

Golden West College Administration, Business and Criminal Justice Demolition

tBP Project No. 21247.00

DSA #04 - 124928

File # 30-C3

Bid No:

Coast Community College District
Costa Mesa, California



PROJECT MANUAL

Divisions 00 - 32
March 5, 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

ADMINISTRATION, BUSINESS AND CRIMINAL JUSTICE DEMOLITION

COAST COMMUNITY COLLEGE DISTRICT
2701 FAIRVIEW ROAD, COSTA MESA, CA 92626
WWW.CCCD.EDU

PROJECT LOCATION
GOLDEN WEST COLLEGE
15744 GOLDEN WEST STREET
HUNINGTON BEACH, CALIFORNIA 92647

PREPARED BY:

ARCHITECT

TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach CA 92660

949.673.0300

www.tbparhitecture.com

Architect's Project Number: 21247.00.

NOTICE: This Project Manual, is an unpublished instrument of service of the authors.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

END OF PROJECT TITLE PAGE

SECTION 00 01 02
PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

- A. Architect's Project Number: 21247.00.
Golden west College
15744 Golden West Street
Huntington Beach, California 92647.
- B. The Owner, hereinafter referred to as District:
Coast Community College District
2701 Fairview Road, Costa Mesa, CA 92626
www.cccd.edu
714.432.5772

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

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: 04-124928 INC:

REVIEWED FOR

SS ☐ FLS ☒ ACS ☒

DATE: 03/19/2026

SECTION 00 01 07
SEALS PAGE

ARCHITECT OF RECORD (AOR)

TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach CA 92660

Hung Cheng

C-34187



CIVIL ENGINEER OF RECORD (CEOR)

FPL & ASSOCIATES

30 Corporate Park, Suite 401, Irvine, California 92606

Alan Wing-Chi Lee, CE

C-34971



LANDSCAPE ARCHITECT OF RECORD (LAOR)

CORNERSTONE STUDIOS, INC.

951 E. Santa Ana Boulevard, Santa Ana. California 92701

Woo-Jung Kim

LA-6082



ELECTRICAL ENGINEER OF RECORD (EEOR)

P2S

5000 East Spring Street, Suite 800, Long Beach. California 90815

Lars Henderson

E22361



MECHANICAL ENGINEER OF RECORD (MEOR)

P2S

5000 East Spring Street, Suite 800, Long Beach. California 90815

Michael Grace

M42504



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REQUEST FOR INFORMATION (PREBID)

RFI NUMBER: _____

DATE: _____

**PROJECT NAME: GOLDEN WEST COLLEGE ADMINISTRATION, BUSINESS AND CRIMINAL JUSTICE
DEMOLITION**

PROJECT NO.: 21247.00

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 COLLEGE ADMINISTRATION, BUSINESS AND CRIMINAL JUSTICE
DEMOLITION**

PROJECT NUMBER: 21247.00

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 COLLEGE ADMINISTRATION, BUSINESS AND CRIMINAL JUSTICE
DEMOLITION**

PROJECT NUMBER: 21247.00

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:

<input type="checkbox"/> Accepted	<input type="checkbox"/> Accepted as Noted	<input type="checkbox"/> Not Accepted	<input type="checkbox"/> Received too Late
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Reviewed by:

Architect: _____ Date: _____

District: _____

Date: _____

Division of the State

Architect: _____

Date: _____

END OF SECTION

SECTION 01 10 00 SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Golden West College Administration, Business, Criminal Justice Demolition
- B. District's Name: Coast Community College District.
- C. Architect's Name: tBP/Architecture.
- D. The Project consists of the demolition of 1 one story, 1 relocatable and 2 two-story buildings with site repair.

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 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 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. Existing Building Demolition: District will contract for demolition of the existing structures on site and removal of foundations. The site will be backfilled at the removed foundations and filled to existing grade elevation. Work will be completed on a schedule to be determined.

- C. Items noted NIC (Not in Contract) will be supplied and installed by District before Date of Substantial Completion.

1.05 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.

1.06 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 30 00.
 - 3. Current construction photographs specified in Section 01 30 00.
 - 4. Partial release of liens from major subcontractors and vendors.
 - a. Provide with each Application for Payment lien releases from all subcontractors, workers and materials suppliers employed for the Project covering their portion of Work to date for which payment application is made. Lien release forms will be provided by District and shall be completed in accordance with directions provided.
 - 5. Project record documents as specified in Section 01 78 00, for review by District which will be returned to the Contractor.

6. Affidavits attesting to off-site stored products.
- K. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 ADDENDA

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

1.06 MODIFICATION PROCEDURES

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

- a. Architect of Record.
 - b. 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.
- 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. Submittals for review, information, and project closeout.
- I. Number of copies of submittals.
- J. Requests for Interpretation or Information (RFI) procedures.
- K. Submittal procedures.

1.02 RELATED REQUIREMENTS

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

1.03 DEFINITIONS

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

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

1.04 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
 - 1. Requests for Interpretation or Information (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

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

3.02 PRECONSTRUCTION MEETING

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

3.03 SITE MOBILIZATION MEETING

- A. District will schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
 - 1. Contractor.
 - 2. District.
 - 3. Architect.
 - 4. Construction Manager.
 - 5. Special consultants.
 - 6. Contractor's superintendent.
 - 7. Major subcontractors.
 - 8. Inspector of Record.
 - 9. DSA Field Representative.
- C. Agenda:
 - 1. Designation of Key Personnel: Contractor shall designate key personnel and provide a name and address list which includes the following:
 - a. Contractor: Project Manager and Superintendent.

- b. Major subcontractors: Principal/Project Manager and Superintendent.
 - c. Major materials suppliers: Contact person.
- 2. 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.
- 3. District's requirements.
- 4. Construction facilities and controls provided by District.
- 5. Temporary utilities provided by District.
- 6. Survey layout.
- 7. Security and housekeeping procedures.
- 8. Schedules.
 - a. Distribute and discuss initial construction schedule and critical work sequencing of major elements of Work;
 - b. Include coordination of District Furnished / Contractor Installed (OFCl) products;
 - c. Work under separate contracts by serving utility agencies;
 - d. Work under separate contracts by companies and District.
- 9. Application for payment procedures.
- 10. Procedures for testing.
- 11. Procedures for maintaining record documents.
- 12. Requirements for start-up of equipment.
- 13. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, District, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-weekly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Meeting Time and Location: As mutually agreed by District, Architect, and Contractor, at on-site location.
- D. Special Meetings: As necessary, Construction Manager may convene special meetings to discuss specific construction issues in detail and to plan specific activities.
 - 1. See Section 01 70 00 - Execution and Closeout Requirements.
- E. 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.
- F. Agenda:
1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of RFIs log and status of responses.
 7. Review of off-site fabrication and delivery schedules.
 8. Maintenance of progress schedule.
 9. Corrective measures to regain projected schedules.
 - a. Develop corrective measures and procedures, including but not necessarily limited to additional personnel loading to regain planned schedule.
 10. Planned progress during succeeding work period.
 11. Coordination of projected progress.
 12. Maintenance of quality and work standards.
 13. Effect of proposed changes on progress schedule and coordination.
 14. Other business relating to work.
- G. 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. Final completion, minimum of ten (10) photos.
- F. Take photographs as evidence of existing project conditions as follows:
 - 1. Exterior views: each elevation, roof and areas adjacent to construction limits.
- G. Views:
 - 1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
 - 2. Consult with Architect for instructions on views required.
 - 3. Provide factual presentation.
 - 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
 - 5. Point of View Sketch: Provide sketch identifying point of view of each photograph.
- H. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: Via email.
 - 2. File Naming: Include project identification, date and time of view, and view identification.
 - 3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.
 - 4. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
 - 5. Photo CD(s): Provide 1 copy including all photos cumulative to date and PDF file(s), with files organized in separate folders by submittal date.
 - 6. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.08 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.

3.09 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 District.
 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 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.

3.10 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.

3.11 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. Field engineering daily reports.
 8. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for District.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
 1. Project record documents.
 2. Operation and maintenance data.
 - a. Include operation and maintenance data submittals in Submittals Schedule specified above.
 - b. Provide space for review action stamps and, if required by governing authorities having jurisdiction, license seal of design Professional, if applicable.
 3. Warranties.
 4. Bonds.
 5. Other types as indicated.
- D. Submit for District's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

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

3.14 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) 26 56 19-1 - First submittal for Section 26 56 19 – LED Exterior Lighting.
 - 2) 26 56 19-2 – Second submittal for Section 26 56 19 – LED Exterior Lighting.
 - b. Use same number for resubmittals as original submittal, followed by a letter indicating sequential resubmittal. For example:
 - 1) 26 56 19-2A - Resubmission of second submittal for Section 26 56 19 – LED Exterior Lighting.
 - 2) 26 56 19-2B - Second resubmission of second submittal for Section 26 56 19 – LED Exterior Lighting.

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.
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 pavement finishes (edges, corners and reveals).
 - b. LED Exterior Lighting color selection
 - c. Field-applied paint colors and finishes.

3.15 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 COLLEGE ADMINISTRATION, BUSINESS AND CRIMINAL JUSTICE
DEMOLITION**

PROJECT NO.: 21247.00

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 35 50
REQUESTS FOR ELECTRONIC FILES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements to request electronic construction document files from Architect.
- B. Hold Harmless Agreement form.

1.02 RELATED SECTIONS

- A. Section 01 30 00 - Administrative Requirements: Shop Drawings, Product Data and Samples.
- B. Section 01 70 00 - Execution and Closeout Requirements.
- C. Divisions 31 through 32 - Site Work.

1.03 REQUIREMENTS

- A. Electronic files have legal ramifications as information therein can be modified.
- B. In order to receive this electronic information, the following Hold Harmless Agreement form must be executed in its entirety, including signature by a company officer.
- C. Costs for processing and handling electronic files, however limited, will be \$250.00

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

PART 3 - EXECUTION

3.01 ELECTRONIC FILE TRANSFER PROCEDURE

- A. In order to expedite the transfer, upon receipt of a PDF copy of this acknowledgement, the requested CAD/Revit/BIM files will be sent in the form of a compact disc, DVD, or thumb drive to the recipient, as requested, by UPS, similar delivery service, or other method of electronic transfer after payment is received.
- B. It is expressly understood that any transfer is done as a courtesy and can be revoked at any time by the Architect.

Agreement is on next page

HOLD HARMLESS AGREEMENT

ARCHITECT'S PROJECT: GWC ADMIN, BUSINESS, CRIMINAL JUSTICE DEMO

ARCHITECT'S PROJECT NUMBER: 21247.00

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

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

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

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

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

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

Sheet numbers or discipline requested: _____

Acknowledged by: Company Name _____

Signature of Company Officer

Print or Type Name

Date

Street Address

City, State, Zip Code

E-mail Address

END OF SECTION

SECTION 01 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. Tolerances.
- G. 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. DSA BU 24-05 - Fire Safety During Construction and Demolition.
- I. IAS AC89 - Accreditation Criteria for Testing Laboratories.

1.04 DEFINITIONS

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

1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
 - 1. Temporary sheeting, shoring, or supports.
 - 2. Temporary scaffolding.
 - 3. Temporary bracing.
 - 4. Temporary falsework for support of spanning or arched structures.
 - 5. Temporary stairs or steps required for construction access only.
 - 6. Temporary hoist(s) and rigging.
 - 7. Investigation of soil conditions to support construction equipment.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. 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.
- C. 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.
- D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
 - 1. Include:

- a. Date issued.
- b. Project title and number.
- c. Name of inspector.
- d. Date and time of sampling or inspection.
- e. Identification of product and specifications section.
- f. Location in the Project.
- g. Type of test/inspection.
- h. Date of test/inspection.
- i. Results of test/inspection.
- j. Compliance with Contract Documents.
- k. When requested by Architect, provide interpretation of results.
- 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for District's information.
- E. 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.

1.07 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Qualification Statement: Provide documentation showing testing laboratory is approved by Division of the State Architect.
 - 4. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in California.
- C. Contractor's Quality Control (CQC) Plan:
 - 1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
 - a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.

- 1) Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.
- b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
 - 1) Management and control of documents and records relating to quality.
 - 2) Communications.
 - 3) Coordination procedures.
 - 4) Resource management.
 - 5) Process control.
 - 6) Inspection and testing procedures and scheduling.
 - 7) Control of noncomplying work.
 - 8) Tracking deficiencies from identification, through acceptable corrective action, and verification.
 - 9) Control of testing and measuring equipment.
 - 10) Project materials certification.
 - 11) Managerial continuity and flexibility.
- c. Provide a Site Fire Safety Plan in coordination with the local fire authority. Comply with DSA BU 24-05. See Section 01 70 00 - Execution and Closeout Requirements.
- d. District will not make a separate payment for providing and maintaining a Quality Control Plan. Include associated costs in Bid price.
- e. Acceptance of the plan is required prior to start of construction activities not including mobilization work. District's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. District reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.
- D. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.

1.08 REFERENCES AND STANDARDS

- 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.

1.09 REGULATORY REQUIREMENTS FOR TESTING AND INSPECTION

- A. Inspections, testing and approvals as required by authorities having jurisdiction. Refer to Section 01 41 00 - Regulatory Requirements and Section 01 45 33 - Code-Required Special Inspections 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.

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. District will employ and pay for services of an independent testing agency approved by DSA to perform specified testing.
- B. As indicated in individual specification sections, District or Contractor shall employ and pay for services of an independent testing agency to perform 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 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.

3.03 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).

3.04 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.

3.05 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 to 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 as 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. Based on ICC (IBC) - ICC International Building Code, 2021.

- b. Effective dates of referenced standards are according to Chapter 35.
- 3. Part 3, Title 24 CCR - 2022 California Electrical Code.
- 4. Part 4, Title 24 CCR - 2022 California Mechanical Code (CMC).
- 5. Part 5, Title 24 CCR - 2022 California Plumbing Code (CPC).
- 6. Part 6, Title 24 CCR - 2022 California Energy Code.
- 7. Part 9, Title 24 CCR - 2022 California Fire Code (CFC).
- 8. Part 10, Title 24 CCR - 2022 California Existing Buildings Code.
- 9. Part 11, Title 24 CCR - 2022 California Green Building Standards Code (CalGreen).
 - a. California Green Building Standards Code, Title 24, Part 11 (CALGreen) Section 5.409 Life Cycle Assessment.
 - 1) GWP Analysis report and Worksheet WS-4.
 - 2) Table 5.409.3 Product GWP Limits
- 10. Part 12, Title 24 CCR - 2022 California Referenced Standards Code.
- 11. Title 19 CCR, Public Safety
- F. Erosion and Sedimentation Control Regulations:
 - 1. California Codes and Regulations; Title 24, California Building Code, Parts 1 & 2.
 - 2. State of California State Water Resources Control Board Regulations.
 - 3. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition.
- G. Maintain on site during construction, a copy of California Codes and Regulations; Title 24, California Building Code, Parts 1 through 5.

1.02 SUMMARY OF REFERENCE STANDARDS

- A. Regulatory requirements applicable to this project are the following:
 - 1. For a list of applicable standards, including California amendments to the NFPA Standards, refer to CBC Chapter 35 and CFC Chapter 80.
- B. California Referenced Standards Code: Chapter 12-7-4 Fire Resistive Standards, for fire rated doors.
- C. National Fire Protection Association (NFPA): (Partial List of Applicable Standards)
 - 1. Reference CBC for applicable NFPA Standards - 2022 CBC (SFM) Chapter 35.
 - 2. NFPA 13 - Standard for the Installation of Sprinkler Systems (CA Amended); 2022, as amended in 2022 CBC Ch. 35 Referenced Standards.
 - 3. NFPA 17A - Standard for Wet Chemical Extinguishing Systems; 2021, as indicated in 2022 CBC Ch. 35 Referenced Standards.
 - 4. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances; 2019, as amended in 2022 CBC Ch. 35 Referenced Standards.
 - 5. NFPA 72 - National Fire Alarm and Signaling Code (CA Amended); 2022, as amended in 2022 CBC Ch.35 Referenced Standards.

- 6. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2019.
- D. 28 CFR 35 - Nondiscrimination on the Basis of Disability in State and Local Government Services; Final Rule; Department of Justice.
- E. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice.
- F. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- G. ADA Standards - 2010 ADA Standards for Accessible Design.
- H. 29 CFR 1910 - Occupational Safety and Health Standards.

1.03 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 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-201: Soils Compaction.
 - 2) DSA-202: Sieve Analysis.
 - 3) DSA-250: Special Inspection(s).
 - 4) DSA-291: Laboratory Verified Report.
 - 5) DSA-292: Special Inspection(s) Verified Report(s).
 - 6) DSA-293: Geotechnical Verified Report.
 - c. Other Division of the State Architect (DSA) Certification Documents (Reports) as may be required.
 2. DSA Form 292 - Special Inspection Verified Report shall be from all special inspectors contracting directly and individually with the school board.

1.05 SPECIAL INSPECTION AND TESTING AGENCY

- A. District is to employ services of Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by building code.
- B. Special Inspection Agency may delegate to independent testing agency to perform testing and sampling associated with special inspections and required by building code.
- C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of contract documents.

1.06 TESTING AND INSPECTION AGENCIES

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

- c. DSA.
- B. District Project Inspector:
 - 1. A Project Inspector (IOR) employed by the District and approved by Architect, Structural Engineer and DSA in accordance with the requirements of the California Building Code will be assigned to the work.
 - a. Project Inspector duties are specifically defined in Title 24 CCR Part 1, California Administrative Code Section 4-342.
 - 2. The District's Inspector must at all times have access for the purpose of inspection to all parts of the work and to the shops where the work is in preparation, and the Contractor is required to at all times maintain proper facilities and provide safe access for such inspection.
 - 3. The work of construction in all stages of progress shall be subject to the personal continuous observation of the District's Inspector.
 - a. The Contractor is required to furnish the Project Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the work and the character of the materials.
 - b. Inspection of the work does not relieve the Contractor from any obligation to fulfill the Contract.
 - c. If determined by DSA, Project Inspector is required to work a normal 40 hour week on this project only. Any overtime required will be included in a deductive change order to the Contractor and sub-contractor requiring the inspection.
- C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of contract documents.
- D. Payments:
 - 1. Costs of initial testing and inspection, except as specifically modified herein, or specified otherwise in technical sections, will be paid for by the District, providing such testing and inspection indicates compliance with Contract Documents. Initial tests and inspections are defined as the first tests and inspections as herein specified.
 - 2. Testing Laboratory: Furnish to District a cost estimate breakdown covering initial tests and inspections required by Contract Documents. Estimate shall include number of tests, man-hours required for tests, field and plant inspections, travel time, and costs.
 - 3. In the event a test or inspection indicates failure of a material or procedure to meet requirements of Contract Documents, costs for retesting and reinspection will be paid by the District and backcharged to the Contractor.
 - 4. Additional tests and inspections not herein specified but requested by District or Architect, will be paid for by District, unless results of such tests and inspections are found to be not in compliance with Contract Documents, in which case the District will pay all costs for initial testing as well as retesting and reinspection and backcharge the Contractor.
 - a. Costs for tests or inspections which are required to correct deficiencies will be paid by the District and backcharged to the Contractor.

- b. Costs for additional tests or inspections required because of change in materials being provided or change of source or supply will be paid by District and backcharged to the Contractor.
 - c. Cost of testing which is required solely for the convenience of Contractor in his scheduling and performance of work will be paid by the District and backcharged to the Contractor.
 - d. Overtime costs for testing and inspections performed outside the regular work day hours, including weekends and holidays, will be paid for by the District and backcharged to the Contractor. Such costs include overtime costs for the District's Inspector.
5. Testing Laboratory: Separate and identify on the invoices, the costs covering all testing and inspections which are to be backcharged to the Contractor as specified above.

1.07 QUALITY ASSURANCE

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SPECIAL INSPECTIONS AND TESTING

- A. The Code requires special inspections and testing of certain materials, components, assemblies, and connections used in constructing the project. Special inspections and testing will be performed in accordance with the Code.
- B. Tests and inspections are required in accordance with DSA 103 Form.
- C. Special inspections and testing will be performed in accordance with the Code for the following materials and project components:
 - 1. Soils.

3.02 INSPECTION BY HEALTH DEPARTMENT:

- A. CONSTRUCTION INSPECTIONS: Contact the Health Department Plan Checker for a Preliminary Inspection when construction is approximately 80% complete, with plumbing, rough ventilation, and rough equipment installed. Request for inspection should be made at least five (5) working days in advance.
- B. A FINAL INSPECTION MUST be made upon completion of ALL work including finished details. APPROVAL to operate shall not be granted, or remodeled areas approved to operate, until the facility has passed the FINAL INSPECTION, and "APPLICATION TO OPERATE" has been completed and PERMIT FEES have been paid.

3.03 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

- A. Special Inspection Agency shall:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified reference standards.
 - 3. Ascertain compliance of materials and products with requirements of Contract Documents.
 - 4. Promptly notify Architect, Structural Engineer, Division of the State Architect, Project Inspector for District, District, and Contractor of observed irregularities or non-compliance of work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Attend preconstruction meetings and progress meetings.
 - 7. Submit reports of all tests or inspections specified.
 - 8. Complete required DSA Forms.
- B. Limits on Special Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the work.
- C. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- D. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor. CAC 4-335 (b).

3.04 TESTING AGENCY DUTIES AND RESPONSIBILITIES

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.

2. Perform specified sampling and testing of products in accordance with specified standards.
 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
 5. Perform additional tests and inspections required by Architect.
 6. Attend preconstruction meetings and progress meetings.
 7. Submit reports of all tests or inspections specified.
 8. Complete required DSA Forms.
- B. Limits on Testing or Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the work.
- C. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.
- D. Contractor will pay for re-testing required because of non-compliance with specified requirements.
- E. At the completion of the project, Testing Laboratory shall certify in writing and on all required DSA forms, that all work specified or required to be tested and inspected conforms to drawings, specifications and applicable building codes.
1. See Division of the State Architect Procedure DSA PR 13-01.

3.05 CONTRACTOR DUTIES AND RESPONSIBILITIES

- A. Each Multi-Prime Contractor or Subcontractor is required to comply with DSA Construction Oversight Procedure DSA PR 13-01. California Code of Regulations (CCR), Title 24, Part 1, CCR, Chapter 4, Article 1 (Sections 4-211 through 4-220) and Group1, Articles 5 and 6 (Sections 4-331 through 4-344) which provide regulations governing the construction process for projects under the jurisdiction of the Division of the State Architect (DSA).
- B. Contractor Responsibilities, General:
1. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.
 2. Provide incidental labor and facilities:
 - a. To provide access to work to be tested or inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
 - c. To facilitate tests or inspections.
 - d. To provide storage and curing of test samples.

3. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
 4. Arrange with District's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 5. Retain special inspection records.
- C. Submit a written "Statement of Responsibility" to comply with CBC section 1704A.4.
1. Each Contractor responsible for the construction of a main wind- or seismic-force-resisting system, designated seismic system or a wind- or seismic-resisting component listed in the statement of special inspections are required to submit a written statement of responsibility to the Division of the State Architect and the District prior to the commencement of work on the system or component. The "Statement of Responsibility" contains the following:
 - a. Acknowledgment of awareness of the special requirements contained in the statement of special inspections;
 - b. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official;
 - c. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports; and
 - d. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Security requirements.
- E. Vehicular access and parking.
- F. Waste removal facilities and services.
- G. Project identification sign.

1.02 TEMPORARY UTILITIES

- A. District will provide the following:
 - 1. Electrical power, consisting of connection to existing facilities.
 - 2. Water supply, consisting of connection to existing facilities.
- B. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Telephone Land Lines: One line, minimum; one handset per line.
 - 3. Internet Connections: Minimum of one; DSL modem or faster.
 - 4. Email: Account/address reserved for project use.

1.04 TEMPORARY SANITARY FACILITIES

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

- C. At end of construction, return facilities to same or better condition as originally found.

1.05 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.

1.06 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.

1.07 CAFETERIA AND FOOD

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

1.08 SMOKING AND TOBACCO

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

1.09 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.

1.10 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.

1.11 PROJECT IDENTIFICATION

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

1.12 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 13
STORM WATER POLLUTION PREVENTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Preparation, implementation and monitoring of Storm Water Pollution Prevention Plan (SWPPP) for the purpose of preventing the discharges of pollutants from the construction site into the receiving waters. This includes elimination of non-storm water pollution discharges such as improper dumping, spills or leakage from storage tanks or transfer areas.
- B. Compliance with all local, state and federal regulations governing storm water discharges associated with construction activities such as, but not limited to clearing, excavating, grading, demolition and other land disturbances.
- C. Payment of application and annual fees required by the State Water Resources Control Board (SWRCB) for the duration of the construction of the Project.
- D. Submittal of all Permit Registration Documents (PRDs) through the SWRCB SMARTS online system.
- E. Certification that the construction project has met all of the conditions of the General Construction Storm Water Permit (GCSWP).

1.02 REFERENCES

- A. National Pollutant Discharge Elimination System (NPDES) General Permit No CAS000002.
- B. State Water Resources Control Board (SWRCB) Water Quality Order WQ 2022-0057-DWQ.
- C. California Stormwater Quality Association, Stormwater Best Management Practice Handbook, Construction, latest edition.

1.03 RELATED DOCUMENTS

- A. Project Contract, including General, Special and Supplementary Conditions and other General Requirements.

