name, model, catalog or part numbers. Catalog cuts shall be legible and shall clearly identify equipment being submitted.
3. Disclosure of Product Deviations: Specifically identify and tabulate any and all deviations from the contract documents including all system functions and features. Reference the corresponding specification sections and paragraph/article numbers. All variances and deviations will be reviewed for acceptance or rejection. It will be the Contractor's sole responsibilities to comply with all other contract requirements not revealed in the disclosure of product deviations.

D. The Contractor shall take full responsibility for all design, coordination, and cost associated with substitutions including, but not limited to:

1. Its integration into the total system including physical mounting space, electrical interconnection, signal wiring, power, quality, electromagnetic interference, communication protocols, and similar design considerations.
2. Any additional materials, equipment, components, accessories, items required for equivalent system operation and performance.
3. Any necessary changes to branch power circuits, circuit protective devices, and the Work of other trades.
4. Any modifications to wire, cable, and raceway design.

2.02 MATERIALS AND EQUIPMENT

A. All equipment and materials required for installation under these Specifications shall be new and without blemish or defect.

B. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacturing of such items, for which replacement parts are available. Specifications are prepared long in advance of project construction; the contractor is to use the newest model of the specified products available at bid time.

C. All material and equipment shall be listed, labeled, or certified by Underwriters' Laboratories, Inc., where such standards have been established. Equipment and material which are not covered by UL Standard will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe will be considered, if inspected or tested in accordance with national industrial standards such as NEMA or ANSI.

D. All parts of a system shall be the product of one manufacturer. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer. Constituent parts which are similar shall be the product of a single manufacturer.

E. All components of an assembled unit need not be products of the same manufacturer; however, all components must be acceptable to the Owner's Representative. Components shall be compatible with each other and with the total assembly for the intended service.

2.03 EQUIPMENT MODIFICATIONS:

A. When standard manufactured equipment is modified from its original condition or factory options have been exercised identify the changes as noted below.

1. Clearly identify the modifications on the shop drawings.
2. Clearly identify each piece of modified equipment with a label, which states, "This unit has been modified..." and identify the modification or reference. Locate the label so that a service technician or factory service personal will be able to determine the equipment in use is non-standard and that modifications are required for service, testing and replacement.
3. Identify and describe the modifications on the Record Documents.

B. Equipment modification labels are not required for jumper or switch settings.

2.04 FABRICATION

A. Fabricate enclosures to easily accommodate interconnecting cables entering from above or below through the use of auxiliary gutters, cable trays, and conduits. Protect all metal cabinet edges where conductors cross and conduit ends with protective covering or bushing.

B. Group wires and cables by types, boards and modules, and maintain National Electrical Code clearances throughout the installation, including Class 1, Class 2, communications, and branch

circuit power separations. Maintain sufficient and proper separation between microphone-level audio, line-level audio, high-level audio, and video cables.

C. Uniformly organize equipment and cable routing throughout all enclosures, racks, and cabinets. Provide wiring ducts, raceways, wire posts, D rings, wire saddles to route and secure factory and field wiring. Provide routing for all wiring from point of entry to point of termination to maintain required separation, access to all components, and general organization to the wiring. Neatly dress, route and secure wiring.

D. Mechanically fasten cabinet raceways and cable clamps to enclosure rear panels, rack members, console members, or to other system components. The use of adhesive fasteners (without mechanical fastener) is not permitted. Furnish and install cable support posts where necessary to properly support cables.

E. No splices are permitted in cabinet raceways. Exception: Splice to cable shield when within two inches of cable termination is permitted.

F. Furnish and install metal grounding type outlet strips in each equipment cabinet, enclosure, and rack. Leave a minimum of two unused receptacles at each location for future expansion. Neatly shorten and dress power cords from individual equipment to the outlet strips.

G. Provide protection from accidental contact of all terminals or exposed conductors over 25 volts within enclosures that contain Class 2 wiring. Use non-conductive barriers, heat shrink or other acceptable methods. Tape of any kind is not permitted.

H. Provide an isolated ground bus within each equipment cabinet, enclosure, and rack for single point termination of audio and data shields and grounds.

2.05 SOURCE QUALITY CONTROL

A. Shop Inspections:

1. The Owner's Representative shall have the right at all times to inspect or otherwise evaluate the Work performed or being performed and shall have access to the premises in which the Work is being performed.
2. The Owner's Representative may verify the inspections or re-inspect any item. The Owner reserves the right to reject materials and workmanship found unacceptable during inspections.

B. Shop Test and Demonstration

1. Shop Test and Demonstration shall be a major milestone that shall commence only after all shop assembly, system integration, and software development and programming is complete. Owner's approval of the integrated shop test shall be obtained before any system components are shipped to the site for installation.
2. Perform a point-by-point system demonstration of the Integrated Security System including surveillance system, duress alarm system, physical access control system, and audio announcement system to show all systems functioning and communicating as a single integrated system where required.
3. Notify the Owner a minimum of 15 working days prior to demonstration so that the Owner may witness the demonstration.
4. Conduct the demonstration in strict accordance with the test procedure accepted by the Owner. Demonstrate full compliance with the required operating modes and sequences of operation under all operating modes. Record demonstration/ test results on a report which shall include a list of all personnel witnessing the demonstration, test methods used, and a record of each specific test made.
5. If demonstration results are not in compliance with requirements, make necessary hardware and software changes, corrections, repairs, or adjustments at no additional cost to the Owner. If corrections cannot be made during the scheduled Shop Test and another shop test is required, the Contractor shall pay for all transportation, lodging and expenses of the Owner's representatives' (maximum seven people) attending the additional tests. This process shall continue until the systems are acceptable to the Owner.

2.06 FIRESTOPPING/SEALANT MATERIALS

A. Firestop and seal all penetrations of fire walls with minimum three hour sealant or Fire Stop Putty(FSP). This includes but is not limited to all raceway, conductor, sleeve and cable tray penetrations where penetrating device does not completely seal the hole.

B. Accepted Products: International Protective Coatings Corp. FlameSafe FSP 1100, Nelson FSP, Domtar Fire-Halt, or approved equal from other manufacturers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Carefully inspect the installed Work by other trades and verify that all such Work is complete to the point where installation of the Work of this division may properly commence.

B. In the event of discrepancy, immediately notify the Owner's Representative. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

C. Install all equipment in accordance with all pertinent codes and regulations, the accepted design, and the referenced standards.

3.02 INSTALLATION

A. Equipment Identification:

1. Install a nameplate on each individual equipment rack, enclosure, boxes, cabinet, and significant equipment item.
2. Use identifiers and abbreviations defined in the Drawings whenever possible. Use plan designation for labeling, unless indicated otherwise.
3. Nameplates shall be laminated black phonemic resin with a white core and engraved lettering, a minimum of 1/4" high.
4. Engrave using upper case letters of uniform height; centered on device, cover plate, or enclosure; with all characters made clearly and distinctly.
5. All equipment shall have the manufacturer's name, address, model number and rating on a name plate securely affixed in a conspicuous place. All equipment shall bear labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service.
6. Identify all field terminals and relays with device identification. Lettering shall be 3/16" high minimum.

B. Equipment Installation:

1. Install all equipment in accordance with the manufacturer's recommendations, and accepted shop drawings.
2. Install all equipment in compliance with CEC requirements, NECA's "Standard of Installation", and recognized industry practices.
3. If requested, submit structural and seismic mounting load calculations demonstrating adequate support and bracing for seismic zone 4.
4. Do not attach electrical materials to roof decking, removable or knockout panels, or temporary walls and partitions unless indicated otherwise. Use hangers and other supports to support the equipment and materials, intended for this purpose.
5. Locate equipment as close as practical to the locations shown on the Drawings.
6. Maintain minimum 3-foot working clearances on each side of equipment or equipment racks where access is required to inspect, service or adjust.
7. Check equipment against available mounting space indicated on the drawings. Coordinate location of equipment with existing devices to minimize interference. Bring all conflicts or clearance problems to the attention of the Owner's Representative during the preparation of shop drawings.
8. Where the Owner's Representative determines that equipment installation is not conveniently accessible for operation and maintenance, remove and reinstall equipment in a conveniently accessible manner at no extra cost.

C. Grounding and Shielding:

1. Comply with Section 27 05 26.

D. Surge Suppression:

1. Comply with Section 27 05 26.

3.03 FIELD QUALITY CONTROL

A. Initial Performance Testing:

1. Initial Performance Testing is to be conducted by the Contractor.
2. Point-by-point testing shall include the sequential operation of each system and control function in each of its operating modes. All tests are to be conducted and recorded per the accepted procedure and test forms.
3. Notify the Owner's Representative ten days in advance that this activity will be occurring.