1.04 ACRONYMS AND DEFINITIONS

BMP	Best Management Practice.
CAN	Corrective Action Notice.
CASQA	California Stormwater Quality Association.

COI	Change of Information.
DWQ	Division of Water Quality.
CGP	NPDES General Permit for Storm Water Discharges Associated with Construction Activities.
ELAP	Environmental Laboratory Accreditation Program.
LRP	Legally Responsible Person (OWNER).
NOI	Notice of Intent.
NOT	Notice of Termination.
NPDES	National Pollutant Discharge Elimination System.
OEHS	LAUSD Office of Environmental Health and Safety.
PRDs	Permit Registration Documents, including NOI, Risk Assessment, Site Map, SWPPP, Annual Fee, Signed Certification Statements.
RISK LEVEL	As defined by CGP.
QSD	Qualified SWPPP Developer.
QSP	Qualified SWPPP Practitioner.
QRE	Qualifying Rain Event, is an event that produces 0.5 inches of precipitation with a 48 hour or more period between rain events.
SMARTS	Storm Water Multiple Application and Report Tracking System (smarts.waterboard.ca.gov).
SWPPP	Storm Water Pollution Prevention Plan.
SWRCB	State Water Resources Control Board.
WPCD	Water Pollution Control Drawings.
WDID	Waste Discharge Identification Number.

1.05 SUBMITTALS

- A. The Contractors QSD shall submit the Notice of Intent and all Permit Registration Documents and the Notice of Intent fee required by SWRCB.
- B. The Contractors QSD shall prepare and submit the Storm Water Pollution Prevention Plan for this project to the State Water Resources Control Board (SWRCB) via SMARTS.

- C. The Contractors QSD shall prepare the SWPPP, including the WPCD, Risk Level Determination, and Post Construction Water Balance Calculation. Copies of these documents shall be provided to the Contractor.
- D. Contractor shall submit qualifications and experience of the QSP for Owner's review and acceptance.
- E. Contractor shall submit electronic copies of weekly and quarterly inspections, annual reports, compliance certifications, and test results.
- F. Contractor shall submit the annual report. The General Permit requires all projects that are enrolled for more than one continuous three-month period to submit information and annually certify that their site is in compliance with these requirements. All dischargers must prepare and electronically submit an annual report no later than September 1 of each year using the Storm water Multi-Application Reporting and Tracking System (SMARTS). The Annual Report must include a summary and evaluation of all sampling and analysis results, original laboratory reports, chain of custody forms, a summary of all corrective actions taken during the compliance year, and identification of any compliance activities or corrective actions that were not implemented.
- G. Within 90 days of when construction is complete or ownership has been transferred, the Contractor shall electronically file a Notice of Termination (NOT), a final site map, and photos through the State Water Boards SMARTS system. Filing a NOT certifies that all General Permit requirements have been met.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Storm Water Pollution Prevention Plan: The Contractor's QSD/QSP shall provide the quality, grade and type of materials as specified in Stormwater Best Management Practice Handbook, Construction, latest edition, and State Water Resources Control Board (SWRCB) Water Quality Order WQ 2022-0057-DWQ.
- B. The Contractor shall have available on-site during construction activities a non-stormwater sampling kit suitable for obtaining storm water and non-stormwater quality grab samples. Kit shall include containers and preservatives appropriate for the pollutants known or expected to be in the stormwater. Required sampling equipment shall be adequate to capture and transport samples to a local ELAP State certified water testing lab.
- C. Provide a rain gauge on site to record readings during site inspections.

PART 3 - EXECUTION

3.01 SWPPP IMPLEMENTATION

- A. The Contractor shall hire a Qualified SWPPP Practitioner (QSP), as defined by the Construction General Permit, to implement the Storm Water Pollution Prevention Plan to be consistent with the requirements of SWRCB Water Quality Order WQ 2022-0057-DWQ, and as follows:
- 1) Install perimeter controls and sediment control BMPs prior to starting construction work at the site.
 - 2) Install effective erosion control BMPs at the jobsite.
 - 3) Protect exposed dirt, such as stockpiles, landscaping areas, and hillsides.
 - 4) Properly manage non-storm water discharges such as ground water, broken utility lines and fire hydrant testing per CGP requirements.
 - 5) Contain on-site storm water at the jobsite. Do not drain on-site water directly into the storm drains.
 - 6) QSP to train personnel for the proper implementation of the SWPPP.
 - 7) Revise the SWPPP to suit changing site conditions and also when properly installed systems are ineffective.
 - 8) Adjust BMP's locations and layouts in accordance to construction progress to assure compliance to regulations.
 - 9) Conduct inspections of pollution prevention controls and provide Site Monitoring Report to OAR immediately if pollutants are discharged into the site runoffs. CONTRACTOR shall sample and remediate contaminated water.
 - 10) QSP to perform and oversee all monitoring consistent with the identified Risk Level for the site.
 - 11) Notification and Report: If pollution occurs in the work area for any reason or when the Contractor becomes aware of any violation of this Section, correct the problem and immediately notify the Inspector. In addition, submit a written report to the Project Civil Engineer within seven (7) calendar days describing the incident and the corrective actions taken. If either the Inspector or Engineer is first to observe pollution or a violation, the Contractor shall also explain in the written report why the Work was inadequately monitored.
 - 12) Revise SWPPP to suit changing site conditions and also when properly installed systems are ineffective.
 - 13) Upon Substantial Completion: Maintain and leave post-construction storm water pollution prevention controls in place and remove those that are not needed as determined by the QSD and OAR.
 - 14) QSP shall submit the annual report. All dischargers must prepare and electronically submit an annual report no later than September 1 of each year

using the Storm water Multi-Application Reporting and Tracking System (SMARTS). The Annual Report must include a summary and evaluation of all sampling and analysis results, original laboratory reports, chain of custody forms, a summary of all corrective actions taken during the compliance year, and identification of any compliance activities or corrective actions that were not implemented.

3.02 MONITORING

- A. The Contractor shall conduct examination of storm water pollution prevention controls according to the monitoring requirements identified for the projects risk level as defined by the Construction General Permit.
- B. The Contractor shall prepare and maintain, at the jobsite, a log of each inspection using Site Monitoring Report forms.
- C. The Contractor shall distribute copies of the Owner provided Storm Water Pollution Prevention Plan to their superintendent and subcontractors. At least one (1) copy of the SWPPP shall be available on site at all times.

3.03 SWPPP LIABILITIES AND PENALTIES

- A. Review of the inspection logs by the Owner shall not relieve the Contractor from liabilities arising from non-compliance with storm water pollution regulations.
- B. Payment of Penalties for non-compliance by the Contractor shall be the sole responsibility of the Contractor and will not be reimbursed by the Owner.
- C. Compliance with the Clean Water Act and the State Water Resources Control Board (SWRCB) Water Quality Order WQ 2022-0057-DWQ pertaining to construction activities is the sole responsibility of the Contractor. For any fine(s) levied against the Owner due to non-compliance by the Contractor, the Owner will have the option to either require payment by Contractor of, or deduct from any payments due the Contractor, the total amount of the fine(s) levied on the Owner and associated costs.

3.04 SWPPP CLOSEOUT

- A. Verify the following prior to Substantial Completion of SWPPP:
 - 1) Elements of the SWPPP have been completed.
 - 2) Final stabilization of site, as defined by the GCP, has been demonstrated.
 - 3) There is no potential for construction related storm water pollutants to be discharged into site runoff.
 - 4) Construction related equipment and temporary BMPs have been removed from site.

- 5) Rubbish, debris, and waste materials have been removed and legally disposed of off the Project site.
- 6) Post-Construction BMP Maintenance Plan has been established.

END OF SECTION

SECTION 01 57 23

TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 - GENERAL

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

1.2 DEFINITIONS

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

1.3 LIABILITIES & PENALTIES:

- A. Payment of penalties for non-compliance by CONTRACTOR shall be the sole responsibility of CONTRACTOR.
- B. Compliance with the Clean Water Act pertaining is the sole responsibility of CONTRACTOR. Any fine against OWNER due to non-compliance by CONTRACTOR, OWNER shall recover all costs of the fine by appropriate OWNER Assessment.

PART 2 - EXECUTION

2.1 Construction activity: Comply with the following minimum water quality protection requirements.

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

deposited onto public ways. Immediately sweep up accidental depositions. Do not allow depositions to be washed away by rain or by any other means.

- G. Contain non-stormwater runoff from equipment or vehicle washing and any other activity at the work site.
- H. At completion of the Work, clear the worksite of debris and restore to a condition at least equal to or better than prior to construction.

PART 3 – MAINTENANCE

- 3.1 To ensure the proper implementation and functioning of control measures, the Contractor shall regularly inspect and maintain the construction site. The Contractor shall identify corrective actions and time needed to address any deficient measures or reinitiate any measures that have been discontinued. Inspections of the construction site shall be conducted by the Contractor to identify deficient measures, as follows:
 - 1. Prior to a forecast storm;
 - 2. At 24-hour intervals during extended precipitation events;
 - 3. After all precipitation, which causes runoff capable of carrying sediment from the construction site; and;
 - 4. Routinely, at a minimum of once every week during the rainy season (October 1st – April 30th) and once every month during non-rainy season (May 1st – September 30th).
- 3.2 All temporary and/or permanent post-construction control measures shall be maintained and regularly inspected by the Contractor after all improvements are in place and accepted by the Owner. Temporary and/or permanent post-construction landscaping maintenance shall include but not limited to, watering, seeding, hydro-seeding, matting, slope stabilization, re-vegetation, and any other maintenance control measures recommended by the Owner to insure proper erosion control and plant growth.

END OF SECTION

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

1.04 SUBMITTALS

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

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

1.05 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Drawings and Specifications:
 - 1. If a conflict exists between the Drawings and the Specifications (Project Manual), then the Contractor is to submit a Request for Interpretation from the Architect.
 - a. As noted in the General Conditions, the more stringent requirements govern, including cost of materials and/or installation.
 - 2. If a specific product is indicated on the Drawings for use, then that product is to be used without exception in the location identified.
 - 3. If the Contractor proposes the use of another "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 manufacture for components being replaced.
 1. To the fullest extent possible, provide products of the same kind from a single source. Products required to be supplied in quantity shall be the same product and interchangeable throughout the Work.

2. When options are specified for the selection of any of two or more products, provide product selected to be compatible with products previously selected.
- F. Product Nameplates and Instructions:
1. Except for required Code-compliance labels and operating and safety instructions, locate nameplates on inconspicuous, accessible surfaces. Do not attach manufacturer's identifying nameplates or trademarks on surfaces exposed to view in occupied spaces or to the exterior.
 2. Provide a permanent nameplate on each item of service-connected or power-operated equipment. Nameplates shall contain identifying information and essential operating data such as the following example:
 - a. Name of manufacturer
 - b. Name of product
 - c. Model and serial number
 - d. Capacity
 - e. Operating and Power Characteristics
 - f. Labels of Tested Compliance with Codes and Standards
 3. Refer to additional requirements which may be specified in various sections, as included in this Project Manual.
 4. For each item of service-connected or power-operated equipment, provide operating and safety instructions, permanently affixed and of durable construction, with legible machine lettering. Comply with all applicable requirements of authorities having jurisdiction and listing agencies.
- G. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to CEC, include lugs for terminal box.

2.05 PRODUCT OPTIONS

- A. Unless the specifications state that no substitution is permitted, whenever the Contract Documents indicate any specific article, device, equipment, product, material, fixture, patented process, form, method, or type of construction or any specific name, make, trade name, or catalog number, with or without the words "or equal," such specification shall be deemed to be used for the purpose of facilitating description of the material, process, or article desired and shall be deemed to be followed by the words "or equal."
1. See Section 01 25 00 - Substitution Procedures.
- B. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
1. Reference Standards:
 - a. Where Specifications require compliance with a standard, provided product shall fully comply with the standard specified.
 - b. Refer to general requirements specified in Section 01 42 19 - Reference Standards regarding compliance with referenced standards, standard specifications, codes, practices and requirements for products.

2. Product Description:
 - a. Where Specifications describe a product, listing characteristics required, with or without use of a brand name, provide a product that has the specified attributes and otherwise complies with specified requirements.
3. Performance Requirements:
 - a. Where Specifications require compliance with performance requirements, provide product(s) that comply and are recommended by the manufacturer for the intended application.
 - b. Verification of manufacturer's recommendations may be by product literature or by certification of performance from manufacturer.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named, prior to bid .
- D. Products Specified by Identification of Manufacturer and Product Name or Number:
 1. "Specified Manufacturer": Provide the specified product(s) of the specified manufacturer.
 - a. If only one manufacturer is specified, without "acceptable manufacturers" being identified, provide only the specified product(s) of the specified manufacturer.
 - b. If District standard is indicated make all efforts to provide that product.
 - c. If the phrase "or equal" or "approved equal" is stated or reference is made to the "or equal provision," products of other manufacturers may be provided if such products are equivalent to the specified product(s) of the specified manufacturer.
 - 1) Equivalence shall be demonstrated by submission of information in compliance with requirements of Section 01 25 00 - Substitution Procedures.
 2. "Acceptable Manufacturers":
 - a. Product(s) of the named manufacturers, if equivalent to the specified product(s) of the specified manufacturer, will be acceptable in accordance with the requirements of Section 01 25 00 - Substitution Procedures.
 - 1) Exception: Considerations regarding changes in Contract Time and Contract Sum will be waived if no increase in Contract Time or Contract Sum results from use of such equivalent products.
 3. Unnamed manufacturers: Product(s) of unnamed manufacturers will be acceptable **when disclosed during the bidding period** and only as follows:
 - a. Unless specifically stated that substitutions will not be accepted or considered, the phrase "or equal" shall be assumed to be included in the description of specified product(s).
 - b. Equivalent products of unnamed manufacturers will be accepted in accordance with the "or equal" provision specified herein, below.
 - c. If provided, prior to bid, products of unnamed manufacturers shall be subject to the requirements of Section 01 25 00 - Substitution Procedures.
 4. Quality basis:

- a. Specified product(s) of the specified manufacturer shall serve as the basis by which products by named acceptable manufacturers and products of unnamed manufacturers will be evaluated.
 - b. Where characteristics of the specified product are described, where performance characteristics are identified or where reference is made to industry standards, such characteristics are specified to identify the most significant attributes of the specified product(s) which will be used to evaluate products of other manufacturers.
- E. Products Specified by Combination of Methods: Where products are specified by a combination of attributes, including manufacturer's name, product brand name, product catalog or identification number, industry reference standard, or description of product characteristics, provide products conforming to all specified attributes.
- F. "Or Equal" Provision: Where the phrase "or equal" or the phrase "or approved equal" is included, equivalent product(s) of unnamed manufacturer(s) may be provided as specified above in subparagraph titled "Unnamed manufacturers" and Section 01 25 00 - Substitution Procedures with the following conditions:
 - 1. The requirements of Section 01 25 00 - Substitution Procedures applies to products provided under the "or equal" provision.
 - a. Exception: If the proposed product(s) are determined to be equivalent to the specified product(s) of the specified manufacturer, the requirement specified for substitutions to result in a net reduction in Contract Time or Contract Sum may be waived.
 - 2. Use of product(s) under the "or equal" provision shall not result in any delay in completion of the Work, including completion of portions of the Work for use by District or for work under separate contract by District.
 - 3. Use of product(s) under the "or equal" provision shall not result in any costs to the District, including design fees and permit and plan check fees.
 - 4. Use of product(s) under the "or equal" provision shall not require substantial change in the intent of the design, in the opinion of the Architect.
 - a. The intent of the design shall include functional performance and aesthetic qualities.
 - 5. The determination of equivalence will be made by the Architect and District, and such determination shall be final.
- G. Visual Matching:
 - 1. Where Specifications require matching a sample, the decision by the Architect on whether a proposed product matches shall be final.
 - 2. Where no product visually matches but the product complies with other requirements, comply with provisions for substitutions for selection of a matching product in another category.
- H. Visual Selection of Products:

1. Where requirements include the phrase "as selected from manufacturer's standard colors, patterns and textures", or a similar phrase, selections of products will be made by indicated party or, if not indicated, by the Architect. The will select color, pattern and texture from the product line of submitted manufacturer, if all other specified provisions are met.
2. The Architect will select color, pattern and texture from the product line of submitted manufacturer, if all other specified provisions are met.

2.06 MAINTENANCE MATERIALS

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

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

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

3.02 OWNER-SUPPLIED PRODUCTS

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

3.03 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

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

3.04 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
 - 1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.
- C. Inspection Provisions: Arrange storage to provide access for inspection and measurement of quantity or counting of units.
- D. Structural Considerations: Store heavy materials away from the structure in a manner that will not endanger supporting construction.
- E. Store and protect products in accordance with manufacturers' instructions.
- F. Store with seals and labels intact and legible.
- G. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.
- H. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- I. For exterior storage of fabricated products, place on sloped supports above ground.
 - 1. Place products on raised blocks, pallets or other supports, above ground and in a manner to not create ponding or misdirection of runoff.
- J. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

1. Execute a formal supplemental agreement between District and Contractor allowing off-site storage, for each occurrence.
- K. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
 1. Periodically inspect to ensure products are undamaged, and are maintained under required conditions.
 2. Remove and replace products damaged by improper storage or protection with new products at no change in Contract Sum or Contract Time.
 3. Weather-Resistant Storage:
 - a. Store moisture-sensitive products above ground, under cover in a weathertight enclosure or covered with an impervious sheet covering. Provide adequate ventilation to avoid condensation.
 - b. Maintain storage within temperature and humidity ranges required by manufacturer's instructions.
 - c. Store loose granular materials on solid surfaces in a well-drained area. Prevent mixing with foreign matter.
- L. Comply with manufacturer's warranty conditions, if any.
- M. Do not store products directly on the ground.
- N. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- O. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- P. Prevent contact with material that may cause corrosion, discoloration, or staining.
- Q. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- R. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

3.05 INSTALLATION OF PRODUCTS

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

3.06 PROTECTION OF COMPLETED WORK

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

END OF SECTION

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

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for VOC-Content-Restricted products.
- B. 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.

1.03 DEFINITIONS

- A. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Exterior paints and coatings.
 - 2. Exterior adhesives and sealants, including flooring adhesives.
 - 3. Other products when specifically stated in the specifications.
- B. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- C. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

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. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products.
- D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.
- E. GreenSeal GS-36 - Standard for Adhesives for Commercial Use.
- F. SCAQMD 1113 - Architectural Coatings.
- G. SCAQMD 1168 - Adhesive and Sealant Applications.
- H. SCS (CPD) - SCS Certified Products.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.
- C. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of installer's products, or 2) that such products used comply with these requirements.
 - 1. Use the form following this section for installer certifications.
- D. Verification of compliance with VOC limits as specified in the CalGreen Code Section 5.504 shall be provided at the request of the Building Inspector.
 - 1. Product certification and specifications.
 - 2. Chain of custody certifications.
 - 3. Product, labeled and invoiced as meeting the Composite Wood Products regulation.
 - 4. Exterior grade products marked as meeting the PS-1 or PS-2 standards of the Engineered Wood Association, the Australian AS/NZS 2269 or European 636 3S standards
 - 5. Other methods approved by the building official.

1.06 QUALITY ASSURANCE

- A. 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.
- B. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scs-certified.com.
 - b. Report of laboratory testing performed in accordance with requirements.
 - c. Published product data showing compliance with requirements.
 - d. Certification by manufacturer that product complies with requirements.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

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

2.02 MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. 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.
- C. 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 College Administration, Business and Criminal Justice Demolition
- B. Project No.: 21247.00
- C. Architect: tBP/Architecture

1.02 USE OF THIS FORM:

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

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

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

2.01 PRODUCT CERTIFICATION

- A. I certify that the installation work of my firm on this project:
 - 1. [HAS] [HAS NOT] required the use of any ADHESIVES.
 - 2. [HAS] [HAS NOT] required the use of any JOINT SEALANTS.
 - 3. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.
 - 4. [HAS] [HAS NOT] required the use of any COMPOSITE WOOD or AGRIFIBER PRODUCTS.
- B. Product data and MSDS sheets are attached.

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

- A. Firm Name: _____
- B. Print Name: _____
- C. Signature: _____
- D. Title: _____ (officer of company)
- E. Date: _____

END OF SECTION

SECTION 01 70 00 EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures.
- C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- D. 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.
- E. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.
- 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 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.
- I. 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 Engineer, 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 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.
- C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in California.

1.06 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water.
- C. Perform dewatering activities, as required, for the duration of the project.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Application of Controls: Regular application of water for dust suppression
 - 2. Site Management: Install wind barriers with less than 50% porosity, cover haul trucks, and limit vehicle speeds on unpaved roads to 5 mph. Avoid high-dust-generation work on high-wind days.
 - 3. Equipment & Procedures: Utilize dust containment devices on tools, use spray systems for demolition, and install wheel wash stations at site exits.
 - 4. Monitoring & Compliance: Daily visual emissions inspections (e.g., EPA Method 9/22) and maintaining a comprehensive dust control plan that addresses all potential, active sources.
 - 5. Regulatory Focus: Adherence to specific local, state, or federal guidelines (such as Caltrans 2022 Standard Specifications Section 17, which dictates that failure to control dust may result in work suspension)
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

- H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

- A. 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.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with site utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate completion and clean-up of work of separate sections.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

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

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

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

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

- H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- I. Periodically verify layouts by same means.
- J. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. Dimensions for Accessibility:
 - 1. Conventions: See CBC Chapter 11B Figure 11B-104. Dimensions that are not stated as "maximum" or "minimum" are absolute.
 - 2. Tolerances shall be per CBC Chapter 11B-104.1.1 "Construction and manufacturing tolerances. All dimensions are subject to conventional industry tolerances except where the requirement is stated as a range with specific minimum and maximum end points."
- B. In addition to compliance with regulatory requirements, conduct construction operations in compliance with CBC Chapter 33, CFC Chapter 33, CFC Chapter 35, and NFPA 241, including applicable recommendations in Appendix A.
 - 1. When welding or doing other hot work, comply with CFC Chapter 35.
 - 2. Provide a Site Fire Safety Plan in coordination with the local fire authority. Comply with DSA BU 24-05.
 - a. A Site Fire Safety Plan and form DSA 102-IC: Construction Start Notice/Inspection Card Request for submittal through the Architect to the Division of the State Architect.
 - b. At a minimum, the site fire safety plan shall include the following information required in CFC Section 3303.1.1.
 - 1) Name and contact information of site safety director.
 - 2) Documentation of training of the site safety director and fire watch personnel.
 - 3) Procedures for reporting emergencies.
 - 4) Fire department vehicle access routes.
 - 5) Locations of fire protection equipment, including portable fire extinguishers, standpipes, fire department connections and fire hydrants.
 - 6) Smoking and cooking policies, designated area to be used where approved, and signage locations in accordance with CFC Section 3305.8.
 - 7) Location and safety considerations for temporary heating equipment.
 - 8) Hot work (welding, roofing, etc.) plan.
 - 9) Plans for control of combustible waste.
 - 10) Locations and methods for storage and use of flammable and combustible liquids and other hazardous materials.

- 11) Provisions for site security.
- 12) Changes that affect this plan.
- 13) Other site specific information requested by the local fire authority (LFA).
- C. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- D. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- E. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- F. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- G. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 .
- C. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on drawings.
 - 3. Relocate items indicated on drawings.
 - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 - 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- D. 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.
- E. Protect existing work to remain.
1. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 2. Repair adjacent construction and finishes damaged during removal work.
- F. 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 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.
- G. 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.
- H. Refinish existing surfaces as indicated:
- I. Clean existing systems and equipment.
- J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- K. Do not begin new construction in alterations areas before demolition is complete.
- L. 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 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 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 Construction Manager for suitability and compatibility. Use no cleaning agents and materials without approval as noted above.
 - 2. Cleaning Procedures: All cleaning processes, agents and materials shall be subject to Architect, District and/or Construction Manager review and approval. Processes and degree of cleanliness shall be as directed by Architect, District and/or Construction Manager.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from area drains and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 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, 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.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and District.
- B. Accompany District and Architect 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 Construction Manager, 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 Construction Manager, 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 Construction Manager, the Architect and the Architect's and District's consultants are required to review completion and correction of the Work, the costs of additional visits shall be reimbursed to the District by the Contractor by deducting such costs from the Final Payment.
- 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.

3.15 FINAL PAYMENT

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

3.16 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. Surveying requirements for the Work.

1.02 RELATED SECTIONS

- A. Section 31 22 00: Grading
- B. Section 31 10 00: Site Clearing

1.03 SURVEY SERVICE

- A. The CONTRACTOR shall provide all surveying services.

1.04 PAYMENT FOR SURVEYING

- A. The payment for surveying shall be included in respective items of work and shall include, but not to be limited to, construction staking, location and/or relocation of conflicting utilities, locating survey monuments, professional office services and field calculations, and furnishing all labor, materials, tools, equipment and incidentals for doing all work involved. No additional compensation shall be allowed unless a separate bid item is provided.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 SUBMITTALS

- A. CONTRACTOR shall submit the name and address of the State of California licensed surveyor to CMR, ARCHITECT and OWNER including any changes as they may occur.
- B. CONTRACTOR shall submit to OWNER and/or CMR, ARCHITECT copies of cut sheets, coordinate plots, data collector printouts, and other documentation as available to verify completeness and/or accuracy of field surveying work.
- C. Statement of Compliance: CONTRACTOR shall submit a statement of certification signed and sealed by Surveyor, counter-signed by CONTRACTOR indicating compliance with grade elevations, slopes and tolerances.

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

3.02 LAYOUT OF THE WORK

- A. CONTRACTOR shall employ a State of California licensed surveyor to lay out the entire Work, set grades, lines, levels, control points, vertical and horizontal control, elevations, grids and positions. Before the commencement of Work, surveyor shall, in conjunction with OWNER and CMR provided engineering survey of the Project site, locate all reference points and benchmarks, then lay out all lines, elevations, and measurements for the entire Work including but not limited to, buildings, grading, paving and utilities.
- B. All work under this contract shall be built in accordance with the lines and grades shown on the plans. Field survey for establishing these, and for the control of construction, shall be the responsibility of the Contractor. All such survey work including construction staking shall be done under the supervision of a California Licensed Land Surveyor or authorized Civil Engineer. Staking shall be done on all items ordinarily requiring grade and alignment, at intervals normally accepted by the agencies and trade involved.
- C. The CONTRACTOR shall be responsible for any errors in the finished work, and shall notify the Engineer, in writing, within 24 hours, of any discrepancies, or design errors during the construction staking.
- D. Contractor shall immediately remediate any areas found not to meet specification requirements.
- E. An electronic autocad files of the survey of existing conditions and new work is available for information. Instructions for a request for an electronic file are specified in Section 01 35 50 Request for Electronic Files.

3.03 SURVEY REQUIREMENTS

- A. Establish a minimum of two permanent horizontal and vertical control points on the Project site, remote from the site area, referenced to data established by the survey control points.
- B. Indicate the reference points on the project record drawings with the basis of elevation being the established benchmarks.
- C. Establish lines, grades, locations and dimensions by instrumentation. From time to time, verify the layout of all Work by the same methods.
- D. Provide grade stakes and elevations to construct over excavation and re-compaction, rough and final grades, paved areas, curbs, gutters, sidewalks, building pads, landscaped areas, and other areas as required.

- E. Calculate and layout proposed finished elevations and intermediate control as required to provide smooth transitions between the spot elevations indicated in the Contract Documents.
- F. Provide stakes and elevations for grading, fill, and topsoil placement.
- G. Provide adequate horizontal and vertical control to locate utility lines, including but not limited to, storm, sewers, water mains, gas, electric and signal and provide vertical control in proportion to the slope of the line as required for accurate construction. Dry utilities will be based upon adequate horizontal and vertical control layout. Prior to trench closure, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished concrete or AC surfaces at key locations such as BC's, EC's, grade breaks, corners or angle points in sufficient number to demonstrate the Work complies with the intent of the Contract Documents.
- H. Provide horizontal and vertical control for batter boards for drainage, utility, and other on-site structures as required.
- I. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within the building pad perimeter adequate to control both over excavation and re-compaction and the final sub-grade elevation of the building pad.

3.04 ESTABLISHMENT OF GRADES IN HARDSCAPE AREAS

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

3.05 RECORD DRAWINGS

- A. Upon Substantial Completion, CONTRACTOR shall obtain and pay for reproducible transparencies of the as built survey drawings. Deliver to ARCHITECT, final "record" drawings of the original drawings and completed Work within specified tolerances.

- B. Record drawings shall indicate locations by coordinate of all utilities onsite with top of pipe elevations at major grade and alignment changes, rim grate or top-of-curb and flow line elevations of all drainage structures and manholes.
- C. Completed record drawing transparencies shall be signed and certified as correct and within specified tolerances by the licensed surveyor.
- D. Attention is called to other sections of the Contract Documents requiring verification or measurements of installed Work by survey. Surveyor shall perform and certify all such surveys or verification are completed in accordance with the Contract Documents.

END OF SECTION

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/calmax/.
 - 1) A free service designed to help businesses find markets for non-hazardous materials they have traditionally discarded.
 - b. General Recycling/Reuse Centers: For information on qualified local solid waste haulers contact the California Department of Resources Recycling and Recovery - CalRecycle. The website lists wastes recycling facilities in counties throughout the State of California.
 - 1) www.calrecycle.ca.gov.
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 Management Plan: Include the following information:
- D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - a. Inert materials shall achieve a construction waste diversion rate of at least 95 percent.
 - 1) These materials include, but are not limited to, concrete, asphalt and rock.
 - 2) Earthwork is not included.
 - 3) Excavated soil shall not be included in any of the calculations used to ensure compliance with this specification section.
 - b. The overall diversion rate must be based on weight.

- c. The diversion rate of individual materials can be measured in either weight or volume, but the rate shall be converted into the units selected for calculating the overall diversion rate.
 - 1) All individual material diversions must be converted to a consistent set of units when calculating the overall diversion rate for the all reports and submittals required for the Work.
 - d. 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.						
Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) D	08	DEF Landfill, Los Angeles	2	35		
b. Total Disposal				0	0	0

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

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

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

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

Notes:

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

CONTRACTOR'S REUSE, RECYCLING, AND DISPOSAL REPORT

(Submit With Each Progress Payment)

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

CONTRACTOR'S REUSE, RECYCLING, AND DISPOSAL REPORT

Continued

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

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

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

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

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

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

SECTION 01 78 00 CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. District issued Bidding Instructions and Contract General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 45 33 - Code-Required Special Inspections and Procedures: Construction oversight procedures by DSA regarding the execution, approval, and closeout of this building project.
- D. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- E. Section 01 78 39 - Project Record Documents: Detailed requirements.
- F. Individual Product Sections: Specific requirements for operation and maintenance data.
- G. Individual Product Sections: Warranties required for specific products or Work.
 - 1. Special Project warranty requirements for specific products or elements of the Work; commitments and agreements for continuing services to District.

1.03 DEFINITIONS

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

1.04 SUBMITTALS

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

- f. All signatures shall be notarized.
- 5. Subcontractor List: Submit 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.

1.05 WARRANTIES AND GUARANTEES

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

- D. Specific Warranty and Guarantee Requirements: Specific requirements are included in product Specifications 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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. See also Section 01 78 39 - Project Record Documents.
- B. Record Documents are to be maintained and submitted in searchable live electronic format (PDF), unflattened.
 - 1. Develop in compliance with Section 01 30 00 - Administrative Requirements.
 - 2. Acceptable markup software:
 - a. Adobe Acrobat Professional.
 - b. Bluebeam Revu.
- C. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Contract Drawings.
 - 2. Project Manual with Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- D. Ensure entries are complete and accurate, enabling future reference by District.
- E. Store record documents separate from documents used for construction.
- F. Record information concurrent with construction progress.
- G. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
 - 4. Provide copies of all approved addenda, directives, corrections, and change orders affecting the associated project.
 - a. These copies shall be included with the "Bid Set" and/or "Record Set" listed above and formatted as detailed above.
- H. Record Drawings and 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 Construction Manager.
 - 2. Measured depths of foundations in relation to finish first floor datum.

3. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
4. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
5. Field changes of dimension and detail.
6. Details not on original Contract drawings.
 - a. Application of copies of details produced and provided by Architect during construction will be accepted.
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.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 - 1. Parts Data:
 - a. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams as necessary for service and maintenance.

- b. Include complete nomenclature and catalog numbers for consumable and replacement parts.
 - c. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in stock by the District or operator.
- O. Include test and balancing reports.
- P. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

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

4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with District's permission, leave date of beginning of time of warranty until Date of Final Acceptance is determined.
- B. Project Warranty and Guarantee Forms:
 1. Example forms for special Project warranties and guarantees are included at the end of this Section.
 2. Prepare written documents utilizing the appropriate form, ready for execution by the Contractor, or the Contractor and subcontractor, supplier or manufacturer.
 - a. Submit a draft to District through Architect for approval prior to final execution.
 3. Refer to product Technical 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.
- C. Manufacturer's Guarantee Form:
 1. Manufacturer's guarantee form may be used in lieu of special Project form included at the end of this Section.
 2. Manufacturer's guarantee form shall contain appropriate terms and identification, ready for execution by the required parties.
 3. If proposed terms and conditions restrict guarantee coverage or require actions by District beyond those specified, submit draft of guarantee to District through Architect for review and acceptance before performance of the Work.
 4. In other cases, submit draft of guarantee to District through Architect for approval prior to final execution of guarantee.
- D. Signatures: Signatures shall be by person authorized to sign warranties, guarantees and bonds on behalf of entity providing such warranty, guarantee or bond.
- E. Co-Signature: All installer's warranties and bonds shall be co-signed by Contractor. Manufacturer's guarantees will not require co-signature.
- F. Verify that documents are in proper form, contain full information, and are notarized.
- G. Co-execute submittals when required.
- H. Retain warranties and bonds until time specified for submittal.

- I. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- J. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
 - 1. If more than one volume of warranties, guarantees and bonds is produced, identify volume number on binder.
- K. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- L. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- M. Form of Warranty and Bond Submittals:
 - 1. Prior to final Application and Certificate for Payment, compile two copies of each required warranty, guarantee and bond, properly executed by Contractor, or jointly by Contractor, subcontractor, supplier, or manufacturer.
 - 2. Collect and assemble all written warranties and guarantees into binders and deliver binders to District for final review and acceptance.
 - 3. Include Table of Contents for binder, neatly typed, following order and Section numbers and titles as used in the Project Manual.
 - 4. Provide heavy paper dividers with celluloid or plastic covered tabs for each separate warranty.
 - a. Mark tabs to identify products or installation, and Section number and title.
 - 5. Include on separate typed sheet, if information is not contained in warranty or guarantee form, a description of the product or installation, and the name, address, telephone number and responsible person for applicable installer, supplier and manufacturer.
 - 6. When operating and maintenance data manuals are required for warranted construction, include additional copies of each required warranty and guarantee in each required manual.
 - a. Coordinate with requirements listed in the prior articles for operating and maintenance data manuals.

3.07 TIME OF WARRANTY AND BOND SUBMITTALS

- A. Submission of Preliminary Copies:
 - 1. Unless otherwise specified, obtain preliminary copies of warranties, guarantees and bonds within ten days of completion of applicable item or Work.
 - 2. Prepare and submit preliminary copies for review as specified herein.
- B. Submission of Final Copies:

1. Submit fully executed copies of warranties, guarantees and bonds within ten days of date identified in Certificate of Completion but no later than three days prior to date of final Application for Payment.
- C. Date of Warranties and Bonds:
1. Unless otherwise directed or specified, commencement date of warranty, guarantee and bond periods shall be the date established in the Certificate of Completion.
 2. Warranties for Work accepted in advance of date stated in Certificate of Completion:
 - a. When a designated system, equipment, component parts or other portion of the Work is completed and occupied or put to beneficial use by District:
 - 1) By separate agreement with Contractor, prior to completion date established in the Certificate of Completion, submit properly executed warranties to District within ten days of completion of that designated portion of the Work.
 - 2) List date of commencement of warranty, guarantee or bond period as the date established in the Certificate of Completion.
 3. Warranties for Work not accepted as of date established in the Certificate of Completion:
 - a. Submit documents within ten days after acceptance, listing date of acceptance as beginning of warranty, guarantee or bond period.
- D. Duration of Warranties and Guarantees:
1. Unless otherwise specified or prescribed by law, warranty and guarantee periods shall be not less than the Correction Period required by the Conditions of the Contract.
 2. In no case, the period is to be less than one year from the date established for completion of the Project in the Certificate of Completion.
 3. See product Specifications Sections of the Project Manual for extended warranty and guarantee beyond the minimum one year duration.

END OF SECTION

SECTION 01 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.
- 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 Construction Manager.
 - 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 Construction Manager for resolution.
4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 01 35 50 - Requests for Electronic Files for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
 1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Architect and Construction Manager 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 Construction Manager.
 - 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 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.

3.04 RECORD SAMPLES

- A. Immediately before date of Substantial Completion, meet with District or Construction Manager at Project site to determine which Samples maintained during the construction period are to be transmitted to District or Construction Manager for record purposes.
- B. Comply with District or Construction Manager's instructions for packaging, identification, marking, and delivery to District or Construction Manager's Sample storage space. Dispose of other Samples in the manner specified for disposing surplus and waste materials

3.05 RECORD PHOTOS

- 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.

3.06 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.

3.07 SUBMISSION

- A. Keep Project Record Documents current, as they will be reviewed for completeness by Architect, Engineer, Project Inspector, and Construction Manager; 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 Construction Manager for review, approval and further processing.

3.08 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 Construction Manager 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 Construction Manager reference during normal working hours.

END OF SECTION

SECTION 02 41 00 DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building demolition .
 - 1. A hazardous materials survey document has been performed for this project. Remediation for hazardous materials is specified in this document and is part of the scope of work.
- 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 wet and dry utility lines outside of utility easement.
 - c. Pavement cutting and removal.
 - d. Debris removal.
 - e. Site furnishings
 - f. Irrigation system.
 - g. Fencing and site walls.
 - h. Light standards
 - 2. Handling and disposal of removed materials.
 - 3. Dewatering of excavations as necessary to control surface and sub-surface water.
- C. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 10 00 - Summary: Description of items to be removed by District.
- C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- D. Section 01 57 23 - Temporary Storm Water Pollution Control.
- E. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- F. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- G. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

- H. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal; earth stripping and stockpiling.
- I. Section 31 22 00 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

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 Construction Manager, supervisory and quality control personnel of Contractor and all subcontractors performing this and directly-related Work.
- D. Submit minutes of meeting to District, Project Inspector and Architect, for Project record purposes.
- E. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.06 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 Construction Manager and other designated representatives to review any salvageable items to determine if District wants to retain ownership, and discuss Contractor's Waste Management and Recycling Plan.
- B. Storage or sale of removed items or materials on-site will not be permitted without advance written approval from Construction Manager.

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 entire buildings as indicated on Overall Site Demo Plan Plan D-1 and Partial Plans D-1.1, D-1.2 and D-1.3
 - 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.
 - f. Remove concrete pile caps. Piles may remain in place
- 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 required so that required rough grade elevations do not subside within one year after completion.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Conform to the relevant Article of the General Conditions, South Coast Air Quality Management District and other applicable regulatory procedures when discovering hazardous or contaminated materials.
- B. Selective Demolition of Site and Building Elements:
 1. Use techniques acceptable to authorities having jurisdiction and which will achieve intended results and provide protection of surrounding features to remain.
 2. Some items may have been demolished prior to Work of this Contract. Verify existing conditions prior to start of demolition. If items are or have been demolished contact the Architect.
 3. Some items may require postponement of demolition until late in Contract Time period.
 4. Phase demolition as necessary to provide adequate interfacing of related Work.
 5. Demolish in an orderly and careful manner. Protect existing foundations, retaining walls, utility structures, other structures and finish materials to remain.
- C. Field Measurements and Conditions:
 1. Survey existing conditions and correlate with requirements indicated to determine extent of demolition and recycling required.
 2. In addition to provisions of the Conditions of the Contract, verify dimensions and field conditions prior to construction. Verify condition of substrate and adjoining Work before proceeding with demolition Work. If conflict is found notify Construction Manager, Project Inspector and Architect.
- D. Comply with 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 Construction Manager.

- 2) Barriers shall control dust, debris and provide protection for persons occupying and using adjacent facilities.
 - 3) Maintain protected egress and access at all times, in accordance with requirements of authorities having jurisdiction.
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 REMOVED AND SALVAGED ITEMS

- A. Clean salvaged items.
- B. Pack or crate items after cleaning. Identify contents of containers.
- C. Store items in a secure area until delivery to the District.
- D. Transport items to the District storage area on-site designated by District.
- E. Protect items from damage during transport and storage

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

09 22 10 FOUNTAIN PLASTER

PART 1- GENERAL SECTION

1.01 Division 1 and the General Conditions apply to all Work of this Section.

1.02 Description:

- A. Work Included: All preparation of swimming pool structures and labor and materials required to provide swimming pool plaster as indicated on the Drawings and herein specified. Phases of the Work include the surface preparation of the concrete vessel before receiving plaster. The process includes applying an initial plaster bond coat and applying a plaster finish coat. Proper surface preparation is essential to the Work; no plaster shall be applied until all surfaces have been reviewed and ready to proceed.
- B. Prepare the pool concrete surface to receive plaster by ensuring the concrete's texture is a minimum of a heavy broom finish to provide a positive bonding between the concrete pool vessel and the plaster's application. The creation of a bondable surface or "tooth" must be provided. If a finish of the concrete substrate is not as rough as required, then distressing the concrete surfaces to receive plaster and applying a bond coat will be necessary and added to the scope of Work.
- C. Thoroughly clean the concrete surface of any plaster laitance and disposing of the same, cleaning to be done with a high-pressure washer. Wetting of surface to be plastered just before placement of plaster is also required.

1.03 Quality Assurance:

- A. Qualifications of Workers:
 - 1. The installer for this portion of the Work shall have been successfully engaged in the business of swimming pool plastering for at least five (5) years immediately before the commencement of this Work. It shall demonstrate to the District's Representative a record of satisfactory workmanship.
 - 2. For actual plastering and finish operations, use only thoroughly trained and experienced plasterers who are completely familiar with the specified materials and methods.
 - 3. Provide at least one person who shall be present during the execution of this portion of the Work, thoroughly familiar with the materials and methods specified, and who shall direct all Work performed under this Section.
- B. Standards: Swimming pool plaster shall comply with the State and Local Health Department's published standards as they apply to the material and services furnished herein. Also, meet requirements of applicable portions of most current editions of the following:
 - 1. ASTM: American Society for Testing Materials.
 - 2. CCR-T19: California Code of Regulations- Title 19, Public Safety.
 - 3. CCR-T21: California Code of Regulations- Title 21, Public Works.
 - 4. CCR-T22: California Code of Regulations- Title 22, Health and Safety.

1.04 Submittals:

- A. Provide submittals in accordance with Section 01 30 00.
 - 1. A list of materials to be incorporated into the Work by brand name, descriptive data, catalog number, brochures, or descriptive literature to identify the specified material and its proportion positively.
- 1.05 Product Handling:
 - A. Delivery: Deliver materials to the Project Site in the manufacturer's original unopened containers with all labels intact and legible.
 - B. Storage: Store materials as unopened containers undercover to prevent damage and contamination, and store only the specified materials at the Project Site.
 - C. Protection: Use all means necessary to protect the swimming pool plaster before, during, and after installation and protect all other trades' installed Work and materials.
 - D. Replacements: In the event of damage, immediately make all repairs and replacements necessary upon reviewing the District's Representative.
- 1.06 Environmental Conditions:
 - A. Plaster application shall only be applied when unsuitable conditions of weather or temperature exist. Plaster shall not be placed if the prevailing temperature is 40 degrees Fahrenheit or less.
 - B. Do not install plaster during rain or inclement weather. If precipitation commences after plastering has begun, immediately protect the plaster, by all means necessary, until the plaster has set.
 - C. Do not install plaster during wind greater than ten (10) mph. If wind commences after plastering begins, immediately protect the plaster, by all means necessary, until the plaster has set.

PART 2 - PRODUCTS

- 2.01 Plaster Thickness: Plaster shall be placed and finished to a true and even surface within established trade practice limits. Thickness from the face of the reinforced, cast-in-place concrete structure (substrate) to the finished plaster surface shall be at least 3/8 inches on the floor and walls.
 - A. Cement: Swimming pool plaster cement shall be white Portland cement conforming to ASTM C-150, Type I, Waterproofed White, as manufactured by Atlas Cement Corporation (Lehigh White) or by Gifford Hill Corporation (Riverside White) or approved equal.
 - B. Aggregate: Swimming pool aggregate shall be clean, pure (washed) white, and free of all organic and inorganic matter injurious to plaster finish. Approved products are Georgia Marble or Wyoming Marble, Riverside Premium Pool Aggregate, Pfizer Pool Aggregate, or approved equal.
 - C. Water: Water for swimming pool plaster shall be clean and free of oil, acid (between pH of 7 & 8), and organic matter injurious to plaster.
- 2.02 Mixing of Plaster: Shall be mixed in mechanical mixers. Frozen cakes or lumped material shall not be utilized. Each batch shall be accurately proportioned by volume measured by manual or mechanical devices, mixed with the minimum amount of water until uniform color and consistency. Re-tempering will not be permitted: plaster that has begun to set must be discarded. Proportioning and mixing for machine application shall be:
 - One part of Portland white cement
 - Two parts of marble sand

One gallon "Acryl 60" concentrate or four gallons regular strength solution. Potable water is required to achieve a slump of (5") five inches utilizing a concrete slump cone to measure. If a standard plaster slump cone is utilized for measurement – the slump is two and one-half inches (2 ½") maximum.

- 2.03 Preparation: Prepare the substrate (concrete or gunite) surface until suitable to receive plaster application by the District's Representative before applying for plasterwork.
- A. The six-inch band of plaster and concrete immediately beneath the waterline tile shall be chipped out around the entire perimeter of the pool, which will ensure a plaster thickness of three-quarters of an inch. No old plaster (if any) will be allowed to remain on the concrete substrate in the area described.
 - B. A six-inch area of concrete immediately around all pool light fixtures, inlets, skimmers, main drains, etc., shall be removed to ensure a plaster thickness of three-quarters of an inch around such items. No old plaster (if any) will be allowed to remain on the concrete substrate in the area described.
 - C. High pressure wash the concrete surface, which receives the plaster finish to remove any sand, debris, dust, and laitance of any type.
- 2.04 Application Sequence: A two-coat process shall be applied to all concrete or gunite surfaces in the pool interior.
- A. Temperature: The ambient temperature shall be above 40 degrees and below 100 degrees Fahrenheit a week before and during the proposed application. Fans and baffles shall be provided, when necessary, for adequate ventilation and circulation to avoid overheating.
 - B. Bond Coat: Pneumatically apply an initial bond coat of plaster – filling all corners and leveling all depressions and bull-nose all reentrant corners. The surfaces thus applied shall be broom finished or roughened so that the finish coat to follows shall adhere to it properly. The bond coat shall be allowed to partially dry before the finish coat is applied.
 - D. Finish Coat: The finish coat, following the specific mix proportions above, shall be pneumatically applied over the partially dry bond coat. The finish coat shall be floated to a true and even surface, then troweled in a manner that will force the sand particles into the plaster. A second troweling is required to place the plaster surface to a smooth and non-rough surface, exclusive of trowel marks, checks, cracks, or blemishes. A dry sponge is then utilized to remove all plaster dust or other laitance from the smooth plaster surface and tile.
 - E. Pool filling with potable water must begin immediately upon completion of the plaster finish coat. If the pool is large or a hot day, special precautions shall be taken to keep the plaster moist or curing or drying too quickly. Special precautions may also need to be implemented if the pool is filling slowly. The Contractor's sole responsibility is to keep the new plaster continually moist until the pool has filled with water. Proper curing of the new material will not be achieved unless this process is properly implemented. The pool must be filled at a rate to ensure proper curing without over-drying of plaster. The Contractor must make arrangements and be responsible for pool filling and curing.
 - F. Patching: Plaster blemishes such as over-sanding, cracking, blistering, pitting, checking or discoloration or crazing, is not acceptable. Any plaster having the above characteristics shall be removed and replaced immediately upon discovery at the Contractor's expense. Any patching is to be done upon prior approval of the District's Representative, and patchwork must match existing Work in color and texture and not be discernable. Plaster for patches should comply with the above specification and be of the same quality and

consistency.

- 2.05 Delivery and Storage of Materials: To be in original containers with labels bearing the manufacturer's name. Storage of materials on site shall be on pallets above the ground and under a weather-tight cover. Any damaged material shall be disposed of properly and may not be utilized in the Work.
- 2.06 Equipment and materials used by the Contractor to accomplish the Work in this Section shall be of heavy-duty type and grade, fully adequate to perform the Work required herein.
- 2.07 Patching Compounds: Where cementitious patching compounds are required to fill minor cracks or hollows in the substrate or smooth the prepared surface, the Contractor shall use Master Builders or Laticrete Grout and Patching Compound or a pre-surfacing mixture specifically approved by the manufacturer of the plastering materials herein specified.
- 2.08 Upon inspection of pool vessel after existing plaster removal, if rusting or staining of concrete pool vessel is evident – chip out concrete before re-plastering and replace rebar and fully encase with new concrete to ensure rusting does not continue nor does it have the opportunity to stain new plaster.

PART 3 - EXECUTION

3.01 Surface Conditions:

A. Preparation:

- 1. Ensure concrete vessel to receive plaster has a heavy broom finish or equivalent throughout and is free of all harmful material or substances. Concrete hollows and patches of significant thickness in the substrate should positively bond to the substrate with unquestionable physical integrity. The remaining plaster adhering to the pool shell should be tested for integrity both internally and in bonding to the pool vessel surface with a sounding hammer.
- 2. Any tile to be protected will be masked with appropriate and substantial material to afford its protection and must be free of plaster laitance.

A. Inspection:

- 1. Before the Work of this Section, carefully inspect the Work of other trades and verify that all such Work is complete to the point where this installation can properly commence.
- 2. Verify that swimming pool plaster is installable in accordance with the original design and all referenced standards.
- 3. The Contractor shall ensure that the original concrete or gunite substrate is virtually exposed, thoroughly cleaned, verified in sound condition, and rough enough to ensure permanent, mechanical bonding of the future plaster coating.
- 4. All depressions, cracks, openings, and non-level areas in the pool substrate shall be cleaned and filled with appropriate patching materials. Grinding may be required in high spots.
- 5. Concrete surfaces contaminated with oil, grease, or other chemicals that might impair the plaster adhesion. Harmful substances or laitance shall be scrubbed with hot (160 degrees Fahrenheit) tri-sodium phosphate solution and water, mixed at a ratio of two pounds per gallon of water until such areas are thoroughly cleaned. Treated areas shall be water blasted and rinsed twice and dried.