B. Performance Verification Testing:

1. Performance Verification Testing (PVT) is to be conducted by the Contractor and witnessed by the Owner's Representative.
2. Schedule point-by-point PVT only after Initial Testing has been satisfactorily completed and all necessary corrections have been made. Provide the Owner's Representative with a minimum of 10 working days' notice with a request to schedule PVT. Submit Initial Performance Test records prior to the scheduled PVT. Failure to submit test results as specified shall be cause to re-schedule testing.
3. Point-by-point testing shall include the sequential operation of each function in each of its operating modes, in addition to completion of all required performance testing and measurement.
4. Conduct point-by-point PVT testing in the presence of Owner's Representative. Record test results on the accepted test checklist which shall include a list of all personnel witnessing the tests. If test results are not in compliance with requirements, make necessary changes or adjustments at no additional cost, and arrange for another test. This process shall continue until the systems are acceptable to the Owner's Representative.
5. Failure of any part of the system which precludes completion of system testing, which cannot be repaired in four (4) hours, shall be cause for terminating the test. Retesting of the entire system shall be rescheduled at the convenience of the Owner, and Contractor shall bear the Owner's costs to complete retesting.
6. PVT will also include inspections for contract document compliance, codes and standards compliance, and workmanship.

3.04 CLEANING

A. Comply with Division 1 requirements.

B. Protect equipment during installation against entry of foreign matter on the inside. Vacuum clean all equipment both inside and outside before testing, operating and painting. Clean electrical connections with a suitable solvent prior to assembly.

C. Remove from the premises and dispose of all packing material and debris on a daily basis.

D. Upon completion of the Work, remove excess debris, materials, equipment, apparatus, tools and the like and leave the premises clean, neat and orderly.

E. Thoroughly polish all bright metal or plated Work and remove any pasted labels, dirt or stains from the equipment.

3.05 TRAINING

A. Provide on-site, project-specific training sessions for system operations, maintenance, and programming with designated total hours as follows:

	Administrative	Operator
1. Video Surveillance System	8/4/4	4/2/2
2. Access Control System	8/4/4	4/2/2

B. All classroom training is to occur on site at a location provided by the Owner.

C. All training is to review the existing systems as they apply to the equipment and systems provided under this contract. All personnel being trained are expected to have basic experience for the existing systems.

D. Operator Training:

1. Train security staff in the operation of the System. Operational training shall include how to monitor and control the systems provided under this contract and how to respond to system events.

E. Administrator Training:

1. Train Owner's personnel in the site-specific programming and software trouble shooting of the System. Training will also include all user programmable features. Conduct training sessions using instructors who have been actively involved throughout construction and who are certified in writing by the manufacturers of the specific systems.
2. Provide a combination of classroom sessions supported by audio/visual aids, and field sessions with personnel participating in hands-on for programming changes, software uploading/downloading, trouble shooting, etc.
3. Train Owner's personnel in the basic user level maintenance and trouble shooting of the System. Structure training to identify the equipment and systems that can be serviced or reset by the on duty building engineer, how to identify systems that have failed or not working, and emergency shut down procedures.
4. Provide a combination of classroom sessions supported by audio/visual aids, and field sessions with personnel participating in hands-on preventative, corrective maintenance and reactive maintenance.

F. Submit an estimated training schedule 15 days prior to training for approval by the Owner's Representative. Estimate classroom and hands-on hours required for all three types of training (operational, maintenance, and programming). Include a syllabus for each class session. Provide video recording, minimum 720p, of the training sessions on solid-state media.

G. All training materials including Operational and Maintenance (O&M) Manuals shall be reviewed and approved prior to conducting the specific training.

SCHEDULE 280500A

SAMPLE LIST OF DIVISION 28 SUBMITTALS

1. CPM Schedule
2. Submittal Matrix
3. Schedule of Values (SOV)
4. Licenses and certifications
5. Key Project Personnel
6. Product Data
7. Shop Drawings
    a. Floor Plans
    b. Enlarged Control / Equipment Rooms and Elevations
    c. Rack and Cabinet Elevations
    d. Block Diagrams
    e. Single Line Diagrams
    f. Point- to-Point Diagrams
    g. Schematic Diagrams
    h. Installation Diagrams and Details
8. Calculations; UPS, Data
9. Sequence of Operations
10. Samples
11. Test Procedures
12. Test Results
13. Record Documents
    a. Drawings
    b. O&M Manuals
    c. Warranty
14. Extra Materials

SCHEDULE 280500 B

SUMMARY OF REQUIRED LICENSES AND CERTIFICATIONS

This list is provided for the convenience of the Contractor only.

A. Section 28 05 00 Integrated Systems Contractors

1. Key Personnel Degree or equal
2. Local Contractors License
3. Qualifications of licensed electrician performing work onsite.

END OF SECTION

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SECTION 282300

VIDEO SURVEILLANCE SYSTEM

PART 1 GENERAL

1.01 INTENT

A. Note that all cameras on this project for the Center for Leadership Building at CSUF are Owner-Furnished, Owner-Installed (OFOI). The information in this specification is for reference on the intended installed product and its requirements.

B. It is the intent of the Owner to enter into a contract with a qualified contractor to have that contractor procure, provide, install, and make fully operational additions to an existing Electronic Video Surveillance System (EVSS) with operational characteristics and capabilities which meet or exceed the product specification and technical performance parameters contained within this document and shown on the project drawings.

C. This EVSS additions shall be installed in the project as shown on Contract Drawings.

1.02 SUMMARY

A. Section includes a video surveillance system consisting of:

1. Fixed Interior Wall / Ceiling Mount Megapixel Camera
2. Fixed Exterior Wall / Pole Mount Megapixel Camera
3. Genetec Digital Video Recording and Management Software (DVRMS) *Existing, NIC*
4. System Servers *Existing, NIC*
5. System Workstations / Review Monitor *Existing, NIC*
6. Power and Data Cabling, Conduit, and Infrastructure

B. Video surveillance system shall be integrated with systems specified in:

1. Section 28 1300: Physical Access Control System
2. Section 28 1600: Intrusion Detection System

1.03 RELATED SECTIONS

A. Section 28 0500: Common Work Results for Electronic Security Systems

B. Section 28 1300: Physical Access Control System

1.04 ABBREVIATIONS AND ACRONYMS

A. Following abbreviations and acronyms apply to this Section:

1. CPU = Central Processing Unit
2. DVD = Digital Video Disc
3. DVRMS = Digital Video Recording and Management System
4. FPS = Frames per Second
5. GB = Gigabyte
6. GBPS = Gigabyte per Second
7. HDD = Hard Disk Drive
8. HDMI = High-Definition Media Interface
9. IDS = Intrusion Detection System
10. IPS = Images per Second
11. LAN = Local Area Network
12. MB = Megabyte
13. MBPS = Megabyte per Second
14. NAS = Network Attached Storage
15. LED = Light Emitting Diode
16. PACS = Physical Access Control System
17. RAID = Redundant Array of Independent Disks
18. RAM = Random Access Memory
19. SAN = Storage Attached Network
20. TCP/IP = Transport Control Protocol / Internet Protocol
21. UPS = Uninterruptable Power Supply
22. USB = Universal Serial Bus
23. PVT = Performance Verification Testing
24. V-LAN = Virtual Local Area Network
25. VMS = See DVRMS
26. VSS = Video Surveillance System
27. WAN = Wide Area Network

1.05 REFERENCE STANDARDS

A. Following reference standards apply to this Section:

1. National Television System Committee - NTSC (North America)
2. Joint Photographic Experts Group – JPEG
3. Motion Joint Photographic Experts Group - MJPEG
4. Moving Picture Experts Group - MPEG
5. Underwriters Laboratory – UL
6. Federal Communications Commission – FCC
7. Interference Causing Equipment Standard – ICES (Canada)
8. Institute of Electronic and Electrical Engineers - IEEE
9. International Standards Organization – ISO

10. International Electrotechnical Commission -IEC
11. Restriction of Hazardous Substances Directive (RoHS)

1.06 ACTION SUBMITTALS

A. See Section 28 05 00 Common Work Results for Electronic Security Systems

1.07 INFORMATIONAL SUBMITTALS

A. See Section 28 05 00 Common Work Results for Electronic Security Systems

1.08 CLOSEOUT SUBMITTALS

A. See Section 28 05 00 Common Work Results for Electronic Security Systems

1.09 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. Comply with NECA 1.

C. Comply with NFPA 70.

WARRANTY

A. See Section 28 05 00 Common Work Results for Electronic Security Systems

PART 2 PRODUCTS

2.01 QUALITY ASSURANCE

A. Manufacturer of any major component or system installed as a part of this project and not named as a basis of design shall have been in the business of manufacturing such component or system for a minimum of 5 years immediately preceding the date on this document.

B. Any major component or system installed as a part of this contract and not named as a basis of design shall have been installed in a minimum of 3 successfully completed projects of a similar

size and scope. Contractor shall supply reference information with their proposal including project name, project location, and contact information for the system end-user.