6. Upon completion of preparatory Work above, the entire surface shall be thoroughly cleaned and vacuumed – followed by compressed air dusting to leave the surface essentially dust-free. Remove all contaminated water.
7. Acid washing is not recommended as a method of surface preparation.
- B. Discrepancies:
1. In the event of a discrepancy, immediately notify the District's Representative.
 2. Do not proceed with installation in areas of the discrepancy until all such discrepancies have been fully resolved.
 3. Failure to notify the District's Representative and give written notice of discrepancies shall constitute acceptance by the Contractor of existing conditions as fit and proper to receive the Work.
 4. If cracks, voids, or heavily eroded areas are discovered during the Work – the correct method to remedy each will be addressed and implemented.
- 3.02 Installation of Pool Plaster:
- A. Completion of Other Work: Do not commence plastering the swimming pool until all concrete areas, landscaping, and other constructions adjacent to the pool is complete. All construction equipment used for those portions of the Work has been moved from the immediate area.
- B. Preparation:
1. Do not apply plaster over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to forming a durable plaster finish.
 2. Consult with the manufacturer on application to specific surfaces being treated. Follow manufacturer's recommendation for curing of concrete; shotcrete surfaces before application of plaster.
 3. Provide suitable covering or masking, ceramic tile, decking, deck equipment, gratings, fittings, and other items.
- C. Application:
1. Into the parging coat of the concrete surfaces, trowel a finish coat of the specified marble plaster to a thickness between 3/8" and 1/2" maximum. If leveling coat is required, use a brown coat application of one part cement to three parts clean, washed sand.
 2. Float the plaster to a uniform plane and trowel to a smooth, dense, impervious surface using extreme care to avoid stains.
 3. Take special care to finish around pool fittings. Make sure to mask off or plug openings so as not to fill such openings with excess plaster. Completely enclose pool fittings with plaster to ensure a leak-proof seal around pipes, fittings, lights, anchors, etc. If fittings are damaged, replace them as part of the Work.
 4. Accurately interface with the finish planes of items installed by other trades.

3.03 Curing:

- A. Preparation: Anticipate the need for any required equipment and have all such equipment immediately available for use upon completion of pool plastering, especially as it pertains to the pool circulation system. Ensure that pumps, filters, strainers, piping, etc., are clean and ready to begin the pool water circulation at the turnover rate of once every six hours.
- B. Pool Filling:
 - 1. After the plaster has sufficiently dried and before drying has proceeded to a damaging point, cure the plaster by gradually filling the pool with water, preventing all damage to finished plaster surfaces.
 - 2. Flow the water continuously until the pool is filled without pause.
 - 3. When the weather is hot and the water pressure is low, ensure the pool is filled rapidly enough to prevent the plaster from over drying. Provide and arrange for additional water sources if required.
 - 4. Coordinate with the General Contractor to ensure that the pool is continuously monitored while filling to prevent overfill, keep walls damp, and prohibit excessive drying before beneath the water level.
 - 5. Contractor to pay for water to fill pool upon completion of plasterwork should the pool be emptied and refilled based on contractor error or failure in maintenance or plaster curing. The cost shall again be born to the Contractor. The original pool water filling is also the responsibility of the Contractor.

3.04 Clean-Up:

- A. Upon completion of pool plaster, remove all materials, equipment, and debris occasioned by this Work and leave the job site in a clean and presentable condition. Perform all such clean-up to meet the review of the District's Representative.
- B. It is especially important that construction dirt and debris be removed and cleaned from the pool circulation piping and surge pit so that the pool can be filled by placing a fill line in the surge tank and filling the pool. The circulation system should be left clean enough not to allow dirt and debris to be washed back into the pool and onto the pool plaster.

3.05 Maintenance:

- A. For the first fourteen (14) days after completing the pool plaster, brush all plastered surfaces at least twice a day to ensure that the plaster is carefully maintained after the initial fourteen-day period. Also, ensure that pool filtration equipment is continuously running during the initial fourteen-day period.
- B. The Contractor shall perform and confirm the fill water's chemical balance, instruct the District regarding proper plaster care, and confirm the District's assumption of such duties before leaving the job. The Contractor shall be responsible for the cost of start-up chemicals for pH and Chlorine management. At the end of the minimum of fourteen days, chemical containers must be full and ready for the District to assume pool maintenance duties. Calcium chloride and bicarbonate of soda quantities will also be required.

3.06 Warranty:

- A. The successful Contractor shall warrant the Work in writing against all defects in materials

and workmanship for three (3) years following completion of the project. This warranty includes but is not limited to; delamination, separation of patches or portions of the plaster from the pool surface or substrate (spalling) due to inadequate bond, degrading of the remaining substrate, etc., or other reason directly related to poor or incomplete preparation and application. Such as discoloration, staining, or other minor variations that do not occur from inadequate maintenance (such as rust from metal items left on the surface long enough to stain). The contractor warrants that such defects will be repaired to a "like-new" condition. Warranty liability does not include degradation or failure from normal wear and tear, mistreatment or neglect, staining due to improper use of chemicals, long-term water imbalance, vandalism, extended periods with the pool drained, or accidental or natural causes beyond the Contractor's control. However, the burden of proof rests with the plaster contractor.

- B. The Contractor is liable for all incidental or consequential damages related to the defects or repair of the same, including the cost of pool draining and refill and associated labor as well as chemicals required to re-establish and cure warranty work. A one-hundred-dollar a day penalty will be assessed in the warranty work event to allow the District to find a new venue for any programs.

END OF SECTION

SECTION 10 14 23 PANEL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Traffic and parking control, and site informational 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. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
- 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.
- 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. Store under cover and elevated above grade.

PART 2 PRODUCTS

2.01 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.
 - 1. Requirements for Persons with Disabilities: Provide identifying devices meeting the requirements for persons with disabilities of the following codes:
 - a. California Building Code (CBC) Title 24, Part 2; Chapter 11B, Accessibility.
 - b. Code of Federal Regulations 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.
 - 2. Pictograms shall comply with CBC Ch. 11B-703.6.
 - 3. Visual Characters shall comply with CBC Section 11B-703.5:
 - a. Mounting height: Visual characters on signs shall be 40" minimum above finish floor or ground.
 - b. Finish and Contrast: Characters and their backgrounds shall have a non-glare finish. Characters 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
 - c. Height: Character height shall be determined based upon height above ground and horizontal viewing distance per CBC Table 11B-703.5.5..
 - d. Proportion: Visual Character proportions 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
 - e. Character Spacing: Spacing between individual adjacent characters shall be 10% min. and 35% max of character height per CBC Section 11B-703.5.8.
 - f. Line Spacing: Spacing between separate lines of characters within a message shall comply with CBC Section 11B-703.5.9
 - 4. Symbols of accessibility shall comply with CBC Section 11B-703.7.

2.02 SIGNAGE APPLICATIONS

- A. Traffic Signs: To match campus standards; locate where indicated on drawings.
 - 1. Manufacturers:
 - a. Hawkins Traffic Safety Supply, Inc.: www.hawkinstraftic.com.
 - b. Safeway Sign Company: www.safewaysign.com.
 - c. Western Highway Products, Inc.: www.westernhighway.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2. Plaque Signs: Provide manufacturer's standard silk-screened signs, baked-on enamel applied over Diamond Grade (DG), (10-year projected life) retro-reflectorized backing; on aluminum or 16 gage galvanized steel sheet. Provide with anti-graffiti protective overlay film. Produce smooth, even, level sign surfaces, constructed to remain flat under installed condition within a tolerance of plus or minus 1/16-inch measured diagonally. Provide two holes for post mounting.
 - a. Parking Stall Signs: Sign text, accessible parking control shall comply with requirements of State of California Code of Regulations (CCR) - Title 24, Part 2, CBC Ch. 11B-502.6 in addition to requirements of State of California, Department of Transportation (CALTRANS) and regulations of local authorities having jurisdiction.
 - 1) Single post mount, not less than 70 square inches with white reflectorized copy on blue background conforming to No. 15090, SAE AMS-STD-595 (FED-STD-595C). Sign shall display a profile view of a wheelchair with occupant in white on blue background to the proportions of CBC Fig. 11B-703.7.2.1.
 - (a) Provide an additional sign below the accessible sign with the text "Minimum Fine \$250".
 - 2) Position one sign at the end of each designated accessible parking space.
 - 3) One in every six spaces (CBC Ch. 11B-208.2.4), but not less than one, provide a 12 inch by 3-1/4 inch "Van Accessible" sign below the symbol of accessibility, wording per CBC Ch. 11B-502.6, 36 CFR 1191, and ADA Standards.
 - 4) Sign shall be mounted 80 inches from bottom of sign to finish grade of parking space or other walking surface, centered on wall at interior end of parking space at a minimum height of 60 inches above the parking space, finished grade, ground or sidewalk, to the bottom of the sign.
 - b. Additional signs, with content as indicated on Drawings.
3. Support Posts:
 - a. Unistrut post, minimum 2 inch square or as indicated.
 - b. Concrete: Ready-mixed, complying with ASTM C94/C94M; normal Portland cement; 3,500 psi strength at 28 days, 3 inch slump; 3/4 inch nominal size aggregate.
4. Accessories: Provide welded galvanized steel fittings and galvanized or stainless steel bolts, nuts and washers.
5. Fasteners: Provide tamper-proof galvanized steel fasteners.
 - a. Tufnut System (714) 962-5838, Allegheny Bolt (Tampruf brand; (516) 568-1052 or equal.

2.03 FABRICATION

- A. Provide signs and supports factory-prefabricated and pre-finished, ready for assembly and installation.

2.04 ACCESSORIES

- A. Exposed Screws: Stainless 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 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 and CBC Chapter 11B.
- D. Protect from damage until final inspection; repair or replace damaged items.

3.03 SITE AND TRAFFIC SIGN INSTALLATION

- A. Locate informational signage as verified in field by District. Verify and coordinate sign locations to prevent conflict with underground utilities.
- B. Excavate for sign support footings to depth as shown on Drawings or, if not shown, as recommended by manufacturer. Provide forms for concrete not supported by compacted soil.
- C. Set posts in concrete base, minimum 12 inch diameter and 18 inches deep; unless indicated otherwise on Drawings.
 - 1. Set sign support post plumb and so sign face will be perpendicular to stall or parallel to curb face, as applicable.
 - a. Set posts into pipe sleeve inserts set and anchored into concrete.
 - b. Fill annular space between posts and sleeves with grouting compound.
 - 2. Signs set in asphaltic paving surfaces or concrete sidewalks shall be mounted in core drilled holes minimum 8 inch diameter, 18 inches deep with top of base flush to finish.
 - 3. Firmly attach signs mounted to walls with appropriate expansion anchors or bolting, adhesive not permitted.
 - 4. Seal all holes water tight.
- D. Install plaque signage to posts, with panel facing traffic as necessary.

3.04 FIELD QUALITY CONTROL

- A. Inspect signs for information content, appearance and location

END OF SECTION

SECTION 23 00 00
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 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. Heating, ventilating and air conditioning systems and equipment

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. 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. 2022 California Building Code (CBC), Title 24, Part 2
 - 4. 2022 California Electrical Code, Title 24, Part 3
 - 5. 2022 California Mechanical Code, Title 24, Part 4
 - 6. 2022 California Plumbing Code, Title 24, Part 5
 - 7. 2022 California Energy Code, Title 24, Part 6
 - 8. 2022 California Fire Code, Title 24, Part 9
 - 9. 2022 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. AHRI Air-Conditioning, Heating 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. Beginning work of any Section constitutes acceptance of conditions.

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.
 - 1. The manufacturer shall resubmit the specification section showing compliance with each respective paragraphs and specified items and features in that particular specification section.
 - 2. All exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.
- C. Note that prior to acceptance of submittals for review, a submittal schedule shall be submitted to the Owner's Representative.
- D. Submit all Division 23 shop drawings and product data grouped and referenced by the specification technical section number in one complete submittal package.
- E. 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.
- F. 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.
- G. 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.
- H. 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.

- I. Certified Test Reports: Before delivery of materials and equipment, certified copies of all test reports specified in individual sections shall be submitted for approval.
- J. 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 PROJECT RECORD DOCUMENTS

- A. Refer to Division 01 for additional requirements.
 - 1. Upon completion of work, an updated record set shall be supplied to the Project Manager. A completely updated record set is required for submittal of final payment. Project Manager and Architect shall be sole judge of completeness of record set. Record set shall include marked-up representation of the actual installation of the work in the field. The use of a cloud with a reference to an RFI response is not acceptable.
 - 2. All changes, deviations and information recorded on the "Project Record Drawings" set during Construction shall be redrafted onto the latest version of AutoCAD or Revit, where applicable.
 - 3. Submit completed shop drawings to the Owner prior to completion in AutoCAD format. 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 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.

1.15 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 - EXECUTION

2.1 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.

2.2 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. 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 23
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Iron, single-flange butterfly valves.

1.03 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Non-rising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. SWP: Steam working pressure.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.05 QUALITY ASSURANCE

- A. ASME Compliance:
 - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 2. ASME B31.9 for building services piping valves.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set butterfly valves closed or slightly open.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.

2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS FOR VALVES

- A. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- B. Valve Sizes: Same as upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
1. Handwheel: For valves other than quarter-turn types.
 2. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.
- D. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
1. Gate Valves: With rising stem.
 2. Butterfly Valves: With extended neck.
- E. 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.
- F. Valve Bypass and Drain Connections: MSS SP-45.

2.02 IRON, SINGLE-FLANGE BUTTERFLY VALVES

- A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Stainless-Steel Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Milwaukee Valve Company.
 - c. NIBCO LD-2000 Series.
 - d. Hammond Valve.
 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: Stainless steel.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Do not attempt to repair defective valves; replace with new valves.

3.02 VALVE INSTALLATION

- A. Locate valves for easy access and provide separate support where necessary.
- B. For direct-buried valves, provide surface valve box for actuation per the project details.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

3.03 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.04 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Butterfly Valve Dead-End Service: Single-flange (lug) type.
- 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 Steel Piping, NPS 2-1/2 and larger: Flanged ends

3.05 CHILLED-WATER VALVE SCHEDULE

- A. Pipe NPS 2-1/2 and Larger:
 - 1. Iron, Single-Flange Butterfly Valves: Stainless Steel disc, 200 CWP, EPDM seat.

3.06 HEATING-WATER VALVE SCHEDULE

- A. Pipe NPS 2-1/2 and Larger:
 - 1. Iron, Single-Flange Butterfly Valves: Stainless Steel disc, 200 CWP, EPDM seat.

END OF SECTION

SECTION 26 00 10
BASIC 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. Remove rubbish, debris and waste materials and legally dispose off the Project site. Remove equipment and implements of service, and leave entire work area neat and clean, to the satisfaction of the Owner Authorized Representative.
 - 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 AS-BUILT DOCUMENTS

- A. Project As-built drawings will strictly adhere to Division 01 Section 01 78 40. In addition, the following items will be enforced:
 - 1. All changes, deviations and information recorded on the "Project As-Built Documents" during Construction shall be redrafted onto the latest version of AutoCAD or Revit, where applicable.
 - 2. Project As-Built Documents that are submitted with "RFI #" written on the drawings will not be considered as As-Built or Record Drawings

1.12 PROJECT RECORD DOCUMENTS

- A. Provide record documentation per Division 01 and district standards. Record information shall include the following:
 - 1. CAD and/or BIM modeling of the final as-built conditions. Format shall be consistent with respect architectural and MEP as-builts. File format AutoCAD 2018 or later, and REVIT 2020 or later.
 - 2. Updates to the district/campus fire life safety operating interface. Allow for graphical programming, commissioning, and training to campus security.

1.13 PRODUCT ALTERNATIVES OR SUBSTITUTIONS

- A. Refer to General Conditions and Division 01 for additional requirements.

1.14 OPERATING INSTRUCTIONS

Furnish approved operating instructions for systems and equipment indicated in the technical sections for use by operation and maintenance personnel. The operating instructions shall include wiring diagrams, control diagrams, and control sequence for each principal system and equipment. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions as directed. Attach or post operating instructions adjacent to each principal system and equipment including startup, proper adjustment, operating, lubrication, shutdown, safety precautions, procedure in the event of equipment failure, and other items of instruction as recommended by the manufacturer of each system or equipment. Provide weather-resistant materials or weatherproof enclosures for operating instructions exposed to the weather. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.15 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.

1.16 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.

1.17 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. Furnish manufacturer's warranties for all equipment furnished under this project.

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.
- B. Equipment specified in the following SECTIONS shall all be provided by the same manufacturer.
 - 1. 261200 Medium-Voltage Transformers
 - 2. 262300 Low-Voltage Switchgear

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).

PART 3 - EXECUTION

3.1 GENERAL

- A. Include 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.
- B. Related Requirements:
 - 1. Section 260513 "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.
 - 2. Section 260533 "Raceways and Boxes for Electrical Systems"
 - 3. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.
 - 4. Section 260553 "Identification for Electrical Systems."

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.

1.5 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 100 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 (only permissible where specifically noted): 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 in data-rooms / IDFs / MDFs. When dedicated neutrals are provided, use color spiral to match associated phase.

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. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 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. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type XHHW-2, single conductors in raceway.

- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway
- D. Feeders Installed below Raised Flooring: Type XHHW-2, single conductors in raceway.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type XHHW-2, single conductors in raceway.
- F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway
- G. Branch Circuits Installed Below Raised Flooring: Type XHHW-2, single conductors in raceway
- H. Cord Drops and Portable Appliance Connections: Type SO. For plugs, provide hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- I. VFD Output Circuits: Type XHHW-2 in metal conduit with braided shield.
- J. Branch Circuits and Feeders at exterior roofs: Type XHHW-2, single conductors in raceway for entire run from source to load
- K. Cable/chain Pendant Lighting – from support surface: manufacturer’s cable assembly or SO cable with finish to match that of fixture’s.

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. Pulling of 2 AWG or larger conductors shall be performed with a cable pull machine. Any runs shorter than 50 feet are exempt. When pulling conductors, do not exceed manufacturer’s recommended 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."

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].
- 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.
- C. Feeder wires and cables shall be identified at each point the conduit run is broken by a cabinet, box, gutter, etc. Where terminal ends are available, identification shall be by means of heat shrink wire markers, which provide terminal strain relief. Markers shall be Brady Perma-Sleeve, or equal. Identification in other areas shall be by means of wrap-around tape markers Brady Perma- Code or equal. Markers shall include feeder designation, size, and description.
- D. Neutral conductors larger than 6 gauge, which are not color identified throughout their entire length, shall be taped, painted white or natural gray, or taped white where they appear in switchboards, cabinet, gutters or pull boxes. Neutral conductors 6 gauge and smaller shall be white color identified throughout their entire length..

3.6 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."

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage an independent qualified testing agency to perform tests and inspections. The tests to be performed are as follows:
 - 1. With a megger insulation tester, perform the time-resistance method to test feeders and branch circuit wires. Tests must be conducted with wire disconnected at each end in order to test the wire itself. A second test must be conducted with the wire connected at each end and the circuit breakers or switches in the closed positions.
- B. Tests shall be performed in presence of the IOR.
- C. Insulation resistance shall not be less than 100 mega-ohms.

- 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 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Grounding systems and equipment.

1.3 DEFINITIONS

- A. NETA ATS: InterNational Electrical Testing Association - Acceptance Testing Specification.
- B. NETA MTS: InterNational Electrical Testing Association - Maintenance Testing Specification.
- C. NFPA : National Fire Protection Association.
- D. IEEE: Institute of Electrical and Electronics Engineers

1.4 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's technical catalog cuts for each type of product indicated.
- B. Shop Drawings: Site drawings to scale including details showing location and size of each field connection of grounding system.
 - 1. Wiring Diagrams: Differentiate between manufacturer installed and field installed wiring.
- C. Sustainable Design Submittals:
 - 1. Product Data: For each conductor and cable indicating lead content.

1.5 INFORMATIONAL SUBMITTALS

- A. Informational Submittals: Provide to client for record – Plans drawn to scale (1/4"=1'-0") showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Test wells.
 - 2. Ground rods.
 - 3. Grounding conductors, connectors.

4. Grounding arrangements and connections for separately derived systems.
- B. Qualification Data: Provide to client for record – For qualified independent testing agency and testing agency's field supervisor.
- C. Field quality-control reports. Provide to client for record – Submit written test reports including the following:
 1. Test procedures used.
 2. Test results that comply with requirements.

1.6 CLOSEOUT SUBMITTALS

- A. Provide to client for record – Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 1. Instructions for periodic testing and inspection of grounding features at test wells based on NETA MTS.
 - a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - b. Include recommended testing intervals.

1.7 QUALITY ASSURANCE

- A. 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 grounding systems similar to those specified on this project.
 2. Testing company shall be located within 50 miles radius of the project.
 3. Testing Agency's Field Supervisor: Currently 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 grounding systems of the type and rating similar to the systems to be tested on this project.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 GROUNDING ELECTRODES, CONDUCTORS, CONNECTOR, BUS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal:
 - 1. Grounding Connectors, Bars and Rods:
 - a. Erico - Pentair Electrical Fastening Solutions
 - b. Burndy – A Hubbell Company.
 - c. Ideal Industries, Inc.
 - d. O-Z/Gedney Co. - A brand of Emerson Industrial Automation.
 - e. Thomas & Betts - A Member of the ABB Group.
 - 2. Grounding Conductors and cables:
 - a. Southwire
 - b. American Insulated Wire
 - c. Okonite

2.2 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.
- D. Lead Content: Less than 300 parts per million

2.3 CONNECTORS

- A. Listed and labeled by UL for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

- B. Bolted Connectors for Conductors, Rods and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- E. Lead Content: Less than 300 parts per million

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m)-in diameter.
- B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts
 - 1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches (1200 mm) long.
 - 2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- C. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment or IT rooms, and elsewhere as indicated.
 - 1. Install bus on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.
 - 3. Coordinate with telcom designs for respective IDF and MDF provisions
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.

3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and pullboxes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Install #4/0 bare copper ground wire loop around the outside perimeter of the manhole, in soil, 12" above bottom of manhole. Cadweld ground wire loop to #4/0 bare copper ground wire connecting all exposed metal parts inside the manhole through a 1" opening at the top of manhole wall. Seal and waterproof opening after wire installation.
- D. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.
- E. Pad-Mounted Transformers and Medium Voltage Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 1/0 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits in the same conduit containing phase and neutral conductors. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70. :
 1. Feeders and branch circuits.
 2. Lighting circuits.
 3. Receptacle circuits.
 4. Single-phase motor and appliance branch circuits.
 5. Three-phase motor and appliance branch circuits.
 6. Flexible raceway runs.

7. Armored and metal-clad cable runs.
 8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
 - D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
 - E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
 - F. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.
 1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch (6.3-by-100-by-300-mm) grounding bus.
 3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
 4. All metallic conduits and cable tray shall be continuously bonded to maintain low resistance ground path and bonded back to the central equipment by the use of bonding jumpers where needed.
 - G. Metallic Fences or Other Metal Structures: Comply with requirements of IEEE C2. Bond metallic fences and other metal structures located within 8 feet (2.5 m) vertically or 16 feet (5 m) horizontally of exposed conductors or equipment.
 1. Grounding Conductor: Bare, **tinned**-copper, not less than **No. 8** AWG.
 2. Gates: Shall be bonded to the gate support post with a flexible bonding jumper. Bond each gate support post to the grounding electrode system in the area.
 3. Provide bond across fence openings with 2 AWG bonding jumper buried 18 inches (460 mm) minimum below finished grade. Extend local grounding electrode system to cover swing of gates.
 4. Barbed Wire: Strands shall be bonded to the grounding conductor.
 - H. Generator (Non-Separately Derived System): Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator. Maintain separation of neutral and ground. Provide warning sign at neutral to ground bond location: "WARNING: SHOCK HAZARD EXISTS IF GROUNDING

ELECTRODE CONDUCTOR OR BONDING JUMPER CONNECTION IN THIS EQUIPMENT IS REMOVED WHILE ALTERNATE SOURCE IS ENERGIZED.”

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade using exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install ground rods at least three rods (unless otherwise indicated on the drawings), spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.
 - 1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
 - 2. Test Wells near light poles: Coordinate location with landscape drawings and install one at each pole. Test well shall be open bottom and installed on a 12"H bed of gravel or crushed stone (1" size).
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service

entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Separately Derived System (SDS): All multiple branch metal water piping laterals originating from outside the area being served by the SDS and which serve the same area being served by the SDS shall be bonded to the common grounding electrode (GE) or the common grounding electrode conductor (GEC). The bonding connection shall be made at each level that the metal water piping serves. When multiple SDS's are installed or an SDS serves multiple levels of a structure, a copper common GEC shall be installed for the SDS as permitted in NFPA 70 article 250.30 (D)3 and sized per article 250.30 (A) and (B).
 3. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 4. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.
- I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.
 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.5 LABELING

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.
- B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage an independent qualified testing agency to perform tests and inspections. Refer to section

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds: 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

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. Metal wireways and auxiliary gutters.
 - 3. Surface raceways.
 - 4. Boxes, enclosures, and cabinets.
- B. Related Requirements:
 - 1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

- A. EMT: Electrical metal tubing
- B. ENT: Electrical non-metallic tubing
- C. GRC: Galvanized rigid steel conduit.
- D. LFMC: Liquidtight flexible metal 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. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

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. Provide to client for record – Qualification Data: For professional engineer.
- C. Provide to client for record – 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.

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 CEC, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. IMC: Comply with ANSI C80.6 and UL 1242.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit -
1. Comply with ANSI C80.1 ETL PVC-001, NEMA RN 1 and UL 6.
 2. Coating Thickness: 0.040 inch, minimum.
 3. A PVC Coated Sealing Locknut shall be used on all exposed male threads transitioning into female NPT threads which do not have sealing sleeves, including transitions from PVC couplings/female adapters to PVC coated GRC elbows in direct burial applications. PVC Coated Sealing Locknuts are not to be used in place of a conduit hub.
- 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.
- 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.
- L. All fittings and connectors shall be malleable iron or steel alloy; die-cast not acceptable.

2.2 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), 12x(any food service areas) per application 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 lockable (readily accessible), Screw-cover type (concealed areas), Flanged-and-gasketed (exteriors and food services areas) type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.3 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be UL listed and labeled as defined in CEC, 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. Wiremold / Legrand.
 - b. Hubbell Wiring Systems

2.4 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. FSR Inc.
 - 4. Hoffman; a Pentair company.
 - 5. Hubbell Incorporated; Killark Division.
 - 6. O-Z/Gedney; a brand of EGS Electrical Group.
 - 7. RACO; a Hubbell Company.
 - 8. Robroy Industries.
 - 9. Thomas & Betts Corporation.

10. 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. Metal Floor Boxes:
1. Material: Cast 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.
- F. 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.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- J. 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.
- K. Gangable boxes are prohibited.
- L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 Type 3R Type 4X Insert type 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.
- M. Cabinets:
1. NEMA 250, Type 1, Type 3R, 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.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

- ~~1.~~ Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jensen Precast Inc.
 - b. CDR Systems Corporation; Hubbell Power Systems.
 - c. Oldcastle Precast, Inc.; Christy Concrete Products.
 - d. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with branch circuits (open) and feeders (closed) bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC.". Boxes containing conductors and cables over 600V, the cover shall include permanently engraved name of the utility company (e.g. UCSD), type of utility (e.g. ELECTRIC), DANGER-HIGH VOLTAGE-KEEP OUT" in minimum 1/2" inch size, block letters.
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 17 Inches Long and Larger: Have inserts for cable racks and pulling-irons installed before concrete is poured.

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. Underground Conduit: refer to 260543
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R, Type 4. Hose down protected, 4x at all food service areas.

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. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. 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. Hose down protected, 4x at all food service areas.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid 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 surface raceways only where indicated on Drawings.
- F. 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. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- G. Support conduit within 12 inches of enclosures to which attached.
- H. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
- 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 250lbs 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-inch radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

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 accessibility requirements. Install boxes with height at ADA and DSA requirements.
 - 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 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances. Top of conduits inside the handhole/box shall be minimum 4 inches above the bottom of the handhole/box.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel (minimum 6 inch high), graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
- E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.4 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 43
UNDERGROUND DUCTS AND RACEWAYS 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. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct bank(s)
 - 2. Handholes and boxes.
 - 3. Manholes.
- B. Related Requirements:
 - 1. Section 260526 "Grounding and Bonding of Electrical Systems".

1.3 DEFINITION

- A. RNC: Rigid nonmetallic conduit.
- B. PVC coated GRS: PVC coated Galvanized rigid steel conduit
- C. PVC: Poly Vinyl Chloride
- D. NETA: InterNational Testing Association

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Duct-bank materials, including separators and miscellaneous components.
 - 2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
 - 3. Accessories for manholes, handholes, boxes, and other utility structures.
 - 4. Warning tape.
 - 5. Warning planks.
 - 6. Pull ropes.
- B. Shop Drawings for Precast or Factory-Fabricated Underground Utility Structures: Include plans, elevations, sections, details, attachments to other work, and accessories, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Reinforcement details.
3. Frame and cover design and manhole frame support rings.

1.5 INFORMATIONAL SUBMITTALS

- A. Duct-Bank Drawings: Show duct profiles and coordination with other utilities and underground structures.
 1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
- B. Provide to client for record – Product Certificates: For concrete and steel used in precast concrete manholes and handholes, as required by ASTM C 858.
- C. Provide to client for record – Qualification Data: For professional engineer and testing agency.
- D. Provide to client for record – Field quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Comply with ANSI C2.
- C. Comply with NFPA 70.
- D. Each conduit shall bear manufacturer's trademark and UL label. Conduits and fittings shall be of a single manufacturer. Multiple manufactures for the same material are not acceptable.
- E. Comply with California Electric Code (CEC).

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver ducts to project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.
- B. Deliver precast concrete manholes, handholes and other underground utility structures when the site is ready for installation. Store precast concrete and other factory-fabricated underground utility structures at project site (if necessary) as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.
- C. Lift and support precast concrete units only at designated lifting or supporting points.

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than fourteen (14) days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Construction Manager's and Owner's written permission.
3. Existing electrical service shall be shut down by owner's authorized personnel. Coordinate with owner in advance.

1.9 COORDINATION

- A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.
- B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

PART 2 - PRODUCTS

2.1 CONDUIT

- A. Plastic-Coated Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1. Plastic-Coated Rigid Steel Conduit and Fittings: Rigid steel conduit and fittings with an extruded polyvinyl chloride jacket, minimum 40 mils. The jacket shall have high tensile strength, shall be highly resistant to corrosion and shall not oxidize or deteriorate or shrink when exposed to sunlight and weather. The jacket shall be flame retardant and shall not support combustion. The interior of the conduit shall have a urethane coating, minimum 2 mils.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube and Conduit
 - b. Republic Conduit
 - c. Western Tube
 - d. Rob Roy/Plastibond
- B. RNC: Heavy wall design; NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B. Make all fittings watertight with solvent-weld recommended by the conduit manufacturer and specifically manufactured for the purpose.
 1. Rigid Plastic Conduit: Provide heavy wall, virgin polyvinyl chloride Schedule 40 and Schedule 80 with solvent welded joints, conforming to Underwriters Laboratories, Inc. (UL 651) and ANSI C33.91 requirements, listed for exposed and direct burial application.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cantex, Inc.

2. Thomas & Betts-Carlon
3. Lamson & Sessions -Carlon Division
4. JM Eagle
5. Allied Tube and Conduit

2.2 NONMETALLIC DUCTS AND DUCT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Allied Tube and Conduit
 2. Cantex, Inc.
 3. Lamson & Sessions; Carlon Electrical Products.
- B. Duct Accessories:
 1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
 2. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."
 3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches (300 by 600 by 76 mm) in size, manufactured from 6000-psi (41-MPa) concrete.
 - a. Color: Red dye added to concrete during batching.
 - b. Mark each plank with "ELECTRIC" in 2-inch- (50-mm-) high, 3/8-inch- (10-mm-) deep letters.

2.3 PRECAST CONCRETE HANDHOLES AND BOXES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Christy Concrete Products.
 2. Oldcastle Precast Group.
 3. Jensen Precast
- B. Comply with ASTM C 858 for design and manufacturing processes.
- C. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have traffic load rating consistent with that of handhole or box.
 1. Handholes - Frame and Cover: Weatherproof steel cover (driveway)/Weatherproof re-enforced concrete cover (turf/sidewalk), with steel framing / enforcement with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
 2. Pullboxes/vaults Frame and Cover: Weatherproof steel frame, with hinged steel access door assembly with tamper-resistant, captive, cover-securing bolts.
 - a. Cover Hinges: Concealed, with hold-open ratchet assembly.
 - b. Cover Handle: Recessed.
 3. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

4. Cover Legend: Molded lettering, "ELECTRIC."
5. Configuration: Units shall be designed for flush burial and have: (open handholes) (integral closed bottom pullboxes/vaults), unless otherwise indicated.
6. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
 - a. Extension shall provide increased depth of 12 inches (300 mm).
 - b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.
7. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.
 - a. Windows shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
 - b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
 - c. Window openings shall be framed with at least two additional No. 4 steel reinforcing bars in concrete around each opening.
8. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
 - a. Type and size shall match fittings to duct or conduit to be terminated.
 - b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.
9. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.4 PRECAST MANHOLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Christy Concrete Products.
 2. Oldcastle Precast Group.
 3. Utility Concrete Products, LLC.
 - ~~4. Jensen Precast~~
 5. Utility Vault Co.
- B. Comply with ASTM C 858 and with interlocking mating sections, complete with accessories, hardware, and features.
 1. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.
 - a. Windows shall be located no less than 6 inches (150 mm) or from interior surfaces of walls, floors, or roofs of manholes, but close enough to corners to facilitate racking of cables on walls. Windows shall be no less than 12 inches (300 mm) from the floor to avoid water intrusion into the underground ducts.

- b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
 - c. Window openings shall be framed with at least two additional No. 4 steel reinforcing bars in concrete around each opening.
- 2. Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
 - a. Type and size shall match fittings to duct or conduit to be terminated.
 - b. Fittings shall align with elevations of approaching ducts and be located near interior corners of manholes to facilitate racking of cable.
- C. Concrete Knockout Panels: 1-1/2 to 2 inches (38 to 50 mm) thick, for future conduit entrance and sleeve for ground rod.
- D. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

2.5 UTILITY STRUCTURE ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Bilco Company (The).
 - 2. Christy Concrete Products.
 - 3. Jensen Precast
 - 4. Neenah Foundry Company.
 - 5. Oldcastle Precast Group.
 - 6. Underground Devices, Inc.
 - 7. Utility Concrete Products, LLC.
- B. Manhole Frames, Covers, and Chimney Components: Comply with structural design loading specified for manhole.
 - 1. Frame and Cover: Weatherproof, gray cast iron complying with ASTM A 48/A 48M, Class 30B 29 inches (737 mm).
 - a. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 - b. Special Covers: Recess in face of cover designed to accept finish material in paved areas.
 - 2. Cover Legend: Cast in. Selected to suit system.
 - a. Legend: "ELECTRIC-LV" for duct systems with power wires and cables for systems operating at 600 V and less.
 - b. Legend: "Name of serving utility company"; "ELECTRIC-HV"; "Manhole/Handhole number as indicated on the drawings" for duct systems with medium-voltage cables.
 - c. Legend: "Name of serving utility company"; "SIGNAL"; "Manhole/Handhole number as indicated on the drawings" for communications, data, and telephone duct systems.
- C. Manhole Sump Frame and Grate: ASTM A 48/A 48M, Class 30B, gray cast iron.

- D. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch- (50-mm-) diameter eye, and 1-by-4-inch (25-by-100-mm) bolt.
 - 1. Working Load Embedded in 6-Inch (150-mm), 4000-psi (27.6-MPa) Concrete: 13,000-lbf (58-kN) minimum tension.
- E. Pulling Eyes in Nonconcrete Walls: Eyebolt with reinforced fastening, 1-1/4-inch- (32-mm-) diameter eye, rated 2500-lbf (11-kN) minimum tension.
- F. Pulling-In and Lifting Irons in Concrete Floors: 7/8-inch- (22-mm-) diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.
 - 1. Ultimate Yield Strength: 40,000-lbf (180-kN) shear and 60,000-lbf (270-kN) tension.
- G. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch (13-mm) ID by 2-3/4 inches (69 mm) deep, flared to 1-1/4 inches (32 mm) minimum at base.
 - 1. Tested Ultimate Pullout Strength: 12,000 lbf (53 kN) minimum.
- H. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch (13-mm) bolt, 5300-lbf (24-kN) rated pullout strength, and minimum 6800-lbf (30-kN) rated shear strength.
- I. Cable Rack Assembly: Steel, hot-dip galvanized, except insulators.
 - 1. Stanchions: T-section or channel; 2-1/4-inch (57-mm) nominal size; punched with 14 holes on 1-1/2-inch (38-mm) centers for cable-arm attachment.
 - 2. Arms: 1-1/2 inches (38 mm) wide, lengths ranging from 3 inches (75 mm) with 450-lb (204-kg) minimum capacity to 18 inches (460 mm) with 250-lb (114-kg) minimum capacity. Arms shall have slots along full length for cable ties and be arranged for secure mounting in horizontal position at any vertical location on stanchions.
 - 3. Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.
- J. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F (2 deg C). Capable of withstanding temperature of 300 deg F (150 deg C) without slump and adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.
- K. Fixed Manhole Ladders: Arranged for attachment to roof or wall and floor of manhole. Ladder and mounting brackets and braces shall be fabricated from hot-dip galvanized steel. Ladder shall be removable if necessary.
- L. Cover Hooks: Heavy duty, designed for lifts 60 lbf (270 N) and greater. Two required.

2.6 SOURCE QUALITY CONTROL

- A. Test and inspect precast concrete utility structures according to ASTM C 1037.

- B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
 - 1. Tests of materials shall be performed by a independent testing agency.
 - 2. Strength tests of complete boxes and covers shall be by either an independent testing agency or the manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
 - 3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 UNDERGROUND DUCT APPLICATION

- A. Ducts for Electrical Cables Over 600 V: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank, unless otherwise indicated.
- B. Ducts for Electrical Feeders 600 V and Less, not beneath buildings: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank, unless otherwise indicated.
- C. Ducts for Electrical Feeders 600 V and Less, beneath buildings: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.
- D. Ducts for Electrical Branch Circuits, beneath building: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.
- E. Ducts for Electrical Branch Circuits, not beneath building: RNC, NEMA Type EPC-80-PVC, in direct-buried duct bank, unless otherwise indicated.
- F. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank, unless otherwise indicated (coordinate with telcom plans).
- G. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC, installed in concrete-encased duct bank, unless otherwise indicated (coordinate with telcom plans)..
- H. Underground Ducts Crossing loading docks: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.2 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Boxes for 600 V and Less:
 - 1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.
 - 2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
 - 3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.

- B. Manholes: Precast concrete.
 - 1. Units Located in Roadways and Other Deliberate Traffic Paths by Heavy or Medium Vehicles: H-20 structural load rating according to AASHTO HB 17.

3.3 EARTHWORK

- A. Excavation and Backfill: Comply with Section 311000 "Site Clearing," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- C. *Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329300 "Plants."*
- D. *Cut and patch existing pavement in the path of underground ducts and utility structures according to Section 017000 "Execution and Closeout Requirements."*

3.4 DUCT INSTALLATION

- A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.
- B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1220 mm), horizontally, unless otherwise indicated.
- C. For underground ducts containing MV and HV cables, use manufactured long sweep bends with a minimum radius 5 feet (60inches) horizontally. Number of bends on ducts for HV and MV systems, telephone and signal systems shall not exceed two (2) 90 degrees.
- D. Vertical Radius bends shall be as follows
 - 1. Feeders over 600V: minimum radius of 36 inches (to match duct bank depth)
 - 2. Feeders less than 600V: minimum radius of 30 inches (to match duct bank depth) (24 inches acceptable for less than 600V applications under building where duct bank depth top is 24".
 - 3. Branch Circuits: minimum radius of 18 inches (to match conduit depth).
- E. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- F. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches (250 mm) o.c. for 5-inch (125-mm) ducts, and vary proportionately for other duct sizes.
 - 1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line.

2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole.
 3. Grout end bells into structure walls from both sides to provide watertight entrances.
- G. Building Wall Penetrations: Make a transition from underground duct to rigid PVC coated steel conduit at least 10 feet (3 m) outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition.
- H. Do not install conduits underneath a building except where the service/feeder/branch circuit conduits enter the building.
- I. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.
- J. Pulling Cord: Install minimum 1/8 inch thick 100-lbf- (445-N-) minimum test nylon cord with minimum 250 pounds per foot tensile strength in ducts, including spares.
- K. Concrete-Encased Ducts: Support ducts on duct separators.
1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 5 spacers per 20 feet (6 m) of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches (150 mm) between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
 2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
 - a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
 - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch (19-mm) reinforcing rod dowels extending 18 inches (450 mm) into concrete on both sides of joint near corners of envelope.
 3. Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.
 4. Encase all feeder ducts in a 3 inch concrete envelope. Extend envelope with 3 inches beyond all external surfaces of all outer most ducts. Do not over pour the concrete.
 5. Concrete encasement shall be minimum 3000 psi. All underground ducts containing MV and HV cables (above 600V) shall be encased in red concrete. Concrete shall be premixed during batching with 1-1/2 lbs of red ocher dye per sack of cement.
 6. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
 7. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.

8. Minimum Space between Ducts: 3 inches (75 mm) between ducts and exterior envelope wall, and 12 inches (300 mm) between power and signal ducts.
9. Depth: Install top of duct bank at least 24 inches (600 mm) below finished grade in areas not subject to deliberate traffic, and at least 30 inches (750 mm) below finished grade in deliberate traffic paths for vehicles, unless otherwise indicated. Minimum depth below grade in all areas shall be 36 inches (900 mm) for underground ducts containing MV and HV ducts.
10. Stub-Ups: Use manufactured PVC coated rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
 - a. Couple PVC coated steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
 - b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of base. Install insulated grounding bushings on terminations at equipment.
11. Warning Tape: Bury warning tape approximately 12 inches (300 mm) below grade above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches (75 mm) of the centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

L. Direct-Buried Duct Banks:

1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
2. Space separators close enough to prevent sagging and deforming of ducts, with not less than 5 spacers per 20 feet (6 m) of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches (150 mm) between tiers.
3. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Section 311000 "Site Clearing" for pipes less than 6 inches (150 mm) in nominal diameter.
4. Install backfill as specified in Section 311000 "Site Clearing"
5. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches (100 mm) over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction as specified in Section 311000 "Site Clearing"
6. Install ducts with a minimum of 3 inches (75 mm) between ducts for like services and 12 inches (300 mm) between power and signal ducts.
7. Depth: see plans .
8. Install manufactured PVC coated rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
 - a. Couple PVC coated steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
 - b. For equipment mounted on outdoor concrete bases, extend PVC coated steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

9. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried ducts and duct banks, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional planks 12 inches (300 mm) apart, horizontally.

3.5 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

- A. Precast Concrete Handhole and Manhole Installation:
 1. Comply with ASTM C 891, unless otherwise indicated.
 2. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
 3. Unless otherwise indicated, support units on a level bed of 12 inches thick crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- B. Elevations:
 1. Manhole Roof: Install with rooftop at least 15 inches (380 mm) below finished grade.
 2. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. In other areas, set manhole frames 1 inch (25 mm) above finished grade.
 3. Install handholes with bottom below the frost line, below grade.
 4. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
 5. Where indicated, cast handhole cover frame integrally with handhole structure.
- C. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.
- D. Manhole Access: Circular opening in manhole roof; sized to match cover size.
 1. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
- E. Waterproofing: Apply waterproofing to exterior surfaces of manholes and pullboxes after concrete has cured at least three days. After ducts have been connected and grouted, and before backfilling, waterproof joints and connections and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.
- F. Dampproofing: Apply dampproofing to exterior surfaces of manholes and pullboxes after concrete has cured at least three days. After ducts have been connected and grouted, and before backfilling, dampproof joints and connections and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.
- G. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.
- H. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.

- I. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches (98 mm) for manholes and 2 inches (50 mm) for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.
- J. Warning Sign: Install "Confined Space Hazard" warning sign on the inside surface of each manhole cover.

3.6 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.
- B. Unless otherwise indicated, support units on a level bed of 12 inches thick crushed stone or gravel, graded from 1/2-inch (12.7-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas and trafficways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
- D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.
- E. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- F. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
 - 1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
 - 2. Dimensions: 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep).

3.7 GROUNDING

- A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

- A. During construction, partially completed duct lines shall be protected from the entrance of debris such as mud, sand and dirt by means of suitable conduit plugs. As each section of a duct line is completed from manhole to vault, a testing mandrel not less than 12 inches long with a diameter 1/4-inch less than the size of the duct, shall be drawn through each duct, after which a brush having the diameter of the duct, and have stiff bristles shall be drawn through until the conduit is clear of all particles of earth, sand, gravel and other foreign materials. Conduit plugs shall then be immediately installed. Underground conduits,

which terminate inside the building below grade, or which slope so that water might flow into building, shall be sealed at termination after installation of wires.

- B. Perform the following tests and inspections and prepare test reports:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
 - 2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
 - 3. Test manhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Correct deficiencies and retest as specified above to demonstrate compliance.

3.9 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump. Remove foreign material.

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. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.
- C. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1 and IEEE C2.
- B. Comply with 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: 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 inches for raceway and conductors.
 - b. 3-1/2 by 5 inches for equipment.
 - c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

- A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters and that stay in place by gripping action.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. HellermannTyton.
 - c. Marking Services, Inc.
 - d. Panduit Corp.
- B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Panduit Corp.

2.5 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlton Industries, LP.
 - b. 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 inch unless 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. 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.
- C. 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.
- B. Degrease and clean surfaces to receive nameplates and labels
- C. Coordinate installation of nameplates, markers and warning signs with the sequence of painting. Refer to Section 099100, "Painting."

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. 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. Emergency system boxes and enclosures.
 - h. Enclosed switches.
 - i. Enclosed circuit breakers.
 - j. Enclosed controllers.
 - k. Variable-speed controllers.
 - l. Push-button stations.
 - m. Power-transfer equipment.
 - n. Contactors.
 - o. Remote-controlled switches, dimmer modules, and control devices.
 - p. Battery-inverter units.
 - q. Battery racks.
 - r. Power-generating units.
 - s. Monitoring and control equipment.
 - t. 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. 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 shall 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 shall 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 (provide license stamp to final documents).
- 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. Basis-of-Design Product: Subject to compliance with requirements, provide 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.
- B. Conduct a power study and coordination of all breaker settings.
- C. Conduct an Arc Flash study, merge the findings into the campus wide Arc Flash documentation and provide all required panel labeling as require and to match the campus standard.
- D. Power System Study:
1. The Contractor shall provide, with the assistance of the switchgear manufacturer, power systems studies consisting of a short circuit study, a coordination study, and an arc flash study - all per latest published editions of the following standards: ANSI c37, IEEE 141, IEEE 242, IEEE 399 - brown book, NFPA 70e & IEEE std 1584/1584a. Additionally:

2. Contractor shall perform study using either computer software programs SKM "systems analysis power tools for windows" or ETAP - latest available versions.
3. Contractor shall furnish/obtain all data required for power systems studies. Data collection effort shall be performed in an expeditious manner and as soon as possible after contract award to ensure study completion for submission as part of the electrical distribution equipment shop drawings and submittals. Data collection efforts may include, but are not limited to, calculated utility company fault values, service transformer primary protective device & applied voltage, electrical characteristics & fault contribution from existing motors/ generators, existing conductor quantities, size and lengths, existing/ new overcurrent protective device specifications & part numbers, transfer switch characteristics & short circuit current ratings in addition to any other data required to perform comprehensive power system studies. Ranges of fault current values or generic fault current values provided by the utility company are unacceptable as are any fault current values shown on the single line diagram or feeder schedule.
4. Data gathering shall be conducted in a safe manner with 1) equipment completely de-energized in coordination with the District during a scheduled power shutdown or 2) utilizing a licensed electrician wearing appropriate personnel protective equipment per NFPA 70e standards.
5. Contractor is solely responsible for obtaining utility data from the utility company - include all costs in base bid for any utility company fees for providing necessary data. Where the project is located on a campus with an District-furnished electrical distribution system, Contractor shall be responsible to obtain sufficient electrical system data to demonstrate coordination of the project's electrical system with campus distribution system. This data may be available in the form of an District-provided campus power system study. Where studies are not available, the Contractor shall include all costs in base bid to perform necessary field investigation of campus distribution system including campus service entrance and serving utility data as required to demonstrate coordination of the project's electrical system with campus distribution system. Include all costs for recommending adjustments to existing campus distribution system settings discovered to be incorrect. District shall be responsible to undertake any physical adjustments to existing medium or high voltage distribution equipment with the exception of fuses, relays or other circuit protective devices located in existing distribution equipment that are dedicated to serve only this project's electrical system.
6. The short circuit study shall include calculated short-circuit momentary and interrupting duties for 3-phase bolted faults and line-to-ground faults throughout the single line to include utility service supply, generators & transfer switches, substations, switchgear, panel boards etc. Study shall evaluate all electrical distribution equipment and protective devices against short circuit ratings. Note any existing circuit protective device(s)/electrical distribution that is inadequately rated to withstand calculated fault values.
7. The coordination study shall include time-current curves (tcc) for over current protective devices (ocpds) along with transformer full-load current, inrush current, and through-fault protection curves, conductor damage curves, ground fault protective device curves, motor starting curve(s)/damage point(s), generator short-circuit curve(s) /damage point(s) etc - clearly identified and plotted on log-log scale graph(s). Tcc graph(s) shall include a one-line diagram identifying the specific portion covered by the graph. Demonstrate that adequate clearing time/selective operation exists between protective devices while providing proper system protection & coordination. Study shall include all main and feeder ocpds including secondary side of each transformer down to breakers in panel boards and individual breakers in distribution boards. In all cases, solid state and/or adjustable ocpds shall be analyzed with upstream and downstream ocpds as required to establish proper coordination settings. Special emphasis shall be placed on analyzing portions of the electrical system requiring selective coordination which include, but are not limited to, NEC (or CEC where adopted) articles 517, 620, 700, 701 & 708; along with any article 702 optional standby systems serving server rooms/data centers or other areas requiring high availability/proper coordination such as manufacturing, clean room or lab facilities. Contractor shall be responsible to recommend settings of all devices, to include ground fault settings, to

achieve system coordination. The Contractor shall field adjust new and existing devices accordingly utilizing a qualified manufacturer's representative or a third-party electrical testing agency.