2.02 BASIS OF DESIGN

A. Where a specific manufacturer's product is listed below, such product's performance characteristics and capabilities constitute the minimum acceptable, and any suggested alternates shall have characteristics and capabilities which meet or exceed the product named as the basis of design. Contractor may propose alternate products as follows:

1. See Section 28 0500 Common Work Results for Electronic Security Systems

2.03 EVSS BASIS OF DESIGN TECHNICAL PERFORMANCE SPECIFICATIONS

A. All cameras shall be by Avigilon.

1. Substitutions are not permitted.
2. Individual camera part numbers and mounting type are per camera schedule.

2.04 POWER SUPPLIES

A. All system components to be connected to a UPS providing a minimum of 4 hours back-up power.

PART 3 EXECUTION

3.01 QUALITY ASSURANCE

A. Contractor shall be a factory authorized reseller / installer of all major components installed as a part of this project. Proof of such authorization shall be submitted as a part of the bid package

B. Contractor shall hold licenses as required by local, state, or federal agencies.

C. Contractor shall have successfully completed a minimum of 3 projects similar in size and scope to this one and shall submit references for such projects with their bid package. Reference shall include project name, location, type of facility, system(s) installed, and end-user contact information. It is expected that substantially the same personnel will be assigned to this project as participated in the referenced projects. This would include the project engineer, project manager, and lead installation technician. If any of these personnel were not involved in the

referenced project, Contractor shall supply resumes for these employees documenting their experience and qualifications related to this project.

D. At a minimum, the lead installation technician assigned to this project shall be manufacturer certified in the installation of all major components installed as a part of this project.

3.02 SITE SPECIFIC SCOPES OF WORK

A. Contractor shall provide and install video surveillance cameras as shown on the project drawings. Include all associated cabling, conduit, and any other item required to render cameras fully operational. Contractor shall coordinate with LBCC to integrate surveillance cameras installed as a part of this project with the existing District-wide Genetec Video Management System.

3.03 EXAMINATION

A. Examine pathway elements intended for EVSS cabling. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation and / or operation, and other conditions affecting installation.

B. Examine roughing-in for all components before device installation.

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

3.04 WIRING

A. Comply with requirements in Section 26 05 33 "Raceways and Boxes for Electrical Systems."

B. Wiring Method: Install cables in raceways and or conduit unless otherwise indicated.

1. Except raceways are not required in accessible indoor ceiling spaces and attics, where Contractor shall utilize self-supported J-hooks.
2. Except raceways are not required in hollow gypsum board partitions.
3. Conceal raceways and wiring except in unfinished spaces.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical

connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

E. For LAN connection and fiber-optic and copper communication wiring, comply with:

1. Section 27 13 13 "Communications Copper Backbone Cabling"
2. Section 27 13 23 "Communications Optical Fiber Backbone Cabling"
3. Section 27 13 33 "Communications Coaxial Backbone Cabling
4. Section 27 15 00 "Communications Horizontal Cabling."

F. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.05 ELECTRONIC VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. EVSS device locations shown on drawings are approximate, and Contractor shall verify final position with the Owner before any work is done.

B. Install all EVSS components per manufacturer’s installation instructions.

C. Install control panel at location as directed by the Owner.

D. Install key locks on all enclosures

E. Identify system components, wiring, cabling, and terminals according to Section 26 05 53 "Identification for Electrical Systems."

3.06 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. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Prepare IDS equipment for acceptance and operational testing as follows:
    a. Prepare equipment list described in "Informational Submittals" Article.
    b. Verify operation of all cameras.
    c. Verify proper recording and playback functionality.
    d. Verify proper operation of workstation with EVSS headend / software for logging alerts and events.

e. Verify all integration functionality with Access Control and Intrusion Detection Systems.

3. Performance Verification Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 14 working days' notice of test schedule.
   a. Contractor shall prepare and submit to the Owner a PVT plan showing a structured and complete testing procedure. This PVT plan shall be submitted to the Owner a minimum of 14 working days prior to planned start of testing.
   b. PVT plan shall show equipment being tested, means of testing, and pass/fail criteria.
   c. PVT form shall include space for Contractor / Owner initials on each testing phase, along with a signature page with PVT results and follow-up notes.
4. Should any component of the system fail TWO (2) consecutive PVT tests, the Contractor shall be liable for costs incurred by the Owner to provide personnel for further PVT testing.

C. Electronic video surveillance system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.07 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to TWO (2) visits to Project during normal business hours for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of cameras and VMS
3. Check proper operation of all integration driven functionalities.

3.08 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean EVSS components as needed.

3.09 TRAINING

A. See Section 28 05 00 Common Work Results for Electronic Security Systems

END OF SECTION

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SECTION 28 31 00
DIGITAL ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This specification provides the minimum requirements for the Life Safety System. The work provided shall include, but not limited to furnishing all permits, equipment, materials, delivery, labor, documentation, testing and services necessary to design and furnish and install a complete, operational system Fire Alarm System.

B. At the time of bid, all exceptions taken to these Specifications, all variances from these Specification and all substitutions of operating capabilities or equipment called for in these Specification shall be listed in writing and forwarded to the Engineer. Any such exception, variances or substitutions that were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment.

1.2 RELATED DOCUMENTS:

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

1.3 REFERENCES

A. All work and materials shall conform to all applicable Federal, State and local codes and regulations governing the installation.

B. Fire alarm system, equipment, installation, and wiring materials and methods used shall comply with the following codes and standards:

1. System components proposed in this specification shall be UL listed for its intended use.
    a. UL 864 (9th Edition) Control Units for Fire-Protective Signaling Systems (UOJZ)
    b. UL 268 Smoke Detector for Fire Protective Signaling Systems
    c. UL 268A Smoke Detectors for Duct Applications
    d. UL 521 Heat Detectors for Fire Protective Signaling Systems
    e. UL 464 Audible Signaling Appliances
    f. UL 1971 Signaling Devices for the Hearing Impaired
    g. UL 38 Manually Actuated Signaling Boxes
    h. UL 1481 Power Supplies for Fire Protective Signaling Systems
    i. UL-1638 Signaling Appliances – Private Mode Emergency and General Utility Signaling
2. California State Listings as follows.
    a. California State Fire Marshall (CSFM) Listed
3. California Adopted Codes references as follows.
    a. 2022 California Building Code
    b. 2022 California Fire Code

c. 2022 California Mechanical Code

d. 2022 California Electrical Code

e. NFPA 72 - 2022 National Fire Alarm Code®, As amended by CA code

f. Americans with Disabilities Act (ADA)

1.4 SYSTEM DESCRIPTION

A. The System supplied under this specification shall utilize node-to-node, direct wired, multi priority peer-to-peer network operations. The system shall utilize independently addressed, input/output modules as described in this specification. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote control panels, and LCD panels. Each panel shall be an equal, active functional member of the network, which is capable of making all local decisions and generating network tasks to other panels in the event of panel failure or communications failure between panels. Master/slave system configurations shall not be considered as equals.

1.5 PERFORMANCE REQUIREMENTS

A. Every new device shall be compatible with the existing Edwards fire alarm control panel.

B. The scope of work shall consist of the following minimum requirements.

1. Initiating Devices

a. All initiating devices shall be new addressable devices as specified. Any conventional initiating devices utilized shall have individual addressable monitor modules provided for each conventional device for unique addressing and annunciation.

b. Smoke detectors shall be added as follows.

1) All Mechanical, Electrical, Telephone, Elevator, Transformer or similar room.

2) At each interior elevator lobby.

3) Magnetically held open or automatic-closing doors.

4) Smoke and combination Smoke/Fire Dampers.

a) Duct smoke detectors not required for dampers where the entire space served by the smoke damper is protected by a system of area smoke detectors.

5) Above each fire alarm control panel or booster power supply.

6) Beam pockets shall be covered as needed in order to meet current code requirements.

c. Manual pull stations shall be added as follows.

1) At all exits from the building.

2) At every exit from every level

3) At each elevator lobby if required by AHJ.

d. Heat Detectors shall be added as follows.

1) Elevator Machine Rooms

2) Elevator Shafts if required per code.

3) Non-Residential Kitchens with smoke producing equipment.

4) Trash Rooms

5) Near shower rooms or other areas that produce steam.

e. Sprinkler tamper and waterflow switches shall be individually monitored.

f. Provide one (1) supervisory module circuit for each sprinkler valve supervisory and waterflow switch.

g. Tamper switches in fire pump room only may be grouped together as allowed per coded.