8. The arc flash analysis shall determine the flash boundary, flash hazard category, ppe requirements, and minimum arc rating (cal/cm^2) at locations in the electrical system where work can or might be performed on energized components where multiple system configuration scenarios are possible, the configuration with greatest incident energy must be shown. Decrement fault contributions from motor(s) & generator(s) based on industry standards. The Contractor shall make recommendations with regard to system adjustments or other mitigation measures to optimize the results of the study as it relates to safe and reliable electrical system operation (e.g. Overcurrent device settings, working distances, current limiting devices). This includes mitigation, where possible, of incident energy levels that exceed $40 \text{ cal}/\text{cm}^2$. Perform iterative calculations to demonstrate effects of opening protective devices utilizing a variety of different settings to best mitigate arc flash energy while maintaining an acceptable level of system coordination. Where such recommendations compromise selective coordination settings, so state in the analysis.
9. Include incident energy/flash protection boundary calculations for both line/load side of all separately enclosed main circuit breakers. All calculations shall be based on actual overcurrent device clearing times.
10. Based on the results of the arc flash analysis, the Contractor shall produce and install a warning label (category 0: yellow, category 1 thru 4: orange) or danger label ($\text{red} > 40 \text{ cal}/\text{cm}^2$) for each piece of equipment as specified in "section a" in accordance with ANSI Z35.4-2007 or latest published edition. The label must be readable in both indoor and outdoor environments for at least 3 years and contain the following information: arc hazard boundary (inches), working distance (inches), arc flash incident energy at the working distance (cal/cm^2), ppe category and description including the glove rating, voltage rating of the equipment, limited approach distance (inches), restricted approach distance (inches), prohibited approach distance (inches), equipment/bus name, date prepared, supplier's name and address. Provide label as manufactured by Brady or equal. Prior to placing arc flash labels, Contractor shall set all protective device settings per the approved coordination study.
11. During the construction phase of the project, all ground fault relays shall be set at the lowest available time delay and pick-up settings.
12. Power systems studies shall be submitted as part of the overall switchgear submittal. The results of the power systems study shall be presented in a comprehensive report that includes:
 - a. Report summary with analysis methodology, findings and recommendations
 - b. Summary of input data for utility source, equipment and cables
 - c. Available fault current at each equipment location with comparison to equipment rating
 - d. Overcurrent device settings (e.g. Pick-up, time delay, curve), as found and as recommended
 - e. Overcurrent device coordination curves including related section of the single-line diagram
 - f. Complete system single-line diagram for the system analyzed
 - g. Incident energy level (cal/cm^2) for each equipment location, recommended ppe and sample arc flash warning labels
 - h. Electronic copy containing electronic project files used to develop the study to include skm project and reference library files. Failure to submit complete studies and files shall result in the rejection of the entire switchgear submittal.
13. The study shall include all portions of electrical single line diagram to include upstream or downstream elements that may not be shown including, but not limited to, utility source contribution, relevant portions of the existing electrical distribution system within a building and/or campus electrical distribution systems as described above.
14. All certified testing reports should be submitted to the District at completion of project

- a. 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. Ratings, types, and settings of generator's overcurrent protective devices.
 - g. Special overcurrent protective device settings or types stipulated by utility company.
 - h. Time-current-characteristic curves of devices indicated to be coordinated.
 - i. 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.
 - j. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
 - k. 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.
 - 6. Standby Generator and respective devices
- 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, 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. 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 or from listed standards indicating conductor size and short-circuit current.
- E. 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.
- F. 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 and Protective 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 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 24 16
PANELBOARDS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.
- B. Related Sections include the following:
 - 1. Section 260553 "Identification for Electrical Systems".
 - 2. Section 260573 "Overcurrent Protective Device Coordination Study" for short-circuit rating of devices and for setting of overcurrent protective devices.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RMS: Root mean square.
- D. SPDT: Single pole, double throw
- E. SPD: Surge Protective Device

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 - 2. The equipment and major components shall be suitable for and certified by actual seismic testing to meet all applicable seismic requirements of the latest California Building Code (CBC) with OSHPD Amendments.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 6. Include wiring diagrams for power, signal, and control wiring.
 - 7. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.6 INFORMATIONAL SUBMITTALS

- A. Provide to client for record – Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: Provide to client for record – Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:
 - 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. Provide to client for record – Field Quality-Control Reports:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
- D. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.7 CLOSEOUT SUBMITTALS

- A. Provide to client for record – Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.8 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. Keys: 4 spares for each type of panelboard cabinet lock.
 2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: one spare for each panelboard.

1.9 QUALITY ASSURANCE

- A. 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.
- B. Contractor shall ensure that the manufacturer has a minimum of 15 years experience in the production of Panelboards similar to the type and size specified in this project.
- C. Manufacturer shall have ISO 9001 or 9002 Certification.
- D. Manufacturer shall have ability to readily provide replacement parts for a minimum period of ten (10) years, from the date of completion of the project. Furnish a letter from the manufacturer confirming the availability.
- E. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- F. Panelboards shall be assembled at the manufacturer's own manufacturing facility using its own major devices (e.g., circuit breakers) for the assembly. These devices shall be normally carried by the manufacturer as standard catalog items.
- G. Panelboard shall comply with seismic zone applicable to the project. Unless otherwise indicated, verify requirements with Architect or Structural Engineer of Record (SEOR). Provide certified test reports of shake table test done by manufacturer on similar units as applicable for OSHPD projects.
- H. Materials and equipment shall be new, modern in design and shall not have been in prior service except as required by factory tests. Major components (e.g. Circuit breakers) shall be manufactured within six months of installation.

- I. Source Limitations: Obtain panelboards, overcurrent protective devices and accessories through one source from a single manufacturer through a local distributor unless otherwise indicated. All power distribution equipment shall be of the same manufacturer as the substation.
- J. Comply with NFPA 70.
- K. Comply with NEMA PB 1.
- L. Comply with UL 891.
- M. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.
- N. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on the specific system indicated. Refer to Part 2 "Product Requirements."
- O. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in NFPA 70, Article 100 and marked for intended location and application.
- P. Testing Agency Qualifications: Member of NETA;
 - 1. Testing agency shall be an independent company; shall have been a member of NETA and has permanent in-house testing engineers and technicians involved with testing of switchboards, panelboards and OCPDs similar to those specified on this project.
 - 2. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing to supervise on-site testing specified in Part 3.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407.

1.11 PROJECT CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
 - b. Altitude: Not exceeding 6600 feet (2000 m).
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
 2. Altitude not exceeding 6600 feet (2000 m).
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
1. Notify Construction Manager and Owner no fewer than 14 days in advance of proposed interruption of electric service.
 2. Do not proceed with interruption of electric service without Construction Manager's and Owner's written permission.
 3. Comply with NFPA 70E.

1.12 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.13 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- B. Enclosures: Flush- and surface-mounted cabinets.
1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Kitchen or Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 3. Finishes:

- a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat
 - b. Back Boxes: Same finish as panels and trim.
- 4. Directory Card: Inside panelboard door, mounted in:
 - a. Interior applications - transparent card holder
 - b. Exterior applications - metal frame with laminated directory.
- C. Phase, Neutral, and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 - 3. Split Bus (where applicable): Vertical buses divided into individual vertical sections.
- D. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Compression type.
 - 3. Ground Lugs and Bus-Configured Terminators: Compression or Mechanical type.
 - 4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- E. Service Equipment Label: UL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.
- F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- G. Panelboard shall be listed and labeled with UL short circuit rating.
- H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. Square D; a brand of Schneider Electric
 - 3. ABB GE Consumer & Industrial - Electrical Distribution.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Interiors shall be completely factory assembled. These shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus interiors.

- D. Cabinet dimensions shall be as follows:
 - 1. 32in-to-36in width, unless otherwise noted.
 - 2. Eaton PRL4, Schneider I-line, or approved equal per respective manufacturers specified.
- E. Doors:
 - 1. Interior - Secured with vault-type latch with tumbler lock; keyed alike. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
 - 2. Exterior – 3-point latch with padlockable handle
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- G. Where indicated, provide circuit breakers UL listed for application at 100% of their continuous ampere rating in their intended enclosure.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers
 - 1. Square D; a brand of Schneider Electric
 - 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 3. ABB GE Consumer & Industrial - Electrical Distribution.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors:
 - 1. Interior - Secured with vault-type latch with tumbler lock; keyed alike. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
 - 2. Exterior – 3-point latch with padlockable handle.

2.4 LOAD CENTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers
 - 1. Square D; a brand of Schneider Electric
 - 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 3. ABB GE Consumer & Industrial - Electrical Distribution.
- B. Load Centers: Comply with UL 67.

- C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units. Plug-in shall be considered where provided for review and approval.
- D. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. Square D; a brand of Schneider Electric
 - 3. ABB GE Consumer & Industrial - Electrical Distribution.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Where indicated provide circuit breakers UL listed for application at 100% of their continuous ampere rating in their intended enclosure.
 - 2. Thermal-Magnetic Circuit Breakers (**below 400A frame**): Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Provide field adjustable magnetic trip setting for circuit-breakers serving motor loads or other special applications as indicated
 - 3. Adjustable Instantaneous-Trip Circuit Breakers (**400A frame size and larger**): Magnetic trip element with front-mounted, field-adjustable trip setting.
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - 4. Circuit breakers shall have a minimum interrupting rating of 10,000 amperes RMS symmetrical at 240 volts, and 14,000 amperes RMS symmetrical at 480 volts, unless otherwise noted on the drawings. Verify maximum available fault levels from the Short Circuit and Coordination Study. Minimum interrupting rating (AIC) shall be 110% of the available fault level.
 - 5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 - 6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 - 7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Compression or Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - d. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
 - e. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
 - f. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.

- g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
- h. Circuit breaker handle locks shall be provided for all circuits that supply exit signs, emergency lights, and fire alarm panels.

2.6 PANELBOARD SUPPRESSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. Square D; a brand of Schneider Electric
 - 3. Current Technology; a subsidiary of Danahar Corporation.
 - 4. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
- B. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, solid-state, parallel-connected, non-modular type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:
 - 1. Accessories:
 - a. LED indicator lights for power and protection status.
 - b. Audible alarm, with silencing switch, to indicate when protection has failed.
 - c. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status.
 - 2. Peak Single-Impulse Surge Current Rating: 120 kA per mode/240 kA per phase.
 - 3. Minimum single-impulse current ratings, using 8-by-20-mic.sec. waveform described in IEEE C62.41.2.
 - a. Line to Neutral: 70,000 A.
 - b. Line to Ground: 70,000 A.
 - c. Neutral to Ground: 50,000 A.
 - 4. Protection modes and UL 1449 SVR for grounded wye circuits with 208Y/120-V, three-phase, four-wire circuits shall be as follows:
 - a. Line to Neutral: 400 V for 208Y/120.
 - b. Line to Ground: 400 V for 208Y/120.
 - c. Neutral to Ground: 400 V for 208Y/120.

2.7 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NECA 407.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NECA 407.
- B. Equipment Mounting: Install panelboards on concrete bases, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in division 033xxx
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
 - 2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to panelboards.
 - 5. Attach panelboard to the vertical finished or structural surface behind the panelboard.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- D. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- E. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated. Mounting height of Over Current Protective Devices shall be 6"7" above finished floor to the center of the grip of device operating handle unless a lower height is indicated or required by code.
- F. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- G. Recessed/flush panelboards shall include acoustical insulation backing.
- H. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- I. Install filler plates in unused spaces.

- J. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.
- K. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- L. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Tests and inspections.
- C. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- D. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test 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.
- E. Panelboards will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable component 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."
- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
 - 1. Measure as directed during period of normal system loading.
 - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
 - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

**SECTION 26 27 13
ELECTRICITY METERING**

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 equipment for electricity metering by Owner.

1.3 DEFINITIONS

- A. KY Pulse: Term used by the metering industry to describe a method of measuring consumption of electricity that is based on a relay opening and closing in response to the rotation of the disk in the meter.
- B. PC: Personal computer.

1.4 ACTION SUBMITTALS

- A. Product Data: Manufacturer's technical data for each type of product indicated.
- B. Shop Drawings: For electricity-metering equipment.
 - 1. Dimensioned plans and sections or elevation layouts.
 - 2. Wiring Diagrams: For power, signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features.
- C. Manufacturer Seismic Qualification Certification for Electricity-Metering Equipment: Submit certification that equipment components and their mounting and anchorage provisions have been designed to remain in place without separation of any parts or loosening of factory-made connections when subjected to the seismic forces and shall include the following:
 - 1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculations.
 - 2. Detailed description of equipment mounting and anchorage devices on which the certification is based and their installation requirements.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - 1. Application and operating software documentation.
 - 2. Software licenses.
 - 3. Software service agreement.
 - 4. Hard copies of manufacturer's operating specifications, design user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy Submittal.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in NFPA 70 and marked for intended location and application.
- B. Owner's Meters in switchgear/switchboard/distribution board shall be installed by the manufacturer at the factory.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Receive, store, and handle modular meter center according to NECA 400.

1.9 PROJECT CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted in writing under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Construction Manager and Owner no fewer than fourteen (14) days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Owner's written permission.
 - 3. Comply with NFPA 70E.
 - 4. Provide temporary standby power through a standby diesel quiet type back-up generator complete with fuel and 7/24 monitoring if the existing service interruption exceeds 2 hours. Coordinate additional requirements with owner minimum fourteen days in advance. Indicate method of providing temporary electric service.

1.10 COORDINATION

- A. Electrical Service Connections: Coordinate with utility companies and components they furnish as follows:
 - 1. Comply with requirements of utilities providing electrical power services.
 - 2. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

1.11 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning with Substantial Completion, provide software support for two years from the date of acceptance of the project by the owner.
- B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software at no additional cost to the owner.
 - 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade his computer equipment if necessary.

PART 2 - PRODUCTS

2.1 EQUIPMENT FOR ELECTRICITY METERING BY OWNER

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - 1. Electrotech Industries
 - 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit
(coordinate with campus BMS system BACNET/BACNET IP)
- B. General Requirements for Owner's Meters:
 - 1. Comply with UL 1244.
 - 2. Meters used for billing shall have an accuracy of 0.2 percent of reading, complying with requirements in ANSI C12.20 and NIST.
 - 3. Meters shall be certified by California Type Evaluation Program as complying with Title 4, California Code of Regulations, Article 2.2.
 - 4. Enclosure: NEMA 250, Type 1 minimum, with hasp for padlocking or sealing.
 - 5. Meters installed outdoor shall be in NEMA 4X stainless steel enclosure. Meter in enclosure shall be factory installed and assembled with strip heaters controlled by thermostat.
 - 6. Identification: Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 7. Memory Backup: Self-contained to maintain memory throughout power outages of 72 hours, minimum.
 - 8. Advance data logging and expanded memory capacity
 - 9. Sensors: Current-sensing type, with current or voltage output, selected for optimum range and accuracy for meters indicated for this application.
 - a. Type: solid core.
 - 10. Current-Transformer connection Cabinet: Listed or recommended by metering equipment manufacturer for use with sensors indicated.
 - 11. Building Automation System (BAS) Interface: One digital KY pulse to a user-definable increment of energy measurement. Match signal to BAS BACNET input and arrange to convey the instantaneous, integrated, demand level measured by meter to provide data for processing and possible programmed demand control action by destination system.
- C. Kilowatt-hour Meter: Electronic single- and three-phase meters, measuring electricity used.

1. Voltage and Phase Configuration: Meter shall be designed for use on circuits with voltage rating and phase configuration indicated for its application.
 2. Display: LCD with characters not less than 0.25 inch (6 mm) high, indicating accumulative kilowatt-hours and current kilowatt load. Retain accumulated kilowatt-hour in a nonvolatile memory, until reset.
- D. Meet LEED requirements as follows:
1. All whole-building energy sources used by the building; and any individual energy end uses that represent 10% or more of the total annual consumption of the building
 2. Meters must be permanently installed, record at intervals of one hour or less, and transmit data to a remote location.
 3. Electricity meters must record both consumption and demand. Whole-building electricity meters should record the power factor, if appropriate
 4. The data collection system must use a local area network, building automation system, wireless network, or comparable communication infrastructure
 5. The system must be capable of storing all meter data for at least 36 months.
 6. The data must be remotely accessible.
 7. All meters in the system must be capable of reporting hourly, daily, monthly, and annual energy use.
- E. Kilowatt-hour/Demand Meter: Electronic single- and three-phase meters, measuring electricity use and demand. Demand shall be integrated over a 15-minute interval.
1. Voltage and Phase Configuration: Meter shall be designed for use on circuits with voltage rating and phase configuration indicated for its application.
 2. Display: LCD with characters not less than 0.25 inch (6 mm) high, indicating accumulative kilowatt-hours, current time and date, current demand, and historic peak demand, and time and date of historic peak demand. Retain accumulated kilowatt-hour and historic peak demand in a nonvolatile memory, until reset.
- F. Data Transmission Cable: Transmit KY pulse data over Class 1 control-circuit conductors in raceway. Comply with Section 260523 "Control-Voltage Electrical Power Cables."
- G. Software: PC based, a product of meter manufacturer, suitable for calculation of utility cost allocation and billing.
1. Utility Cost Allocation: Automatically import energy-usage records to allocate energy costs for at least 5 tenants.
 2. Tenant or Activity Billing Software: Automatically import energy-usage records to automatically compute and prepare tenant bills and activity demand and energy-use statements based on metering of energy use and peak demand. Maintain separate directory for each tenant's historical billing information. Prepare summary reports in user-defined formats and time intervals.
- H. Accessories:
1. Fuses: Provide fuses to protect meters.
 2. Shunting Devices: Provide shunting devices for maintenance of meters.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with equipment installation requirements in NECA 1.
- B. Install modular meter components according to NECA 400 switchboard installation requirements.
- C. Install arc-flash labels as required by NFPA 70.
- D. Wiring Method:
 - 1. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
 - 2. Install unshielded, twisted-pair cable for control and signal transmission conductors, complying with Section 271513 "Communications Copper Horizontal Cabling."
 - 3. Minimum conduit size shall be 1/2 inch (13 mm).

3.2 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
 - 1. Series Combination Warning Label: Self-adhesive type, with text as required by NFPA 70.
 - 2. Equipment Identification Labels: Adhesive film labels with clear protective overlay. For residential meters, provide an additional card holder suitable for typewritten card with occupant's name.

3.3 FIELD QUALITY CONTROL

- A. Engage a factory-authorized service representative for installation and testing.
- B. Tests and Inspections:
 - 1. Connect a load of known kilowatt rating, 1.5 kW minimum, to a circuit supplied by metered feeder.
 - 2. Turn off circuits supplied by metered feeder and secure them in off condition.
 - 3. Run test load continuously for eight hours minimum, or longer, to obtain a measurable meter indication. Use test-load placement and setting that ensures continuous, safe operation.
 - 4. Check and record meter reading at end of test period and compare with actual electricity used, based on test-load rating, duration of test, and sample measurements of supply voltage at test-load connection. Record test results. This shall be done in the presence of Owner's Meter Shop Personnel. Coordinate through Owner's Representative.
- C. Electricity metering will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

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, receptacles with integral GFCI, and associated device plates.
 - 2. Twist-locking receptacles.
 - 3. Weather-resistant receptacles.
 - 4. Snap switches and wall-box dimmers.
 - 5. Solid-state fan speed controls.
 - 6. Wall-switch and exterior occupancy sensors.
 - 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.

1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Provide to client for record – 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 covers/doors: 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. 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. All devices in dining, breakrooms, maternity rooms, and food service areas shall be anti-microbial, and suitable and listed to health department requirements.
- D. 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, NEMA WD6 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. 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, with separate grounding screw and NEMA 5-20R plug configurations.
- B. Weather-Resistant Duplex Receptacle, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
 2. Configuration: NEMA WD 6, Configuration 5-20R.
 3. Standards: Comply with UL 498.
- C. 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, 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 GFCI RECEPTACLES

- A. General Description:
 1. Straight blade, *non-feed*-through type.
 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
 4. Include self test feature so that the outlet is automatically tested every fifteen minutes.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - ~~1.~~ Products: Subject to compliance with requirements, provide one of the following manufacturers:
 - a. Hubbell; GFR5352L.
 - b. Pass & Seymour; 2095.
 - c. Leviton; 7590.

2.5 TWIST-LOCKING RECEPTACLES

- A. Single Convenience Receptacles, NEMA type per circuit voltage: Comply with NEMA WD 1, NEMA WD 6 Configuration , and UL 498.
 1. Products: Subject to compliance with requirements, provide one of the following manufacturers:
 - a. Hubbell; HBL2310.
 - b. Leviton; 2310.
 - c. Pass & Seymour; L520-R.
 2. Locking receptacles other than 20 amps – refer to notes on plans for indicated locations.
 - a. Unless otherwise noted, model shall be consistent manufacturer and series to those noted in 262726-2.5-A-1 where possible.

2.6 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. Additional plug type where noted on plans
 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, stainless steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.7 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. Insulation shall be suitable for food services.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.8 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. All switches in dining, breakrooms, maternity rooms, and food service areas shall be anti-microbial.

C. Antimicrobial, Switches, 120/277 V, 20 A:

1. Description: Contact surfaces treated with a coating that kills 99.9 percent of certain common bacteria within two hours when regularly and properly cleaned.
 - a. Standards: Comply with UL 20 and FS W-S-896.

D. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following manufacturers:

- 1) Hubbell; HBL1221.
- 2) Leviton; 1221-2.
- 3) Pass & Seymour; CSB20AC1.

Two Pole:

- 4) Hubbell; HBL1222.
- 5) Leviton; 1222-2.
- 6) Pass & Seymour; CSB20AC2.

Three Way:

- 7) Hubbell; HBL1223.
- 8) Leviton; 1223-2.
- 9) Pass & Seymour; CSB20AC3.

Four Way:

- 10) Hubbell; HBL1224.
- 11) Leviton; 1224-2.
- 12) Pass & Seymour; CSB20AC4.

E. 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 green, illuminated when switch is "off."
- F. Key-Operated Switches, 120/277 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; HBL1221L.
 - b. Leviton; 1221-2L.
 - c. Pass & Seymour; PS20AC1-L.
 - d. nLight
 2. Description: Single pole, with factory-supplied key in lieu of switch handle.

2.9 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. GFCI, *Non-Feed-Through* Type, Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and UL 943 Class A.
- ~~1.~~ Products: Subject to compliance with requirements, provide one of the following manufacturers:
 - a. Hubbell; GF20LA.
 - b. Leviton; 8599.
 - c. Pass & Seymour; 2094.
- C. GFCI, and Weather-Resistant Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and UL 943 Class A.
1. Products: Subject to compliance with requirements, provide one of the following manufacturers:
 - a. Hubbell; GFTR20.
 - b. Pass & Seymour; 2094TRWR.
 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article Section.

- D. 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).
- E. Pilot 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."

2.10 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 thermo vinyl.
 - 3. Material for breakrooms, food service: 0.04-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel. Smoothie," Hubbell #97071 Series or equal.
 - 4. Material for: stainless steel.
 - 5. Material for interior Damp Locations: Hi-Impact Thermo vinyl with in-use cover, and listed and labeled for use in wet and damp locations.
- B. Wet and exterior Locations, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant stainless-steel plate with cast metal lockable, in-use cover.
- C. Antimicrobial Cover Plates at all dining, and maternity rooms:
 - 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.

2.11 FLOOR SERVICE FITTINGS

- A. *Type: Modular, flush-type, dual-service units suitable for wiring method used.*
 - 1. *For AV, computer labs, and lectern applications – Power and Data combination: FSR 500 and accessories. 2-circuits, 120v duplex (dual or single, quantity per plans). Shall be coordinated with division 27.*
 - a. *Covers*
 - 1) *floors Flush edge to slab, surface cover*
 - 2) *include fire-rated concrete pour-pan for upper floors*

2. *Flush Power Receptacle: HUBBELL S1SFB series; S1TFCxx series metal cover, or Legrand equal.*
- B. Compartments: Barrier separates power from voice and data communication cabling.
 - C. Service Cover Plate: solid brass with satin finish. Provide 10 spare covers of each type and color variation (in the project) for client stock.
 - D. Both box and cover shall be metal assembly
 - E. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
 - F. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for UTP cable

2.12 POKE-THROUGH ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
 1. Wiremold/Legrand.
 2. Hubbell Incorporated; Wiring Device-Kellems.
 3. *Power and data combination (recessed):*
 - a. *For AV, computer labs, and lectern applications: FSR FL-500 series with fire rated concrete pour pan and accessories. Shall be coordinate with division 27. 2-circuits, 120v duplex (dual or single, quantity per plans).*
 - b. *Covers*
 - 1) *Floor – Flush edge to slab, surface cover*
 4. *Power receptacle (surface): HUBBELL S1PTFIT SERIES ; S1 series metal cover, lockable. 2 circuit, quadraplex, or Legrand equal*
- B. Service Cover Plate: solid brass with satin finish. Provide 10 spare covers of each type and color variation (in the project) for client stock.
- C. 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. Both pokethrough box and cover shall be metal assembly
 3. Comply with UL 514 scrub water exclusion requirements.
 4. Service-Outlet Assembly: Flush type with four simplex receptacles and space for four RJ-45 jacks. See Div 27 for additional notes.
 5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
 6. Closure Plug: Arranged to close unused 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 two or four, four-pair cables that comply with requirements in Division 27.