2. Notifications Devices

a. Fire alarm speakers shall be added as follows.

b. Shall be added throughout public and private spaces to achieve 15db above ambient as needed to meet current code requirements.

c. Fire Alarm Strobes shall be added in public use areas and common use areas including but not limited to:

d. Sanitary facilities including restrooms, bathrooms and shower rooms.

e. Corridors.

f. Multipurpose Rooms.

g. Occupational shops.

h. Occupied Rooms where Ambient Noise Impairs Hearing of the Fire Alarm.

i. Lobbies.

j. Meeting Rooms.

k. Classrooms.

l. Any other area for common use.

m. Additional strobes shall be added in ADA rooms as needed.

n. Sized Per ADA coverage and NFPA72

o. Combination Audible/Visual appliances may be used as needed.

p. Areas having more than 2 strobes in the field of view shall be synchronized

3. Booster Power Supplies shall be distributed throughout the facility to provide the power necessary for all indicating devices. Power Supplies shall be initiated by Synchronized Signal Modules. Synchronization by means of a common pair of wires chaining power supplies shall not an acceptable means of synchronization between units.

4. Fan and Damper control as follows.

a. Interface and provide air-handling systems shutdown control. An addressable control relay shall be provided for each air handler unit.

b. Interface and provide non-managed smoke damper shutdown. Provide addressable control relays at each electrical panel where smoke dampers are powered.

5. Elevator Interface Cabinet

a. Provide red metal cabinet enclosure with word FIRE in white letters on the cover. Inside will be four intelligent relays (Primary Recall, Alternate Recall, Fire Hat and

Shunt Trip), one monitor input (Shunt Trip AC Power Supervision) and 120vac relay (Shunt Trip AC Power Supv).

6. Other device/controls shall be added as follows.
    a. Interface with any door lock\card accesses release circuits. An addressable control relay shall be provided at each lock location obstructing the emergency exit path. Stairwell door locks may have one common control.
    b. Provide and Interface with magnetic door holder release circuits including WON doors. Provide addressable control relays as required.
    c. Magnetic door holders shall be provided as part of this section at elevator lobby doors and all cross-corridor doors and as required per code.

C. Demolition
1. Remove all devices indicated on drawings during the demo phase. Devices shall be handed over to the owner. All addressable devices removed in the demo area shall be programmed out of the system.
2. All conduit and boxes not required shall be removed as indicated on the drawings.
3. Any spare device wiring shall be terminated at the nearest fire alarm terminal cabinet and labeled.

1.6 SEQUENCE OF OPERATIONS

A. General Alarm Operation: Upon alarm activation of any area smoke detector, duct smoke detector, heat detector, manual pull station, sprinkler waterflow, the following functions shall automatically occur:
1. The internal audible device shall sound at the control panel, annunciator or command center.
2. The LCD Display shall indicate all applicable information associated with the alarm condition including zone, device type, device location and time/date.
3. All system activity/events shall be documented on the system printer.
4. Any remote or local annunciator LCD/LED's associated with the alarm zone shall be illuminated.
5. The following notification signals and actions shall occur simultaneously:
    a. An evacuation signal shall be sounded on fire floors (zones). The signal shall be a Temporal 3 tone.
    b. Activate visual strobes on the fire floors (zones). The visual strobe shall stop operating when the "Alarm Silence" is pressed.
6. Transmit signal to the building automation system (if applicable) and/or shutdown all HVAC units serving the floor of alarm.
7. Transmit signal to the central station with point identification.
8. Activate automatic smoke control sequences (if applicable).
9. All stairwell/exit doors shall unlock throughout the building.
10. All self-closing fire/smoke doors held open shall be released.

11. All automatic events programmed to the alarm point shall be executed and the associated outputs activated.

B. Elevator Lobby / Equipment Room Detectors: Upon alarm activation of any elevator lobby smoke detector or equipment room detector the following functions shall automatically occur:
   1. Perform general alarm sequence above.
   2. Elevator Lobby smoke detectors shall recall the elevators to primary floor
   3. Elevator Lobby smoke detectors located on the primary recall floor shall recall the elevator the alternate floor.
   4. Equipment room smoke detectors shall recall the elevator to the primary floor.
   5. Activation of the Equipment room heat detector shall initiate the shunt trip in the associated elevator equipment room.

C. Supervisory Operation: Upon supervisory activation of any sprinkler valve supervisory switch, fire pump off-normal, clean agent fire suppression system trouble, the following functions shall automatically occur:
   1. The internal audible device shall sound at the control panel, annunciator or command center.
   2. The LCD display shall indicate all applicable information associated with the supervisory condition including; zone, device type, device location and time/date.
   3. All system activity/events shall be documented on the system printer.
   4. Any remote or local annunciator LCD/LED's associated with the supervisory zone shall be illuminated.
   5. Transmit signal to the central station with point identification.

D. Trouble Operation: Upon activation of a trouble condition or signal from any device on the system, the following functions shall automatically occur:
   1. The internal audible device shall sound at the control panel, annunciator or command center.
   2. The LCD keypad display shall indicate all applicable information associated with the trouble condition including; zone, device type, device location and time/date.
   3. All system activity/events shall be documented on the system printer.
   4. Any remote or local annunciator LCD/LED's associated with the trouble zone shall be illuminated.
   5. Transmit signal to the central station with point identification.

E. Monitor Activation: Upon activation of any device connected to a monitor circuit (fire pump/emergency generator status), the following functions shall automatically occur:
   1. The LCD display shall indicate all applicable information associated with the status condition including; zone, device type, device location and time/date.
   2. All system activity/events shall be documented on the system printer.
   3. Any remote or local annunciator LCD/LED's associated with the status zone shall be illuminated.

1.7 SYSTEM DESIGN PARAMETERS

A. Standby power

1. The standby power supply shall be an electrical battery with capacity to operate the system under maximum supervisory load for twenty four (24) hours and capable of operating the system for fifteen (15) minutes of evacuation alarm on all devices, operating at maximum load. The system shall include a charging circuit to automatically maintain the electrical charge of the battery. The system shall automatically adjust the charging of the battery to compensate for temperature.

B. Voltage Drop

1. Under all operating conditions, the voltage on the NAC must be sufficient to operate all the notification appliances so that they deliver the proper signal intensity. The worst case operating condition shall be calculated from when the control units primary powers supply has failed and the battery capacity is at its lowest point. An end of useful battery life starting value of 20.4 Volts shall be used at the starting voltage unless the manufacturer's instructions indicate that a higher or lower value should be used. The current draw of an appliance at the minimum listed operating voltage (16 Volts) should be used.

2. The point-to-point Ohm's Law voltage drop calculations of all alarm system circuits shall not exceed

C. Spare Capacity

1. The system shall be engineered to accommodate 20% spare capacity on each individual loop, and 20% spare on system power supplies.

D. Circuiting Guidelines

1. Initiating Device Circuits

a. Where necessary, conventional initiating device circuits (i.e. waterflow switches, valve supervisory switches, fire pump functions, etc.) shall be Class B (Style "B").

2. Notification Appliance Circuits

a. All notification appliance circuits shall be Class B (Style "Y"). The notification circuits shall be power limited. Non-power limited circuits are not acceptable.

3. Signaling Line Circuits: Addressable Analog Devices

a. The signaling line circuit connecting to addressable/analog devices including, detectors, monitor modules, control modules, isolation modules, intrusion detection modules and notification circuit modules shall be Class B (style 4).

b. Each addressable analog loop shall be circuited so device loading is not to exceed 80% of loop capacity in order to leave for space for future devices.

4. Signaling Line Circuits: Data & Audio for FACP & Annunciator Network

a. The signaling line circuit connecting network panel/nodes, annunciators, command centers, shall be Class A (style 7). The media shall be copper except where fiber optic cable is specified on the drawings.

1.8 SUBMITTALS – FOR REVIEW/APPROVAL

A. General

1. It is the responsibility of the contractor to meet the entire intent and functional performance detailed in these specifications.
2. The proposed equipment shall be subject to the approval of the Architect/Engineer/Owner.
3. Approved submittals shall only allow the contractor to proceed with the installation and shall not be construed to mean that the contractor has satisfied the requirements of these specifications.