2.13 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.
 - 3. Assembly shall include dedicated low voltage channel where raceways are indicated at same locations on telecom/AV and electrical plans
- C.** Raceway Material: Metal, with manufacturer's standard finish. Aluminum
- 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 unless otherwise shown on drawings.

2.14 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 and standby Power System: Red.
 - 3. Plug control Devices: Blue with "controlled" stamp.
- 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.
10. Devices and plates shall be level and plumb.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

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 bottom. 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 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with 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.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test Instruments: Use instruments that comply with UL 1436.
 - 2. 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. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Test straight-blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz. (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. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Receptacle switches.
 - 4. Shunt trip switches.
 - 5. Molded-case circuit breakers (MCCBs).
 - 6. Molded-case switches.
 - 7. 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. Systems on emergency standby: 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. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
1. Test procedures used.
 2. Test results that comply with requirements.

1.7 CLOSEOUT SUBMITTALS

- A. Provide to client for record – 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 log-log graph.

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. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 2. Fuse Pullers: Two for each size and type.

1.9 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.
- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Construction Manager and Owner no fewer than 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 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. Square D; a brand of Schneider Electric.
 - 3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified and indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Auxiliary Contact Kit: One or Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Coordinate with the following:
 - a. Variable frequency drives (VFD) and elevator controls – interlock to deactivate control. Include control cabling in ¾" conduit.
6. Lugs: Mechanical or Compression type, suitable for number, size, and conductor material.
7. Service-Rated Switches: Labeled for use as service equipment.
8. Accessory Control Power Voltage: 120-V ac standard, coordinate with respective to final equipment for voltage type.

2.2 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. 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. 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. 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. Coordinate with the following:
 - a. Variable frequency drives (VFD) and elevator controls – interlock to deactivate control. Include control cabling in ¾" conduit.
 5. Lugs: Mechanical or Compression type, suitable for number, size, and conductor material.
 6. Service-Rated Switches: Labeled for use as service equipment.
 7. Accessory Control Power Voltage: 120-V ac standard, coordinate with respective to final equipment for voltage type.

2.3 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. 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: 15 to 100 amps; Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
 - D. Adjustable, Instantaneous-Trip Circuit Breakers frame sizes 125 A and larger: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - E. Electronic Trip Circuit Breakers frame sizes 250 A and larger: 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 or 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: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

2.4 MOLDED-CASE 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. Square D; a brand of Schneider Electric.
- B. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

C. Features and Accessories:

1. Standard frame sizes and number of poles.
2. Lugs: Mechanical or Compression type, suitable for number, size, trip ratings, and conductor material.
3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.

2.5 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, stainless steel 316.
 3. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, 316 stainless steel.
 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4 stainless steel 316.
 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.
- C. Unless otherwise indicated or required, use only unfused type for motor or equipment disconnects. Provide switches for the number of poles and the voltage, current and horsepower ratings as required.
- D. Provide each switch with laminated plastic nameplate indicating panel designation and circuit number of the feeder and equipment controlled.

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. Install fuses in fusible devices.
- D. 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. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. 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.
- C. 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. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers. 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 56 19
LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
 - 2. Luminaire supports.
 - 3. Luminaire-mounted photoelectric relays.
 - 4. Tree and landscape lighting
- B. Related Requirements:
 - 1. Section 260943 Programmable lighting control systems with low-voltage control wiring or data communication circuits.

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. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of luminaire.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of luminaire.
 - 4. Pole material dimensions, and bolting pattern.

5. Lamps, 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, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project and testing procedures and criteria required by IES LM-79 and LM-80.
 - a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
 7. Wiring diagrams for power, control, and signal wiring.
 8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.
- 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 (as applicable).
 3. Include diagrams for power, signal, and control wiring.
- C. Sustainable Design Submittals:
1. "BUG ratings" Light Pollution Reduction for both uplight and light trespass.

PART 2 - PRODUCTS

2.1 REFER TO LIGHT FIXTURE SCHEDULE ON PLANS

- A. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

2.2 INFORMATIONAL SUBMITTALS

- A. 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: locate and describe mounting and anchorage provisions.
- B. All LED lifetime projections shall be made per TM-21-11 (approved method for taking LM-80 data and making useful LED lifetime projections).
- C. Source quality-control reports.

2.3 CLOSEOUT SUBMITTALS

- A. For client record only – Operation and Maintenance Data: For luminaires to include in operation and maintenance manuals.
 - 1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
 - 2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

2.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
 - 3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
 - 4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

2.5 QUALITY ASSURANCE

- A. Provide luminaires from a single manufacturer for each luminaire type.
- B. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

2.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

2.7 FIELD CONDITIONS

- A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.
- B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

2.8 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:

- a. Structural failures, including luminaire support components.
 - b. Faulty operation of luminaires and accessories.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- 2. Warranty Period: 5-years from date of Substantial Completion.

PART 3 - PRODUCTS

3.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. UL Compliance: Comply with UL 1598 and listed for wet location.
- D. CRI of minimum 80.
- E. L70 lamp life of 50,000 hours.
- F. Lamps continuous dimmable from 100 percent to 0 percent of maximum light output (where noted on plans).
- G. Internal driver.

3.2 LUMINAIRE TYPES

See fixture schedules on design drawings

3.3 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. 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. Doors shall be removable for cleaning or replacing lenses.
- C. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- D. Housings:
 - 1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
 - 2. Provide filter/breather for enclosed luminaires.

- E. Factory-Applied Labels: Comply with UL 1598.

3.4 FINISHES

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

3.5 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 4 - EXECUTION

4.1 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 electrical conduit to verify actual locations of conduit connections before luminaire installation.
- C. Examine walls, roofs, ceilings for suitable conditions where luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 TEMPORARY LIGHTING

- A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting.

4.3 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with NECA 1.
- B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Fasten luminaire to structural support. Comply with project Structural designs and code requirements.
- D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning.
3. Support luminaires without causing deflection of finished surface.
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. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls or Attached to a minimum **1/8 inch** backing plate attached to wall structural members.

F. Wiring Method: Install cables in raceways. Conceal raceways and cables.

G. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.

H. Coordinate layout and installation of luminaires with other construction.

I. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

4.4 BOLLARD LUMINAIRE INSTALLATION

A. Align units for optimum directional alignment of light distribution.

1. Install on concrete base with top above finished grade or surface at luminaire location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

4.5 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated on Drawings.

B. Install on concrete base with top above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

4.6 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

4.7 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

4.8 FIELD QUALITY CONTROL

- A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Verify operation of motion controls.
- C. Illumination Tests:
 - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
 - 2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- D. Luminaire will be considered defective if it does not pass tests and inspections.
- E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

4.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaires.

4.10 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
 - 1. During adjustment visits, inspect all luminaires. Replace 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 00
GENERAL REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Provide a standard defining the structured communications cabling systems to be installed within the customer facility.
 - 2. Scope of Work Compliance.
 - 3. Contractor Qualifications.
 - 4. Warranty.
 - 5. Safety.
 - 6. Working Conditions.

1.2 PROJECT INFORMATION

- A. Project Site Description: Project
 - 1. Project location: Street address & zip-code
 - 2. Building Owner: Name
 - 3. Project delivery: Construction Type
 - 4. Managed by: Name - Email
 - 5. Project Main Point of Authorization; Name - [Email](#)
- B. Client (Owner): Authorization to Work requires one or more of the following documents and shall be confirmed with the OAR or Project Manager:
 - 1. Prequalification Package: #
 - 2. Annual Job Order Contractor – Agreement #
 - a. Confirm with the (IOR) Authorizer that Project – SoW is included.
 - 3. Project Purchase Order: #

1.3 GENERAL TERMS AND CONDITIONS

- A. The goal is to accomplish this technology project utilizing **Golden West College** IT-approved materials in the most economical and systematic possible and compliant with the latest codes, cabling standards, and industry best practices.
- B. The General Contractor is responsible for all required Division 27 scope of work and shall ensure that all communication sub-tier contractors adhere to the qualifications outlined in project Division 27 specifications, including project experience and certifications.
- C. Prices quoted shall be all-inclusive and represent a complete, fully-engineered system installation at the Project site as contemplated and detailed in the drawing package and accompanying specifications.
- D. Omissions in the specification of any described provision shall not be construed to relieve the Contractor of any responsibility or obligation requisite to the complete and satisfactory delivery, installation, operation, and support of any and all systems, equipment, or services. Correction of any omission on the

Contractor's part due to misinterpretation of this specification or any other project conditions shall be the Contractor's responsibility and shall not result in any contract modification or additional costs to **Golden West College**.

- E. Where conflicts and/or irregularities occur between project documents, specifications, drawings, and/or applicable codes, rules, regulations, ordinances, standards, guidelines, and practices, the more stringent requirement shall apply as reasonably determined by **Golden West College** or government agency inspector.
- F. This specification represents the design intent for the project communicated by way of narrative descriptions of intended functionality and a single line or detail drawings indicating likely equipment connectivity to achieve that functionality. The designs in this specification do not represent fully engineered technical solutions. Contractors are required to review the designs presented in the project documents closely, submit any questions and clarifications regarding the design intent through the RFI process, and develop their own engineered solutions representing a fully functional turn-key solution in their bid responses.
- G. This project's scope includes the complete system engineering, procurement, fabrication, installation, programming, testing, training, and warranty.
- H. Proposed solutions shall be based on the designs communicated in the specifications. Still, they shall include any additional equipment, materials, software, licenses, and/or labor required for the Contractor to deliver a fully functional turn-key system solution that meets intended operational performance requirements.
- I. The contractor awarded this project is responsible for ensuring that all quantities, materials, labor, licenses, permits, sales taxes, and any other costs to provide a turnkey project are included in their bid.
- J. Floor plans, drawings, elevation drawings, and other drawings received by the Contractor as part of the construction process are hereby incorporated into this document by reference. The Contractor is responsible for ensuring that amounts and lengths of cabling and pathways are correct and that all materials and labor are included to install the system per the drawings and these specifications.
- K. Permits, licenses, applicable sales taxes, insurance requirements, payment/performance bond costs, and other miscellaneous costs are the Contractor's responsibility and shall be included in the contract price and this scope of work. Such items are to be listed separately on pricing sheets if provided. Copies of all required permits, licenses, insurance requirements, and bond(s) are to be delivered to **Golden West College** before the commencement of any work.
- L. Installation Schedule and Coordination: the Contractor shall take the fast-track nature of this project and the potential requirement for installation/work schedule adjustments and quick turnarounds into consideration in constructing this project, as the **Golden West College** will NOT entertain or agree to added-cost change orders associated with scheduling changes.
- M. Work must be closely coordinated with the architect, **Golden West College** Personnel (PW, IT, PD, etc.), GC, MEP contractors, structural Contractors, and all low-voltage contractors and their respective schedules.
- N. This will be a turn-key Project. Any item of the equipment or material not explicitly addressed on the drawings, specifications, or elsewhere in Division 27 specifications documents but required to provide complete and functional systems as contemplated and/or specified herein shall be provided at no

additional charge to the **Golden West College** in a quantity and quality consistent with other specified items.¹

- O. Coordination with Project Design Team: The building contractor will coordinate all communications cabling infrastructure requirements, including review of existing site conditions, review and coordination of electrical power and grounding requirements, conduits and back boxes, structural support requirements, and coordination with other trades.
- P. Assembly: The Contractor shall procure and assemble all hardware, equipment, and any additional materials required to deliver the completely functioning communications cabling system.
- Q. Installation: The Contractor shall install all equipment, inter-rack and intra-rack cable, equipment, wiring, connectors, panels, plates, and other materials at the Project site.
- R. Testing and Adjustment: The Contractor shall perform all tests and adjustments, furnish all test equipment necessary, and perform all Work required to properly configure the systems and verify their performance per the information in this document and the design-build integrator's approved engineered designs.
- S. Warranty: The Contractor shall warrant the installed system in accordance with the terms of this document and accompanying contractual documents.

1.4 RELATED DOCUMENTS

- A. All Construction Contract Documents, specification documents, and general provisions.
- B. Division 1 specification sections. (**Golden West College** Project Manager & **Golden West College** Acct. Representative)
- C. Division 24 & 25 for BMS and Control Systems. (Provided by EoR)
- D. Section 26 00 10 General Electrical Requirements and related documents. (Provided by EoR)
- E. Section 27 05 26 Grounding Bonding for Communications Systems
- F. Section 27 05 29 Hangers and Supports for Communications Systems.
- G. Section 27 05 33 Conduit and Boxes for Communications Systems.
- H. Section 27 05 53 Identification for Communications Systems.
- I. Section 27 08 00 Commissioning for Communications Systems.
- J. Section 27 11 19 Termination Blocks and Patch Panels for Communications Systems.
- K. Section 27 11 23 Cable Management and Overhead Ladder (typ) Racking for Communications Systems.
- L. Section 27 13 23 Communications Optical Fiber Backbone Cabling.
- M. Section 27 15 00 Copper Horizontal Cabling.
- N. Section 27 15 43 Communications Faceplates and Connectors.

- O. Section 27 16 19 Communications Patch Cords
- P. Architectural, civil, structural, mechanical, electrical, and all technology drawings, including but not limited to Telecommunication Drawings.
- Q. Product manufacture data sheets and installation requirements for the product's intended use or assembly.
- R. Project Basis of Design document for low-voltage/signal systems (a.k.a. Technology Systems including but not limited to IP Networks, Wireless IP Networks, and Category 6A Structured Cabling Solutions, Remote IDF, furniture systems interface, New conduit locations, etc).
- S. Refer to structural seismic requirement design documents specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

1.5 REFERENCES

- A. Abbreviations and Acronyms: (See associated drawing set - cover sheet(s) for a complete list).
 - 1. A/E Architect / Engineer (designer)
 - 2. BICSI Building Industry Consulting Service International
 - 3. EIA Electronics Industry Alliance
 - 4. ELFEXT Equal Level far End Cross Talk
 - 5. FTP Foiled Twisted Pair
 - 6. IDF Intermediate Distribution Facility (aka TR)
 - 7. ILEC/LEC Incumbent Local Exchange Carrier
 - 8. ISP Inside Plant
 - 9. IT Information Technology
 - 10. BDF Building Distribution Frame
 - 11. LOMMF Laser Optimized Multi-Mode Fiber
 - 12. MDF Main Distribution Facility (aka TEC)
 - 13. MPOE Minimum Point of Entry
 - 14. NEXT Near End Cross Talk
 - 15. OAR Owner Approved Representative
 - 16. OSP Outside Plant
 - 17. PSELFEXT Power Sum Equal Level Far End Cross Talk
 - 18. PSNEXT Power Sum Near End Cross Talk
 - 19. PW Public Works
 - 20. RCDD Registered Communications Distribution Designer
 - 21. TBD To Be Determined
 - 22. TCIM Telecommunication Cabling Installation Manual
 - 23. TDMM Telecommunications Distribution Methods Manual
 - 24. TIA Telecommunications Industry Association
 - 25. UTP Unshielded Twisted Pair
 - 26. WAO Work Area Outlet
 - 27. WAP Wireless Access Point

1.6 APPLICABLE REGULATORY REFERENCES

- A. The Contractor is responsible for knowledge and application of current versions of all applicable Best Practices, Standards, and Codes/Regulatory requirements. In cases where listed Standards and Codes

have been updated, the Contractor shall adhere to the most recent revisions, including all relevant changes or addenda at the time of installation.

1. ANSI/IEEE
 - a. ANSI/IEEE C2, National Electrical Safety Code®
2. ANSI/NECA
 - a. ANSI/NECA-1-2015 Standard for Good Workmanship in Electrical Construction
3. ANSI/TIA:
 - a. TIA-526-7 (OFSTP-7) (July 2015) Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
 - b. TIA-526-14-C (April 2015) (OFSTP-14) Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
 - c. ANSI/TIA/EIA-598-D (2018) Optical Fiber Cable Color Coding
 - d. ANSI/TIA-568-C.0 (December 2015) Generic Telecommunications Cabling for Customer Premises
 - e. TIA-568-C.0-1 (September 2012) Generic Telecommunications Cabling for Customer Premises-Addendum 1, Updated Reference for Balanced Twisted-Pair Cabling
 - f. ANSI/TIA-568-C.1 (February 2012) Commercial Building Telecommunications Cabling Standards
 - g. TIA-568-C.1-2 (November 2014) Commercial Building Telecommunications Cabling Standard, Addendum 2 General Updates
 - h. ANSI/TIA-568-C.2 (June 2016) Balanced Twisted Pair Communications Cabling and Components Standards
 - i. ANSI/TIA-568-C.3 (June 2011) Optical Fiber Cabling Components Standard
 - j. ANSI/TIA-568-C.3-1 (December 2011) Optical Fiber Cabling Component Standard-Addendum 1, Addition of OM4 Cabled Optical Fiber and array connectors
 - k. ANSI/TIA-568.1 Revision E, March 2020
 - l. ANSI/TIA-568D – Series Generic Telecommunications Cabling for Customer Premises (that includes Cat6A, OM5, and other cable performance enhancements)
 - m. ANSI/TIA-1183-A (2017) Test Fixtures for Balun-Less Measurements of Balanced Components and Systems
 - n. ANSI/TIA-568-C.4 (July 2011) Broadband Coaxial Cabling Components Standard
 - o. ANSI/TIA-942-B (2020) Telecommunications Infrastructure Standard for Data Centers
 - p. TIA-569-E (2020) Telecommunications Pathways and Spaces
 - q. ANSI/TIA-606-C (2017) Administration Standard for Telecommunications Infrastructure
 - r. TIA-607-D (2019) Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises
 - s. TIA-758-B (2018) Customer-Owned Outside Plant Telecommunication Infrastructure Standard
 - t. TIA-1152-A (2016) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
 - u. ANSI/TIA-862-B (February 2016) Structured Cabling Infrastructure Standard for Intelligent Building Systems.
 - v. TIA-570-D (2018) Residential Telecommunications Infrastructure Standard
 - w. TIA-1005-A (June 2012) Industrial Telecommunications Infrastructure Standard for Manufacturing, Process & Refining
 - x. ANSI/TIA-1005 (January 2015) Telecommunications Infrastructure Standard for Industrial Premises
 - y. TIA-1005-1 (May 2012) Telecommunications Infrastructure Standard for Industrial Premises; Addendum 1 - Industrial Pathways and Spaces
 - z. TIA-1179-A (July 2018) Healthcare Facility Telecommunications Infrastructure Standard
4. ISO/IEC

- a. ISO 11801-6 (2017) - Generic Cabling for Customer Premises
 - b. ISO/IEC TR 14763-3-2 (2016) - Information technology -- Implementation and operation of customer premises cabling -- Part 2-1: Planning and installation - Identifiers within the administration system
- 5. National Codes
 - a. ANSI/NFPA 70-2017, National Electrical Code® (NEC®)
 - b. ANSI/NFPA 99-2021, Health Care Facilities Code
 - c. ANSI/IEEE C2-2017, National Electrical Safety Code®
 - d. ANSI/NFPA 780, Lightning Protection Code
- 6. Federal Communications Commission
 - a. (FCC) Part 15
 - b. (FCC) Part 68
- 7. OSHA Standards and Regulations – all applicable
- 8. American Society for Testing Materials (ASTM) Publications
- 9. National Electrical Manufacturer’s Association (NEMA) Publications
- 10. State of California Public Utilities Commission (Cal. P.U.C.) Publication
 - a. G.O. 92, 95, & 128 Rules for Construction of Underground Electrical and Communications Systems
 - b. Rural Utilities Services (RUS), formally REA
- 11. 2022 California Title 24
 - a. 2025 California Administrative Code, Title 24 Part 1
 - b. 2022 California Building Code, Title 24 Part 2
 - c. 2022 California Electrical Code, Title 24 Part 3
 - 1) Chapter 2: Article 250 “Grounding”
 - 2) Chapter 3 compliant installation with modification to accommodate optical fiber manufacturer’s installation requirements.
 - 3) Chapter 6: Articles 645, & 646
 - 4) Chapter 7: Articles 725 & 770
 - 5) Chapter 8: All Systems & related work by reference to other articles
 - d. 2022 California Mechanical Code, Title 24 Part 4
 - e. 2022 California Plumbing Code, Title 24 Part 5
 - f. 2022 California Energy Code, Title 24 Part 6
 - g. 2022 California Fire Code, Title 24 Part 9
 - h. 2022 Green Building Standard Code, Title 24 part 11
 - i. 2022 California Standard Code, Title 24 Part 12
- 12. Underwriters Laboratories Inc. (U.L.) Publications
 - a. 6-1981 (R86) Rigid Metallic Conduit
 - b. 514B-1982 Fittings for Conduit and Outlet Boxes
 - c. 651-1981 Schedule 40 and 80 Rigid PVC Conduit
 - d. UL 467 “Grounding and Bonding Equipment”
 - e. UL 497, 497A, and 497B “Communications Circuit Protectors”
 - f. UL 924 & UL1994 Emergency Lighting
- 13. Local Codes and Standards – all applicable
 - a. **Golden West College** Installation and Best Practices

- b. **Golden West College** Information Technology – Standard Equipment and Installation Best Practices
14. BICSI Publications, Manuals, & ANSI Approved BICSI Standards
 - a. Telecommunications Distribution Methods Manual, 14th Edition (2021)
 - b. AV Design Reference Manual, 1st Edition (2015)
 - c. Network Design Reference Manual, 7th Edition (2015)
 - d. Network Systems and Commissioning (NSC) reference, 1st Edition (2015)
 - e. Outside Plant Design Reference Manual, 6th Edition (2018)
 - f. Wireless Design Reference Manual, 3rd Edition (2015)
 - g. Electronic Safety and Security Design Reference Manual, 4th Edition. (2014)
 - h. Information Technology Systems Installation Methods Manual (ITSIMM), 6th Edition
 - i. ANSI/BICSI 001-2017, Information Transport Systems Design Standard for K-12 Educational Institutions
 - j. ANSI/BICSI 002-2019, Data Center Design and Implementation Best Practices
 - k. ANSI/BICSI 003-2014 Building Information Modeling (BIM) Practices for Information Technology Systems
 - l. BICSI 004-2018, Information Technology Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities
 - m. ANSI/BICSI 005-2016 – Electronic Safety and Security (ESS) System Design and Implementation Best Practices
 - n. ANSI/BICSI 006-2020 Distributed Antenna System (DAS) Design and Implementation Best Practices
 - o. ANSI/BICSI 007-2017 Information Communication Technology Design and Implementation Practices for Intelligent Buildings and Premises
 - p. ANSI/BICSI 008-2018 Wireless Local Area Network (WLAN) Systems Design and Implementation Best Practices
 - q. ANSI/BICSI 009-2019 Data Center Operations and Maintenance Best Practices
 - r. ANSI/BICSI N1-19 Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure. Formally known as - ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
 - s. ANSI/BICSI N2-17 Practices for the Installation of Telecommunications and ICT Cabling Intended to Support Remote Power Applications
 - t. ANSI/BICSI N3-20 Planning and Installation Methods for the Bonding and Grounding of Telecommunication and ICT Systems and Infrastructure – formally known as - NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
 - u. BICSI G1-17 ICT Outside Plant Construction and Installation: General Practices
 15. Anywhere cabling Standards conflict with electrical or safety Codes, the Contractor shall defer to NEC and any applicable local codes or ordinances or default to the most stringent requirements listed by either.
 16. Knowledge and execution of applicable codes is the Contractor's sole responsibility.
 17. Any code violations committed during installation shall be remedied at the Contractor's expense.

1.7 SCOPE OF WORK

- A. General project information:
 1. These Specifications and associated drawings are the governing documents for the telecommunications infrastructure installation and include project descriptions, specified and recommended products, installation and project management methods, the Scope of Work, and elevation drawing specifications.

2. This division specification document will refer to {Name} as the **Golden West College**.
3. **Golden West College** wishes to contract with a General Contractor, who will sub-tier the supplier/contractor ("ICT-Information, Communication Technology, and Audio-Visual") to provide, install, test, and warranty a complete turn-key a Cable Infrastructure System and Audio-Visual System for the **Golden West College's** {Fine Arts Building}, the "Project" per the scope of Work and specifications stated herein. This inquiry implies no obligation on the part of **<Client>**. The Contractor shall bear all costs and expenses incurred in preparing a response to a Request for Proposal ("RFP") and subsequent award of the project; it is understood and agreed that **<Client>** accepts no responsibility for any costs and/or expenses incurred by the winning Contractor in preparing and submitting such response.
4. The **<Client>** is developing a {Insert Building}, located at {Address}. The building will consist of the following:
 - a. Describe Room types to be in scope
 - b. Describe the AV system if applicable
 - c. Reference Div 28 security systems if applicable
 - d. Describe the MDF/BDF/IDF room build-out.
 - e. Describe backbone infrastructure and cable as needed.
 - f. Describe Horizontal cable infrastructure as needed.