B. Product Data

1. Provide list of all types of equipment and components provided. This shall be incorporated as part of a Table of Contents, which will also indicate the manufacturer's part number, the description of the part, and the part number of the manufacturer's product datasheet on which the information can be found.
2. Provide manufacturer's ORIGINAL printed data sheets with the printed logo or trademark of the manufacturer for all equipment. Photocopied and/or illegible product data sheets shall not be acceptable.
3. Indicated in the documentation will be the type, size, rating, style, and catalog number for all items proposed to meet the system performance detailed in this specification.
4. CSFM listing sheet for each component

C. Shop Drawings

1. A complete set of shop drawings shall be supplied. The shop drawings shall be reproduced electronically in digital format. This package shall include but not be limited to:
    a. All drawings and diagrams shall include the contractor's title block, complete with drawing title, contractor's name, address, date including revisions, and preparer's and reviewer's initials
    b. Complete system bill of material with peripheral device backbox size information, part numbers, device mounting height information
    c. Detailed system operational description. Any Specification differences and deviations shall be clearly noted and marked.
    d. A riser diagram that individually depicts all control panels, annunciators, addressable devices and notification appliances. Field addressable devices and notification appliances may be grouped together by specific type per loop or circuit if allowed by AHJ.
    e. Complete 1/8" = 1'-0 scale floor plan drawing locating all system devices and elevation of all equipment at the Fire Command Station. Floor plans shall indicate accurate locations for all control and peripheral devices as well as raceway size and routing, junction boxes, and conductor size, and quantity in each raceway. All notification appliances shall be provided with a candela rating and circuit address that corresponds to that depicted on the Riser Diagram. If individual floors need to be segmented to accommodate the 1/8" scale requirements, KEY PLANS and BREAK-LINES shall be provided on the plans in an orderly and professional manner. End-of-line resistors (and values) shall be depicted.

f. All drawings shall be reviewed and signed off by an individual having a minimum of a NICET 3 certification in fire protection engineering technology, subfield of fire alarm systems.

g. Control panel wiring and interconnection schematics. The drawing(s) shall depict internal component placement and all internal and field termination points. Drawing shall provide a detail indicating where conduit penetrations shall be made, so as to avoid conflicts with internally mounted batteries. For each additional data-gathering panel, a separate control panel drawing shall be provided, which clearly indicated the designation, service and location of the control enclosure.

h. Complete calculations shall clearly indicate the quantity of devices, the device part numbers, the supervisory current draw, the alarm current draw, totals for all categories, and the calculated battery requirements. Battery calculations shall also reflect all control panel component, remote annunciator, and auxiliary relay current draws.

i. System (Load & Battery) calculations shall be provided for each system power supply, each notification appliance circuit and each auxiliary control circuit that draws power from any system power supply.

j. Any additional requirements if required by AHJ for approval.

D. General Submittal Requirements

1. Installer's NICET 3 Certification
2. Letter or Certificate from the fire alarm manufacturer stating that the fire alarm contractor is an authorized distributor of the specified product.
3. Submit a copy of the system supplier's training certification for the specified product issued by the manufacturer of the integrated life safety system.
4. Equipment submittals and other documentation shall be incorporated bound with the information indexed and tabbed for quick reference.

1.9 CLOSEOUT SUBMITTALS

A. Minimum two (2) copies of the closeout documents shall be delivered to the building owner's representative at the time of system acceptance.

B. Provide the name, address and telephone of the authorized factory representative.

C. As-Built Drawings

1. Drawings consisting of: a scaled plan of each building showing the placement of each individual item of the Integrated Life Safety System equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.
2. All drawings must reflect point to point wiring, device address and programmed characteristics as verified in the presence of the engineer and/or the end user unless device addressing is electronically generated, and automatically graphically self-documented by the system.
3. All drawings shall be provided in standard Revit or AutoCAD format.

D. Operation & Maintenance Data:

1. Manufacturer's data sheets for all equipment supplied.
2. Manufacturer’s Operation & Maintenance Manual

3. A filled out Record of Completion as defined or similar to those provided in NFPA 72.
4. Abbreviated operating instructions for mounting at fire alarm control panel.

E. Software

1. Electronic record copy of site-specific software on non-volatile, non-erasable, non-rewritable media shall be provided to owner. A copy shall be stored and secured on site.
2. Printed Device list w/ Labels and Device/Serial Numbers

1.10 QUALITY ASSURANCE

A. All work specified in this Section shall be performed (furnished, installed and connected) by a qualified fire alarm contractor. The fire alarm contractor shall provide the following documentation to show compliance with the contractor qualifications within 14 days after notice of award of contractor.

1. Contractor's License: A copy of the contractor's valid State of California License. The contractor must be licensed in the state of project location and have been incorporated in the business in that state for a minimum of 5 years.
2. Proof of Experience: Proof that the fire alarm contractor has successfully installed similar system fire detection, and visual signaling control components on a previous project of comparable size and complexity. Provide a statement summarizing any pending litigation involving an officer or principal of /or the company, the nature of the litigation and what effect the litigation may carry as it relates to this work in the worst case scenario. Non-disclosure of this item, if later discovered, may result, at the owner's discretion, in the contractor bearing all costs and any cost related to associated delays in the progress of the work.
3. Insurance Certificates: Copy of fire alarm contractor's current liability insurance and state industrial insurance certificates in conformance with the contract document.
4. Service Capability: The fire alarm contractor shall have in-house engineering, installation and service personnel with adequate spare parts stock and a maintenance office within 50 miles of the project location.
5. Authorization Letters: Letters from the fire alarm equipment manufacturer stating that the fire alarm contractor is a Factory Authorized Distributor, and is trained and certified for the equipment proposed on this project and is licensed to purchase and install the software required to provide the specified functions.
6. Certifications:
    a. Provide a copy of the National Institute for Certification in Technologies (NICET) Technician Level 3 Certificate for the employee actively involved in this project.
    b. Documentation that the fire alarm contractor has on staff personnel factory-trained and certified for the equipment proposed for this project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. All panels and peripheral devices shall be of the standard product of single manufacturer and shall display the manufacturer's name of each component. The catalog numbers specified under this section are those of EST by Edwards, a UTC Fire & Security Company. and shall constitute the type, product quality, material and desired operating features.

2.2 GENERAL

A. All equipment and components shall be the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approval agency for use as part of a protected premises (fire alarm) system.

B. The contractor shall provide, from the acceptable manufacturer's current product lines, equipment and components, which comply, with the requirements of these specifications. Equipment or components, which do not provide the performance and features, required by these specifications are not acceptable, regardless of manufacturer.

C. All System components shall be the cataloged products of a single supplier. All products shall be UL listed by the manufacturer for their intended purpose.

D. All control panel assemblies and connected field appliances shall be both designed and manufactured by the same company, and shall be tested and cross-listed as to ensure that a fully functioning system is designed and installed.

2.3 FIRE ALARM CONTROL PANEL (FACP)

A. Existing.

2.4 INTELLIGENT ADDRESSABLE DETECTORS

A. General

1. Each remote device shall have a microprocessor with non-volatile memory to support its functionality and serviceability. Each device shall store as required for its functionality the following data: device serial number, device address, device type, personality code, date of manufacture, hours in use, time and date of last alarm, amount of environmental compensation left/used, last maintenance date, job/project number, current detector sensitivity values, diagnostic information (trouble codes) and algorithms required to process sensor data and perform communications with the loop controller.

2. Each device shall be capable of electronic addressing, either automatically or application programmed assigned, to support physical/electrical mapping and supervision by location. Setting a device’s address by physical means shall not be necessary.

3. The System Intelligent Detectors shall be capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters. Devices not capable of combining different fire parameters or employing digital filters shall not be acceptable.

4. Each detector shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and analog loop controller. Detectors not capable of making independent alarm decisions shall not be acceptable. Maximum total analog loop response time for detectors changing state shall be 0.75 seconds. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. Systems using central intelligence for alarm decisions shall not be acceptable.

5. The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC or the SIGA-PRO Signature Program/Service Tool.
6. Each detector shall have a separate means of displaying communication and alarm status. A bicolor green/red LED shall flash to confirm communication with the analog loop controller and display alarm status.
7. The detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector.
8. Each smoke detector shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings.
9. Each detector microprocessor shall contain an environmental compensation algorithm, which identifies and sets ambient "Environmental Thresholds" approximately six times an hour. The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminates as well as detector aging. The process shall employ digital compensation to adapt the detector to both 24 hour long-term and 4 hour short-term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the "learned" base line sensitivity. The base line sensitivity information shall be updated and permanently stored at the detector approximately once every hour.
10. The intelligent analog detectors shall be suitable for mounting on any Signature Series detector mounting base.
11. The Fire alarm system shall have the ability to set individual smoke detectors for alarm verification. Detector in the alarm verification mode shall indicate, by point in a text format at the main control and at the remote LCD annunciators.

B. Photoelectric Smoke Detector, SIGA-PD, CSFM 7272-1657:331

1. Provide intelligent photoelectric smoke detectors SIGA-PD. The analog photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings.
2. Each unit shall have a field-replaceable smoke chamber
3. Each unit shall have the capability of adding optional field-replaceable carbon monoxide sensor/daughterboard module
4. The photo detector shall be rated for ceiling installation at a minimum of 30 ft (9.1m) centers and be suitable for wall mount applications.
5. The photoelectric smoke detector shall be suitable for direct insertion into air ducts up to 3 ft (0.91m) high and 3 ft (0.91m) wide with air velocities up to 5,000 ft/min. (0-25.39 m/sec) without requiring specific duct detector housings or supply tubes.

6. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0% to 3.5%. The photo detector shall be suitable for operation in the following environment:
    a. Temperature: 32oF to 120oF (0oC to 49oC)
    b. Humidity: 0-93% RH, non-condensing
    c. Installation Attitude: no limit

C. Fixed Temp/Rate of Rise Heat Detector, SIGA-HRD/HFD, CSFM 7270-1657:333
    1. Provide intelligent combination fixed temperature/rate-of-rise heat detectors SIGA-HRD/HFD. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm.
    2. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable.
    3. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135oF (57oC) and a rate-of-rise alarm point of 15oF (9oC) per minute.
    4. Each unit shall have the capability of adding optional field-replaceable carbon monoxide sensor/daughterboard module
    5. The heat detector shall be rated for ceiling installation at a minimum of 50 ft (15.2m) centers and be suitable for wall mount applications.

D. Standard Detector Bases, SIGA-SB/SIGA-SB4, CSFM 7300-1657:120
    1. Provide standard detector mounting bases SIGA-SB suitable for mounting on North American 1-gang, 3½" or 4" octagon box and 4" square box. The base shall, contain no electronics, support all Signature Series detector types and have the following minimum requirements:
        a. Removal of the respective detector shall not affect communications with other detectors.
        b. Terminal connections shall be made on the room side of the base. Bases, which must be removed to gain access to the terminals, shall not be acceptable.
        c. The base shall be capable of supporting one (1) Signature Series SIGA-LED Remote Alarm LED Indicator. Provide remote LED alarm indicators where shown on the plans.

E. Relay Detector Bases - If Required, SIGA-RB / SIGA-RB4, CSFM 7300-1657:120
    1. Provide standard detector mounting bases SIGA-RB suitable for mounting on North American 1-gang, 3½" or 4" octagon box and 4" square box. The base shall support all Signature Series detector types and have the following minimum requirements:
        a. Removal of the respective detector shall not affect communications with other detectors.
        b. Terminal connections shall be made on the room side of the base. Bases, which must be removed to gain access to the terminals, shall not be acceptable.
        c. The relay shall be a bi-stable type and selectable for normally open or normally closed operation.

d. The position of the contact shall be supervised.

e. The relay shall automatically de-energize when a detector is removed.

f. The operation of the relay base shall be controlled by its respective detector processor. Detectors operating standalone mode shall operate the relay upon changing to alarm state. Relay bases not controlled by the detector microprocessor shall not be acceptable.

g. Form "C" Relay contacts shall have a minimum rating of 1 amp @ 30 Vdc and be listed for pilot duty.

F. Duct Detector, SIGA-SD, CSFM 3242-1657:223

1. Provide intelligent addressable photoelectric duct smoke detectors SIGA-SD. The analog photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. Systems using central intelligence for alarm decisions shall not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop.

2. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 0.79% to 2.46%. The duct detector shall be suitable for operation in the following environment:

a. Temperature: -20oF to 158oF (-29oC to 70oC)

b. Humidity: 0-93% RH, non-condensing

c. Air velocity: 100 to 4000 ft/min

3. Provide an air exhaust tube and an air sampling inlet tube, which extends into the duct air stream up to ten feet. The sampling tube can be installed with or without the cover in place and can be rotated in 45 degree increments to ensure proper alignment with the duct airflow.

4. Status LEDs shall remain visible through a clear assembly cover.

5. The unit shall contain a magnet-activated test switch.

6. One integral form C auxiliary alarm relay shall be provided. The relay contact shall be capable of being individually programmed from the control panel. The contact shall be rated for 2.0A at 30VDC

2.5 CONVENTIONAL INITIATING DEVICES

A. General

1. All initiating devices shall be UL Listed for Fire Protective Service.

2. All initiating devices shall be of the same manufacturer as the Fire Alarm Control Panel specified to assure absolute compatibility between the devices and the control panels, and to assure that the application of the initiating devices is done in accordance with the single manufacturer's instructions.

B. Weatherproof Pull Stations - If Required, MPSR1-S45W-GE, CSFM 7150-1657:236

1. Provide single action, single stage MPSR series fire alarm stations with terminals for wire connections rated for outdoor use.
2. Key reset shall be provided with keys identical to those required for the specified fire alarm panels, booster power supplies and other locked fire alarm cabinets.
3. Finish the station in red plated surface to inhibit corrosion.
4. Compatible factory weatherproof box w/ gasket shall be provided in all locations.
5. Pull Stations shall be individually monitored by addressable monitor module.

2.6 INTELLIGENT ADDRESSABLE MODULES

A. General

1. Each remote device shall have a microprocessor with non-volatile memory to support its functionality and serviceability. Each device shall store as required for its functionality the following data: device serial number, device address, device type, personality code, date of manufacture, hours in use, time and date of last alarm, amount of environmental compensation left/used, last maintenance date, job/project number, current detector sensitivity values, diagnostic information (trouble codes) and algorithms required to process sensor data and perform communications with the loop controller.
2. Each device shall be capable of electronic addressing, either automatically or application programmed assigned, to support physical/electrical mapping and supervision by location. Setting a device's address by physical means shall not be necessary.
3. It shall be possible to address each Intelligent Signature Series module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Modules requiring EPROM, PROM, ROM changes or DIP switch and/or jumper changes shall not be acceptable. The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes, which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults.
4. The module shall be suitable for operation in the following environment:
    a. Temperature: 32oF to 120oF (0oC to 49oC)
    b. Humidity: 0-93% RH, non condensing

B. Single Input Module, SIGA-CT1, CSFM 7300-1657:121

1. Provide intelligent single input modules SIGA-CT1 for monitoring of PIV's, Fan Status, Tamper Switches, Flow Switches, Generator & Fire Pump Status, Preaction System Alarm or Trouble or any other dry contact required to be monitored.
2. The Single Input Module shall provide one (1) supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation.
3. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.
4. The single input module shall support the following circuit types:

a. Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)

b. Normally-Open Alarm Delayed Latching (Waterflow Switches)

c. Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)

d. Normally-Open Active Latching (Supervisory, Tamper Switches)

C. Dual Input Module, SIGA-CT2, CSFM 7300-1657:121

1. Provide intelligent dual input modules SIGA-CT2 for monitoring of sets of PIV's, Fan/Damper Status, Tamper Switches, Flow Switches, Generator & Fire Pump Status, Preaction System Alarm or Trouble or any other sets of dry contacts required to be monitored.

2. The Dual Input Module shall provide two (2) supervised Class B input circuits each capable of a minimum of 4 personalities, each with a distinct operation.

3. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.

4. The dual input module shall support the following circuit types:

a. Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)

b. Normally-Open Alarm Delayed Latching (Waterflow Switches)

c. Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)

d. Normally-Open Active Latching (Supervisory, Tamper Switches)

D. Signal Module, SIGA-CC1, CSFM 7300-1657:121

1. Provide intelligent single input signal modules SIGA-CC1 for activation of booster power supplies, audible/visual circuits, for monitoring and communication of phone jacks.

2. The Single Input (Single Riser Select) Signal Module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation.

3. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes.

4. The single input signal module shall support the following operations:

a. Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A, 25Vrms @50w or 70 Vrms @ 35 Watts of Audio)

b. Telephone Power Selector with Ring Tone (Fire Fighter's Telephone)

5. When selected as a telephone power selector, the module shall be capable of generating its own "ring tone".

E. Synchronized Signal Module, SIGA-CC1S, CSFM 7300-1657:121

1. Provide intelligent single input signal modules SIGA-CC1S for activation of booster power supplies and/or audible/visual circuits that require synchronization.

2. The Single Input (Single Riser Select) Signal Module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation.

3. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes.

4. The single input signal module shall support the following operations:
    a. Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A, 25Vrms @50w or 70 Vrms @ 35 Watts of Audio)
    b. Telephone Power Selector with Ring Tone (Fire Fighter's Telephone)
5. Provides UL1971 auto-sync output for synchronizing multiple notification appliance circuits

F. Control Relay Module, SIGA-CR, CSFM 7300-1657:121

1. Provide intelligent control relay modules SIGA-CR for activation and/or shutdown of fans, dampers, door holder circuits, door locks, shunt trip, elevator recall or any other fail safe system requiring control or activation.
2. The Control Relay Module shall provide one form "R" dry relay contact rated at 2 amps @ 24 Vdc to control external appliances or equipment shutdown.
3. The control relay shall be rated for pilot duty and releasing systems.
4. The position of the relay contact shall be confirmed by the system firmware.
5. The control relay module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.

G. Manual Pull Station, SIGA-270, CSFM 7150-1657:129

1. Provide intelligent single action, single stage fire alarm stations SIGA-270. The fire alarm station shall be of metal construction with an internal toggle switch. Provide a locked test feature. Finish the station in red with silver "PULL IN CASE OF FIRE" English lettering.
2. The manual station shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.
3. Provide compatible surface mount red box, 276B-RSB, at all surface mount locations. Standard electrical boxes are not acceptable.

2.7 NOTIFICATION APPLIANCES

A. General

1. All fire alarm appliances shall be UL Listed for Fire Protective Service.
2. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturers' instructions.
3. Any appliances, which do not meet the above requirements, and are submitted, for use must show written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers which clearly states that their equipment (as submitted) are 100% compatible with each other for the purposes intended.

B. Wall Strobes (Fire – Evacuation), Genesis G1 Series, CSFM 7125-1657:218

1. Provide wall mounted CLEAR lens strobes with WHITE body and "FIRE" markings.
2. The strobe shall be UL1971 listed have selectable 15, 30, 75 or 110 candela settings.
3. The strobe (15, 30, 75, 110) candela rating shall be view from the side window to verify the setting.

4. It shall be possible to change the strobe setting without removing the device from the wall
5. All strobes shall be synchronization to within 10 milliseconds for an indefinite period shall not require the use of separately installed remote synch modules.
6. The strobe shall be a low profile design and shall not protrude more than 1” off the wall. In-out screw terminals shall be provided for wiring.
7. The strobe shall be suitable for wall mounting and shall mount in a standard North American 1-gang box. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.

C. Ceiling Strobes (Fire – Evacuation), Genesis GC Series, CSFM 7125-1657:219
1. Provide ceiling mounted CLEAR lens strobes with WHITE body and “FIRE” markings.
2. The standard ceiling strobe shall be UL1971 listed and have selectable 15, 30, 75 or 95 cd settings.
3. The high output ceiling strobe shall be UL1971 listed and have selectable 95, 115, 150 or 177 cd settings.
4. The strobe (15, 30, 75, 110) candela rating shall be view from the side window to verify the setting.
5. It shall be possible to change the strobe setting without removing the device from the ceiling.
6. All strobes shall be synchronization to within 10 milliseconds for an indefinite period shall not require the use of separately installed remote synch modules.
7. The strobe shall be a low profile design and shall not protrude more than 1.6” off the ceiling. In-out screw terminals shall be provided for wiring.
8. The strobe shall be suitable for ceiling mounting and shall mount in a standard 4" square 2 1/8" (54 mm) deep electrical box. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.

D. Weatherproof Wall or Ceiling Strobes - If Required, Integrity CS405 Series, CSFM 7125-1657:184
1. In and out screw terminals shall be provided for wiring.
2. Strobes shall provide synchronized flash.
3. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 60cd, or 110cd devices
4. Strobes shall mount in a North American 1-gang box. For weatherproof application provide weatherproof wall boxes for mounting.

E. Wall Speakers, Genesis G4 Series, CSFM 7320-1657:211
1. Provide wall mounted CLEAR lens strobes with WHITE body and “FIRE” markings.
2. The speaker shall provide a high fidelity 520 Hz Low frequency output to meet NFPA standards.
3. The low profile speaker shall not extend more than 1" (2.5cm) past the finished wall surface, and provide a switch selectable audible output of 2W (90dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (81dBA) at 10 ft. when measured in reverberation room per UL-464.

4. Wattage setting shall be visible with the cover installed The strobe shall be a low profile design and shall not protrude more than 1” off the wall. In-out screw terminals shall be provided for wiring.
5. It shall be suitable for wall mounting and shall mount in a standard North American 1-gang box. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.

F. Wall Speaker-Strobes, Genesis G4 Series, CSFM 7320-1657:323
1. Provide wall mounted CLEAR lens strobes with WHITE body and “FIRE” markings.
2. The speaker shall provide a high fidelity 520 Hz Low frequency output to meet NFPA standards.
3. The strobe shall be UL1971 listed have selectable 15, 30, 75 or 110 candela settings.
4. The strobe (15, 30, 75, 110) candela rating shall be view from the side window to verify the setting.
5. It shall be possible to change the strobe setting without removing the device from the wall
6. All strobes shall be synchronization to within 10 milliseconds for an indefinite period shall not require the use of separately installed remote synch modules.
7. The strobe shall be a low profile design and shall not protrude more than 1” off the wall. In-out screw terminals shall be provided for wiring.
8. The low profile speaker shall not extend more than 1" (2.5cm) past the finished wall surface, and provide a switch selectable audible output of 2W (90dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (81dBA) at 10 ft. when measured in reverberation room per UL-464.
9. Wattage setting shall be visible with the cover installed.
10. It shall be a low profile design and shall not protrude more than 1” off the wall. In-out screw terminals shall be provided for wiring.
11. It shall be suitable for wall mounting and shall mount in a standard North American 1-gang box. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.

G. Ceiling Speaker-Strobes, Genesis GC Series, CSFM 7320-1657:285
1. Provide ceiling mounted CLEAR lens strobes with WHITE body and “FIRE” markings.
2. The speaker shall provide a high fidelity 520 Hz Low frequency output to meet NFPA standards.
3. The standard ceiling strobe shall be UL1971 listed and have selectable 15, 30, 75 or 95 cd settings.
4. The high output ceiling strobe shall be UL1971 listed and have selectable 95, 115, 150 or 177 cd settings.
5. The strobe (15, 30, 75, 110) candela rating shall be view from the side window to verify the setting.
6. It shall be possible to change the strobe setting without removing the device from the ceiling.

7. All strobes shall be synchronization to within 10 milliseconds for an indefinite period shall not require the use of separately installed remote synch modules.
8. The low profile speaker shall provide a switch selectable audible output of 2W (90dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (81dBA) at 10 ft. when measured in reverberation room per UL-464.
9. Wattage and Candela setting shall be visible with the cover installed.
10. It shall be a low profile design and shall not protrude more than 1.6” off the ceiling. In-out screw terminals shall be provided for wiring.
11. It shall be suitable for ceiling mounting and shall mount in a standard 4" square 2 1/8" (54 mm) deep electrical box. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.

H. Wall or Ceiling Weatherproof Speakers, Genesis WG4 Series, CSFM 7320-1657:211
1. Provide wall or ceiling mounted with WHITE body and “FIRE” markings.
2. The low profile speaker shall provide a switch selectable audible output of 2W (90dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (81dBA) at 10 ft. when measured in reverberation room per UL-464.
3. Wattage setting shall be visible with the cover installed.
4. Speakers shall provide a switch selectable voltage setting for use with 25V or 70V systems.
5. Weatherproof boxes (EST 449) with trim skirt (EST WG4WTS) shall be provided for outdoor mounting.

I. Wall or Ceiling Weatherproof Speaker-Strobes, Genesis WG4 Series, CSFM 7320-1657:211
1. Provide wall or ceiling mounted CLEAR lens strobes with WHITE body and “FIRE” markings.
2. The standard ceiling strobe shall be UL1971 listed and have selectable 15, 29, 70 or 87 cd settings.
3. The high output ceiling strobe shall be UL1971 listed and have selectable 102, 123, 147 or 161 cd settings.
4. The strobe candela rating shall be view from the side window to verify the setting.
5. It shall be possible to change the strobe setting without removing the device from the ceiling.
6. All strobes shall be synchronization to within 10 milliseconds for an indefinite period shall not require the use of separately installed remote synch modules.
7. The low profile speaker shall provide a switch selectable audible output of 2W (90dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (81dBA) at 10 ft. when measured in reverberation room per UL-464.
8. Wattage and Candela setting shall be visible with the cover installed.
9. Speakers shall provide a switch selectable voltage setting for use with 25V or 70V systems.
10. Weatherproof boxes (EST 449) with trim skirt (EST WG4WTS) shall be provided for outdoor mounting.

J. Vibrating Bell - If Required, 439D-10AWR, CSFM 7320-1657:182

1. Provide 10" surface weatherproof vibrating bell.
2. The bell shall be 24vdc.
3. Bell shall have a heavy duty cast housing with Red finish.
4. Weatherproof boxes (449) shall be provided for outdoor mounting.

2.8 ACCESSORY EQUIPMENT

A. Multi-Voltage Control Relays, MR Series, CSFM 7300-1004:101

1. General
    a. Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc.
    b. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac.
    c. A single relay may be energized from a voltage source of 24 Vdc, 24 Vac, 115 Vac, or 230 Vac.
    d. A red LED shall indicate the relay is energized.
    e. A metal enclosure shall be provided.
2. MR-100 Series
    a. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac.
3. MR-200 Series
    a. Relay contact ratings shall be DPDT and rated for 10 amperes at 115 Vac.

B. Electromagnetic Door Holders - If Required, EST 1500 Series, CSFM 3550-1501:137

1. General - Electromagnetic door holders submitted for use must have written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purpose intended.
2. Wall Mounted, 1504/1505/1508/1509 Series
    a. Provide flush, semi-flush or surface wall mounted electromagnetic door holder/releases selectable to 24 Vac/dc or 120 Vac as directed by the Consulting Engineer. Finish shall be brushed zinc.

C. Remote Booster Power Supplies, BPS6A/BPS10A, CSFM 7300-1657:229

1. Unit shall be a self contained with 24Vdc power supply and batteries housed in its own locked enclosure. Keys provided shall be identical to the keys provided for all other fire alarm equipment provided.
2. Power supply shall be available in both 10 Amp or 6.5 Amp models and 110 Vac or 220Vac.
3. On board LED indicators for each resident NAC, battery supervision, ground fault and AC power.
4. The power supply shall provide four (4) independent 3Amp NACs. Each circuit can be configurable as an auxiliary output.
5. Configurable for any one of three signaling rates: 120SPM; 3-3-3 temporal; or, continuous.

6. Two independent and configurable inputs switch selectable to allow correlation of the two (2) inputs and the four (4) outputs.
7. NACs shall be configurable for either four Class B or two Class A circuits.
8. The unit shall be compatible with SIGA-CC1S for synchronization of multiple power supplies without inter-connect wiring.
9. Brackets shall be provided inside the enclosure to allow mounting the signaling modules. All signaling modules shall be listed to be located inside the booster power supply enclosure.
10. A selectable dip switch shall enable built in synchronization for horns and strobes which may be used to synchronize downstream devices, as well as other boosters and their connected devices.

PART 3 - EXECUTION

3.1 INSTALLATION CONDITIONS

A. All equipment and components shall be installed in strict compliance with each manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation.

B. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's wiring diagram.

C. All fire alarm system wiring shall be in conduit. All system wiring shall be in accordance with manufacturer's recommendations and installed in an approved raceway.

3.2 CONDUCTORS

A. All circuits shall be rated power limited in accordance with NEC Article 760.

B. All new system conductors shall be of the type(s) specified herein.

1. All initiating circuit, signaling line circuit, AC power conductors, shield drain conductors and grounding conductors, shall be solid copper, stranded or bunch tinned (bonded) stranded copper.
2. All wiring shall be color-coded throughout.
3. Signaling Line Circuits
    a. Shall be 18 AWG minimum multi-conductor jacketed twisted cable or as per manufacturer's requirements.
    b. Circuit Integrity (CI) Cable: Provide as required to meet NFPA or Local Code requirements.
    c. CI Cable shall meet article 760, power limited fire alarm service.
4. Initiating Device Circuits
    a. 24 VDC IDC or Auxiliary function circuits shall be 18 AWG minimum or per manufacturer's requirements.
5. Notification Appliance Circuits –
    a. Horn-Strobe or Strobe: Non-Twisted pair, not less than No. 14 AWG or as recommended by the manufacturer.
6. 120 VAC circuits

a. Minimum 10 AWG for panel power circuits. Minimum 12 AWG for all other circuits.

b. Sharing of neutrals is prohibited. Each circuit shall have it's own dedicated neutral conductor.

7. Fiber Optic Cable

a. Only glass filament cable permitted. Plastic filament fiber optic cables are not acceptable.

b. Multimode shall be 62.5/125 micron fiber optic cables with ST connectors used at all equipment terminations

c. Single Mode shall be 8.3 micron fiber micron fiber optic cables with Duplex SC connectors used at all equipment terminations

3.3 CONDUIT RACEWAY

A. All systems and system components listed to UL864 Control Units for Fire Protective Signaling Systems maybe installed within a common conduit raceway system, in accordance with the manufacture's recommendations. System(s)or system components not listed to the UL864 standard shall utilize a separate conduit raceway system for each of the sub-systems.

B. All system conduits shall be EMT, 3/4 -inch minimum, except for flexible metallic conduit used for whips to devices only, maximum length 6 feet, 3/4-inch diameter, minimum.

C. All system conduits, which are installed in areas, which may be subject to physical damage or weather, shall be IMC or rigid steel, 3/4 -inch minimum.

D. Conduits shall be sized according to the conductors contained therein. Cross sectional area percentage fill for system conduits shall not exceed 40%.

E. Existing conduit raceway system may be re-used where possible.

F. All fire alarm conduit systems shall be routed and installed to minimize the potential for physical, mechanical or by fire damage, and so as not to interfere with existing building systems, facilities or equipment, and to facilitate service and minimize maintenance.

G. All conduits, except flexible conduit whips to devices, shall be solidly attached to building structural members, ceiling slabs or permanent walls. Conduits shall not be attached to existing conduit, duct work, cable trays, other ceiling equipment, drop ceiling hangers/grids or partition walls, except where necessary to connect to initiating, notification, or auxiliary function devices.

H. All system conduits, junction boxes, pull boxes, terminal cabinets, electrical enclosures and device back boxes shall be readily accessible for inspection, testing, service and maintenance.

I. All penetration of floor slabs and firewalls shall be sleeved (1" conduit minimum) fire stopped in accordance with all local fire codes.

J. All junction box covers shall be painted red.

3.4 INSTALLATION REQUIREMENTS

A. All pull stations shall be mounted 48 inches above the finished floor, as measured on handle.

B. Pull stations currently mounted at the incorrect height shall be lowered accordingly when replaced.

C. All manual pull stations shall be flush mounted. Surface mounted pull stations shall be identified and requested prior to submittal. They shall only be allowed if approved by the Engineer

prior to installation. All surface mount pull station shall be provided w/ manufacturers listed back box.

D. All new audio/visual devices shall be mounted at a minimum of 80 inches and no more than 96 inches above the finished floor, as measured on strobe center. Devices shall be mounted no less than 6 inches from the ceiling.

E. No area smoke detectors shall be mounted within 36 inches of any HVAC supply, return air register or lighting fixture.

F. No area smoke or heat detector shall be mounted within 12 inches of any wall.

G. All fire alarm devices shall be accessible for periodic maintenance. Should a device location indicated on the Contract Drawings not meet this requirement, it shall be the responsibility of the installing contractor to bring it, in writing, to the attention of the Project Engineer. Failure to bring such issues to the attention of the Project Engineer shall be the exclusive liability of the installing Electrical Contractor.

H. End of Line Resistors shall be furnished as required for mounting as directed by the manufacturer. Devices containing end-of-line resistors shall be appropriately labeled. Devices should be labeled so removal of the device is not required to identify the EOL device.

I. All addressable modules shall be mounted within 36 inches of the monitored or controlled point of termination. This shall include, but is not necessarily limited to, fan shutdown, elevator recall, shunt trip, sprinkler status points, or door release. Label all addressable modules as to their function.

J. Power-limited/Non-power-limited NEC wiring standards SHALL BE OBSERVED.

K. Auxiliary relays shall be appropriately labeled on the exterior to indicate “FIRE ALARM SYSTEM” and their specific function (i.e. FAN S-1 SHUTDOWN).

L. All AC power connections shall be to the building's designated emergency electrical power circuit and shall meet the requirements of NFPA 72 - The AC power circuit shall be installed in conduit raceway. The power circuit disconnect means shall be clearly labeled FIRE ALARM CIRCUIT CONTROL and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside the each control panel the disconnect serves.

3.5 TEST & INSPECTION

A. All fire alarm testing shall be in accordance with NFPA 72.

B. The system shall be pre-tested and documented prior to the final inspection by the AHJ. The owner shall be notified of the pretest 48 hours in advance and shall witness this test if desired.

C. The pre-test shall include the following:

1. All intelligent analog addressable devices shall be tested for current address, sensitivity, and user defined message.
2. All wiring shall be tested for continuity, shorts, and grounds before the system is activated.
3. Proper operation and execution of all it's sequences

D. At the final test and inspection, a factory-trained representative of the system manufacturer shall demonstrate to the Owner, his representative, and the local fire inspector all its sequence of operations and any additional tests required by the AHJ. In the event the system does not operate properly, the test may be terminated. Corrections shall be made and the testing

procedure shall be repeated until it is acceptable to the Owner, his representatives and the fire inspector.

3.6 TRAINING

A. The System Supplier shall schedule and present a documented formalized instruction for the building owner, detailing the proper operation of the installed System. One training segment shall be available at the completion of the project. A second training segment may be required within the warranty period.

B. The instruction shall be presented in an organized and professional manner by a person factory trained in the operation and maintenance of the equipment and who is also thoroughly familiar with the installation.

C. The instruction shall cover the schedule of maintenance required by NFPA 72 and any additional maintenance recommended by the system manufacturer.

D. Instruction shall be made available to the Local Municipal Fire Department if requested by the Local Authority Having Jurisdiction.

3.7 EXTRA MATERIALS

A. Provide 2% of each type of manual stations (minimum of two for each type).

B. Provide six keys of each type.

C. Provide 2% of each type of smoke and heat detector (minimum of two for each type).

D. Provide 2% of each type of audible and visual indicating appliances (minimum of two for each type).

3.8 WARRANTY

A. The contractor shall warranty all materials, installation and workmanship for one (1) year from date of acceptance, unless otherwise specified.

B. A copy of the manufacturer's warranty shall be provided with closeout documentation and included with the operation and installation manuals.

END OF SECTION