B. Purpose:

1. This specification defines quality standards and practices common to all network cabling for the project. In addition, the project will have Requests for Proposals (RFP), associated drawings, and requirements about their specific environments. This document will refer to such collateral as "Project Specific Documentation" or simply "Construction Documents."
2. Voice and Data Networks encompass a broad spectrum of technologies and are distributed into internal project spaces. Installed cables will be used for Ethernet, high and low-speed data applications, and analog and digital voice, not to exclude other future Voice/Data technologies. This specification will include indoor/outdoor cable installations, backbone cabling, telecommunications closet and equipment cabling, equipment hardware, and routing and support infrastructure.
3. the installing Contractor is responsible for evaluating these general recommendations and adapting them effectively to actual projects. The Contractor is responsible for identifying and bringing to the attention any design directions that may be in conflict or otherwise improved. All such conflict resolutions shall be in writing from A/E or **Golden West College**.
4. Note that while many portions of this global specification are addressed to "The Contractor," these requirements apply equally to anyone doing the network cabling and infrastructure work within, whether those persons are outside contractors or persons directly employed by the **Golden West College**.
5. The Contractor shall be solely responsible for all parts, labor, testing, documentation, and all other associated processes and physical apparatus necessary to turn over the completed system fully warranted and operational for acceptance by A/E and manufacturer's representative.
6. This specification includes structured cabling design considerations, product specifications, and installation guidelines for low-voltage network systems and associated infrastructure, including but not limited to:
 - a. Cabling Sub-system 1 – Horizontal
 - 1) Category 6A cable
 - 2) Work area (equipment outlet) appliances and configuration (Furniture systems cabling).
 - 3) Horizontal Pathways
 - 4) Copper Patching
 - b. Backbone Cabling

- 1) Interbuilding backbone – Copper and Fiber
- 2) Patching / Cross-connect – Copper and Fiber
- c. Telecommunications Spaces
 - 1) Telecommunications Room Requirements
 - 2) Racks and Cabinets
 - 3) Overhead Pathways
- d. Communications Grounding Systems
- e. Communications Labeling and Administration

C. Scheduling:

- 1. Contract Documents and the overall construction schedule must be carefully reviewed to determine all required interfacing and timing of the Work. All such documents shall be available through the General Contractor or Construction Manager.
- 2. The project schedule shall include, but is not limited to, the following task sequence:
 - a. New Server Room, IDF Construction, and buildout.
 - b. Conduit infrastructure: including vaults/pull box install and conduit duct banks.
 - c. Individual Building Pathway Installation.
 - d. Building Category 6A Cable installations; includes installation, termination, labeling, testing, as-built, and warranty documentation.
 - e. Wireless Access Points.
 - f. New backbone fiber optic cabling installations: includes installation, termination, labeling, testing, as built, and warranty documentation.
 - g. Service provider cabling and equipment installation.
 - h. Service provider completion and commissioning.

D. Coordination:

- 1. Install and coordinate the telecommunications cabling work in cooperation with other trades installing interrelated work. Before installation, make proper provisions to avoid interference in a manner accepted by the architect. Any repairs or changes made necessary in the contract work caused by the sub-contractor's neglect shall be made by the sub-contractor at their own expense.

E. Project Scoping from Basis of Design:

- 1. The Contractor shall use all **Golden West College** current technology standards input for a complete functioning turn-key technology solution.
- 2. {Copy Scope of Work from drawing set cover sheet and insert here.}
- 3. Scope of Work (Narrative):
 - a. The telecommunications infrastructure for the **Golden West College** (Campus/Site) shall include a standard infrastructure to support voice, data, wireless communications, and specified audio-visual services. The foundation for the design shall be according to **Golden West College** Design Guidelines (if applicable), EIA/TIA 568C & D Series and 569B standards, along with BICSI Methodologies (TDMM and OSPDRM), Industry Best Practices, and Manufacturer's Installation Requirements.
 - b. All Low-Voltage/Signal Systems shall be installed and furnished by a manufacturer's pre-qualified company. A certified manufacturer's representative shall install the low voltage/signal infrastructure with all material covered under an extended warranty for compliance with **Golden West College** Standards. A minimum 25-year extended product and performance warranty must cover the new cabling. Each installer must show proof of training and proficiency for the Low-Voltage/Signal Systems being expanded and extended to for the building type. All hardware the Contractor provides shall be "new in the box" and match the existing in-service back-end and end-devices to maintain the current Campus low-voltage/signal system's integrity. All Contractor-furnished equipment and materials shall be in full compliance with district specifications and shall be submitted to the project

OAR for **Golden West College** review and acceptance prior to contractor installation. Equipment and materials submittals shall comply with specified formatting and indexing defined in the system-specific specification. Any and all equipment that does not match the current (Campus/Site) solution/part number(s) is required to be accompanied by a letter and cross-reference table(s) from the manufacturer for verification that the product is compatible with the interface with currently deployed solutions.

- c. Contractor shall register the PROJECT NAME project 2023 with CommScope (SYSTIMAX) to add these locations to the **<Client>**'s extended warranty agreement.
- 4. Make Ready and Demolition Scope of Work (Narrative):
 - a. The Contractor shall be required to work with the **Golden West College** IT Services and the General Contractor not only to verify and document each portion of the demolition but there shall be times when the temporary connection of certain low-voltage/signal systems shall be required to be immediately reconnected for safety and to provide the campus and its occupants with systems operating as normally as possible.
 - b. The Contractor shall be required to assist **Golden West College** IT Staff with disconnecting and removing Low-Voltage/Signal end devices and associated IDF equipment in the buildings identified as part of the demolition phase(s). This work may include multiple sub-phases in each building being demolished and buildings that feed from or to the buildings on the demolition list.
 - c. The Contractor shall verify through **Golden West College** Authorized Representative (OAR) that the IT Staff have removed all connections to each building/BDF/MDF/IDF before disconnecting and removing building entrance cabling and associated equipment.
 - d. The Contractor shall remove all low voltage/signal cabling associated with demolishing the building. End devices from all common voltage/signal systems will have a predefined location for staging and inventory post-demolition activities.
 - e. As part of the Contractor's responsibility, all conduits where backbone cabling has been removed shall be identified on project as-builts. At a minimum, the Contractor shall provide the following information:
 - 1) Supporting route (complete with all pull-box locations).
 - 2) Conduit sizes (update conduit elevation in each vault).
 - 3) Quantity of cables removed, the quantity of each type of cables staying, cable type, and manufacturer.
 - 4) (Campus/Site) wireless, PA announcements, and camera surveillance.
 - f. The Contractor shall:
 - 1) Install a 3/8" cotton measured line (Mule-Tape) with duct plugs on each end of the conduit.
 - 2) Assist the **Golden West College** IT Staff with identifying areas no longer covered by the building being removed from service.
 - 3) Immediately respond to any and all unforeseen outages caused by any demolition activity on campus/site.

1.8 SYSTEM DESCRIPTION AND GENERAL RESPONSIBILITIES

- A. The work to be performed under this contract includes the furnishing of all labor, materials, and equipment for an industry-compliant CFCI telecommunications pathway and spaces building system, analog and optical fiber backbone cabling solution, category six enhanced (6A) manufacturer-compliant structured cabling systems with extended performance and replacement warranty, for the systems required by the project. These systems include OFOI data network connections, OFCI VoIP instruments, and CFCI headend interfaces', OFCI Campus wireless and Wi-Fi access, CFCI Paging, CFCI Time and Attendance functionality, CFCI Video surveillance system, a CFCI physical access control system, a CFCI duress/panic system, and a CFCI audio announcement system. Work shall include all provisions of new

electronic controls systems, including physical access control, duress alarm, video surveillance, and audio. The portion of the work is to be bid as an optional add alternate, and the **Golden West College** may or may not choose to execute this work under the contract.

B. Combined Prescriptive and Performance Design Requirements

1. Division 27 includes a combination of prescriptive and performance specifications. Compliance with the performance specifications and coordination and integration of the prescription requirements will require substantial design work on the Contractor's part.
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 27 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 the requirements for each of the Division 27 systems when preparing a 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 of the requirements of the Division 27 work and/or the coordination requirements of the Division 27 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 performance 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 detailed 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 exclude any elements necessary for complete work.
2. The work shall be provided by 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 in lowercase 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 regarding the dimensioning and positioning of the Work, are intended only for 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 27 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, and 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 systems 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.

1.9 CONTRACTOR QUALIFICATIONS

- A. General:
 - 1. The Contractor shall have at least 5 years' experience installing and testing structured cabling systems.
 - 2. The Contractor shall employ at least one BICSI Registered Communication Distribution Designer (RCDD), and the RCDD shall sign-off on all designs offered, including stamping the design with their current BICSI/RCDD stamp.
 - 3. The Contractor shall be responsible for obtaining any of the necessary permits, licenses, and inspections required for the performance of data, voice, and fiber optic cable installations.
 - 4. The Contractor shall be a current manufacturer with a Certified Installer certificate. A copy of the corporate certificate shall be included with the quote.
 - 5. The Contractor shall have service facilities within 50 miles of the project location.
 - 6. At least 75 percent of the technicians on the job shall have a current manufacturer Certified Copper Technicians certificate to install manufacturer Copper Distribution Systems.
 - 7. At least 75 percent of the technicians installing any Fiber Distribution Systems shall have a current manufacturer Certified Fiber Technicians certificate to install Fiber Distribution Systems.
 - 8. The Telecommunications contractor shall provide a project manager to serve as the single point of contact to manage the installation, speak for the Contractor, and provide the following functions:
 - a. Initiate and coordinate tasks with the Construction Manager and others as specified by the project schedule.
 - b. Provide day-to-day direction and on-site supervision of Contractor personnel.
 - c. Ensure conformance with all contract and warranty provisions.
 - d. Participate in weekly site project meetings.
 - e. This individual shall remain the project manager for the project duration. The Contractor may change the Project Manager only with the written approval of A/E.
- B. References:
 - 1. Communications: The Contractor shall provide with the bid a list of three reference accounts where similar Data, Voice, Fiber Optic Cable, and related migration/cutover equipment installation work was performed within the last year or twelve-month period.
- C. Insurance Requirements:
 - 1. The Contractor shall be insured and shall provide with the bid a Certificate of Indemnification and Certificate of Insurance and meet all required insurance and licensing policies as specified by A/E Risk Management Division and any Federal, State, and local organization pertaining to data, voice, and fiber optic cable installation.

2. Contractor vehicles brought onto project properties shall comply with all requirements of all Federal, State, and local agencies. Vehicles shall meet current DOT, state, and local safety inspections where required.

D. Termination of Services:

1. **Golden West College** or A/E reserves the right to terminate the Communication Contractor's services if the A/E determines the Communication Contractor is not fulfilling their responsibilities as defined in this document.
2. The Contractor's appearance and work ethic shall be of a professional manner, and dress shall be commensurate with the work being performed.
3. Dress displaying lewd or controversial innuendos is strictly prohibited.
4. Conduct on project property shall be professional in nature.
5. Any person in the Contractor's employ working on a project considered to be incompetent or disorderly, or for any other reason unsatisfactory or undesirable, shall be removed from work on the project.
6. The Communications Contractor shall b
7. +e restricted from the premises and compensated for the percentage of work completed satisfactorily.

E. Other Contractor Responsibilities:

1. The Contractor is responsible for the removal and disposal of all installation and construction debris created in the process of the job. All work areas shall be cleaned at the conclusion of the workday, and no tools or materials shall be left in a manner as to pose a safety hazard.
2. The Contractor shall remove all abandoned cables per Article 800 of the National Electrical Code and per TIA and BICSI standards, recycling these materials where possible. This is mandatory; Contractors shall consider this when placing bids.
3. The Contractor shall abide by the regulations set by A/E or **Golden West College** Security Department pertaining to access to and conduct while on project property and shall obey speed limits and parking regulations.

1.10 SYSTEM PERFORMANCE WARRANTY

A. General

1. The Contractor shall provide a manufacturer System Warranty on all copper and fiber permanent cabling links.
2. This is a system performance warranty guaranteeing for a minimum of 20 years from acceptance that the installed system shall support all data link protocols for which that copper Category (6A) or fiber OS designation is engineered to support according to IEEE and TIA standards.
3. The manufacturer's System Warranty may be invoked only if the cabling channel links are comprised of manufacturer connectivity and approved by the manufacturer. Patch cords shall be same manufacturer of cable.
4. Upon acceptance of the Warranty, the manufacturer will mail a notification letter to the installer and a notification letter and warranty certificate to **Golden West College** IT (Attn. Greg Smith).
5. See this for additional information on optical fiber extended warranty, and U/UTP extended warranty requirements

B. Contractor Warranty Obligations

1. The installation firm shall be a current manufacturer-certified installer in good standing and shall include a copy of the company certification with the bid.
2. The Contractor shall name a supervisor to serve on-site as a liaison responsible for inspecting and ensuring that all terminations comply with factory methods taught in manufacturer Technician

Certification Training and according to all Standards cited in the Regulatory References section of this document.

3. The Contractor liaison shall have a current, up-to-date manufacturer-certified technician certificate in copper and fiber. Copies of the copper and fiber certificates of the manufacturer liaison shall be submitted with the bid.
4. The Contractor agrees that all active link components shall be of the same copper Category (6A) or fiber OS/OM designation as the installed system. The Contractor shall under no circumstances mix different Categories or OS/OM classes of cable or termination devices (connectors) within the same link or system.
5. The Contractor shall install all racking and support structures according to cited TIA Standards in such fashion as to maintain both Standards and Manufacturer recommendations for uniform support and protection, segregation of different cable types, maintenance of maximum pulling tensions, minimum bend radius, and approved termination methods as well as adhering to industry accepted practices of good workmanship.
6. The Contractor is responsible for understanding and submitting to the manufacturer all documents required prior to the project start to apply for this warranty. These include but are not limited to the project information form and SCS warranty agreement.
7. The Contractor is responsible for understanding and submitting to the manufacturer all documents required at the project end. These include completed warranty forms, passing test reports, and drawings of floor plans showing the locations of links tested.
8. Test results shall be delivered in the tester native format (not Excel) and represent the full test report. Summaries shall not be accepted—contact the manufacturer for a current list of approved testers, test leads, and the latest operating systems.
9. The Communications Contractor shall correct any problems and malfunctions that are warranty-related issues without additional charge for the entire warranty period. The warranty period shall commence following the acceptance of the project by A/E and written confirmation of the Warranty from the manufacturer.

C. Corning Optical Fiber Solution

1. Contractor shall provide a **Golden West College** IT Standard's Base Solution that shall perform and be installed per Corning installation requirements.
2. Warranty Requirements
 - a. Required is a Corning Optical Communications 25-Year Extended Warranty on this project using only Covered Corning Optical Communications Products, as originally installed. As used herein, Warranty Term means:
3. Term means:
 - a. Twenty-five (25) years beginning on the Installation Date (as defined below) for an Enterprise Networks or Premises Fiber Optic Cabling Solution.
4. Covered Corning Optical Communications Products means:
 - a. new fiber optic cabling infrastructure with material supplied by Corning Optical Communications; and
 - b. 1- or 2-fiber simplex/duplex patch cords manufactured by Corning Optical Communications or manufacturers approved in writing by Corning Optical Communications, including Cable Assembly House (CAH) Connections Gold Program Members, with a 0.75 dB max insertion loss specification.
5. Warranty Conditions:
 - a. The preceding warranty is expressly conditioned upon the satisfaction of each of the following, as applicable:

- 1) Covered Corning Optical Communications Products shall be installed in accordance with the most current revision level of the National Electrical Code, ANSI/TIA-568, ANSI/TIA-569, TIA-942, Fibre Channel FC-PI, Fibre Channel 10 GFC, IEEE 802.3, Infiniband Standards and Corning Optical Communications' LAN-1561-AEN attached as Exhibit C and NPI Testing Guidance.
 - 2) The installation shall consist of Covered Corning Optical Communications Products only.
 - 3) "Installation Date" means the date of the completed installation by a Certified Member of the Corning Network of Preferred Installers or NPI.
6. NPI installers can be found by using the following link:
 - a. <http://corning.force.com/opcomm/nafta/npi/directory> (within the US)
 - b. <http://corning.force.com/opcomm/cala/pge/directory> (outside the US)
 7. Corning Optical Communications and its agents shall have the right to inspect the installed Covered Corning Optical Communications Products during the term of this extended warranty.

1.11 SAFETY

A. General

1. All cabling work being performed on project property or under contract shall comply with Rules for safe operations of state or local safety regulations and meet the requirements of OSHA Safety and Health Standards. The contractor Project Manager shall maintain a copy of the Rules for Safe Operations for reference. It is the responsibility of the Communications Contractor to immediately correct any unsafe working practices on the part of contractor personnel. Contractor personnel's unsafe working environments or conditions shall be reported immediately to the Construction Manager.
2. Any liability for correcting conditions created by the Contractor's personnel rests with the Contractor.
3. The Communications Contractor shall be solely and entirely responsible for conditions of the job site (as pertaining to the materials and equipment specified), including the safety of persons and property during the performance of work.
4. No act, service, drawing review, or construction observance by any employee, representative, or engineer may be construed as a review or approval of the adequacy of the Contractor (s) safety measures in, on, or near the construction site.

1.12 WORKING CONDITIONS

A. Site Access

1. All cable installations shall be pre-approved by the Construction Manager to ensure that the necessary arrangements have been made for proper access to project sites.
2. A twenty-four-hour prior notice shall be submitted to the Construction Manager for any work schedule changes.
3. The Communications Contractor shall display badges or passes as mandated by project property Security Department Rules and Regulations.

B. Scheduling

1. Coordination of site surveys and the issue of project **Golden West College** owned materials and equipment shall be the responsibility of the Construction Manager. Once said equipment and materials are in the Contractor's possession, the contractors must safeguard the material and equipment from damage or theft.

2. Information required by the Contractor to price and complete a defined scope of Work shall be furnished to the Communications Contractor by the A/E Project Manager in a Scope of Work document and at the time of the site survey (if necessary). The Communications Contractor shall maintain it until the completion of the job.
 3. The contractor is responsible for beginning Work promptly according to the Start Dates and completing Work by the Proposed Completion Date listed on the Cable Run Request Form.
 4. The Contractor shall notify the Construction Manager in writing of any delays; at that time, they shall come up with a mutually agreeable project schedule.
 5. The Communications Contractor shall coordinate with the Construction Manager's working hours and job site access issues.
 6. The Communications Contractor shall coordinate with the Construction Manager to minimize outages to the existing systems.
 7. Any service interruption required by the Communications Contractor shall be requested in writing and scheduled with the Construction Manager.
 8. The Communications Contractor shall not proceed with the requested service interruption until the Construction Manager grants written approval.
 9. All problems and questions relating to a particular job shall be referred to the Construction Manager, and no changes shall be made without their written approval.
- C. Harmony Clause
1. The Contractor shall coordinate and work in harmony with other trades on the project as well as with A/E personnel for the best interests of the **Golden West College** of the project.
 2. Coordination shall include but not limited to:
 - a. Service Provider for the (utility) area and the building (including required services – i.e.. Riser Company)
 - b. Division 8 contractor for access control and interfaces for indoor and outdoor.

1.13 COORDINATION

- A. Coordinate layout and installation of voice and data communication cabling with other **Golden West College** contractors and equipment suppliers.
1. Meet jointly with other contractors, equipment suppliers, and **Golden West College** representatives to exchange information and agree on details of equipment arrangements and installation interfaces.
 2. Record agreements reached in meetings and distributed to other participants.
 3. Adjust arrangements and locations of distribution frames, cross-connect, and patch panels in equipment rooms and telecommunications rooms to accommodate and optimize voice and LAN equipment's arrangement and space requirements.
 4. the Contractor shall reuse existing copper and fiber optic backbone cables when indicated on drawings.
 5. Provide weekly progress reports and crew schedules to project representatives by 5:00 p.m. Thursday (or agreed upon day) of each project work week.

1.14 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
1. Submit all product data in accordance with the general requirements of the construction documents.
 2. Submit product cut sheets and a detailed list of components a minimum of two (2) weeks prior to commencement of Division-27 Work for A/E review and action.

3. The Contractor shall submit product materials in one complete Division 27 package, with sub-divisions clearly identified. Products applicable to project drawings and specifications are clearly identified under each sub-division.
4. The Contractor shall provide product data and installation instructions for all fire-stopping materials.
5. Alternate and "Or Equal" designated products shall be submitted for review and judgment to the A/E prior to installation. The contractor-proposed alternate products or components shall be verified by two (2) independent sources within the past 6 months. This request shall include the two (2) independent sources, the original Product's specification sheet, the proposed substitute product cut sheet, and a written request to review the substitute product.
6. Any request of an alternate or substitution shall be submitted to the A/E for action no later than fourteen (14) calendar days after the release of the original telecommunications bid documents.

1.15 Information & Communication Technology (ICT) components

- A. The Contract Documents generally outline industry-standard components to be installed as part of the project ICT installation requirements. Such identification is intended to be general in nature rather than exhaustive. All stated quantities are subject to validation by the ICT contractor. The Contractor is reminded that differences between estimated quantities and those reasonably derived based from the Contract Documents (as well as through bid conferences, job walks, addendums, and other distribution of information) shall be the responsibility of the ICT contractor. There shall be no additional cost incurred by **Golden West College** IT projects for not complying with the specifications and requirements of the Contract Documents.
- B. Any variance from those components identified on the drawings and/or below shall be submitted to **Golden West College** IT project representatives for approval prior to ordering and installation; the risk for all costs incurred by the ICT Contractor for materials ordered prior to such written consent shall be borne entirely by the ICT Contractor. Nonetheless, the ICT Contractor must determine the availability of necessary materials and propose equivalent substitutes as necessary to meet all installation milestones. Delays in ICT installations due to lack of product availability are unacceptable. As catalog numbers change frequently, the ICT Contractor shall verify all part numbers prior to ordering materials. Clarifications shall be issued in response to written Requests for Information (RFI).
- C. Fire Stop and fire-stopping requirements for the project include the following:
 1. All conduits leaving the entrance room for other portions of the building shall be fire-stopped after cable installation.
 2. The Contractor shall fire stop around the tray and, after installation of the cables, within the tray using removable pillow-style products following manufacturers' guidelines. Sound deadening material shall be provided and installed after the installation of the cable.
 3. Strict adherence to the CEC/NEC NFPA 101 is required for any raceway penetrations of fire-rated walls. See Section 07 84 00 for UL system numbers and to construction drawings for details.
 4. All riser conduits shall be sealed using a UL-classified fire stop. The Contractor shall provide a copy of the fire seal manufacturer's installation instructions and rating information prior to inspection of the installed materials.
 5. Integrally Fire Stopped Sleeves:
 - a. Integrally Fire Stopped Sleeves shall be used for Telecommunications cabling in locations where the cabling pathway penetrates a fire barrier. The IFSS shall replace the use of conduit used in conjunction with other fire-stopping methods.
 - b. All manufacturer instructions and requirements shall be followed for the installation of the IFSS.
 - c. Documentation shall include a picture of the completed assembly with a time/date stamp.

- D. All new fiber optic cabling shall be indoor/outdoor-Plenum rated. Unrated cable (such as filled ASP) shall not be installed within the structure except when placed within IMT, PVC, or RGS conduit.
- E. Throughout this specification, Systimax(Commscope), Corning, Chatsworth Products, Inc., and other manufacturers are cited. These citations are required to maintain the current **Golden West College** IT extended warranties and shall not be substituted without written permission from the **Golden West College** IT CIO. These standard **Golden West College** products are to establish quality, performance, and warranty certification criteria.

1.13 DELIVERY AND STORAGE

- C. The ICT Contractor shall provide a materials schedule prior to the start date of cable installation. The material schedule shall specify all material quantities and their delivery date for this project.
- D. The ICT Contractor shall provide protection from weather, moisture, dirt, dust, and other contaminants for telecommunications cabling and pathway equipment placed in storage.

1.14 INFORMATIONAL SUBMITTALS

- A. Division 27 & 28 Submittal Schedule
 - 1. See 27 05 00 Appendix C for contractor submittal requirements
- B. Coordination Drawings:
 - 1. Submit all shop drawings in accordance with the general requirements of the construction documents.
 - 2. Submit shop drawings at least two (2) weeks before the commencement of Division 27 work for A/E review and action.
 - 3. Shop drawings shall include evidence that grounding and bonding components are coordinated with field conditions and the work of other trades. This submittal may have a written component and a visual, drawn component for review and action by the A/E prior to installation.
- C. Certificates:
 - 1. Submit management and installation team reference documentation verifying that:
 - a. The project manager is an RCDD in good standing with BICSI, is qualified to manage the Scope of Work described in the contract documents, and has five (5) years of experience managing similar projects in size and scope. The documentation shall include the RCDD registration number.
 - b. The field supervisor is a BICSI-trained technician that is qualified to perform and oversee the work described in the contract documents.
- D. Qualification Statements:
 - 1. The Contractor shall submit documentation that within the past 12 months, at least 75% of all installation personnel have been trained or certified by the manufacturer of the products they are installing.

1.15 CLOSEOUT SUBMITTALS

- A. As-Built Drawings:
 - 1. Submit all as-built drawings in accordance with the general requirements of the construction documents.
 - a. The drawing notes shall define field conditions experienced not described in sheet notes.
 - b. The drawings shall identify all fire stop locations, and a digital picture shall accompany the as-built package.
 - c. As-built conditions shall be identified on record drawings and include:
 - 1) Outlet location w/ Cable ID (test results to use this ID).
 - a) Cable ID shall include IDF# - Patch-Panel – Port ID #
 - 2) Sleeves and poke-through conduit routing.
 - 3) Information shall be submitted for review and organizing two weeks prior to the requested punch-walk date.
 - 2. Submit as-built drawings a minimum of two weeks after completion of all Division 27 work for A/E and **Golden West College** reference.
 - 3. Communication contractor to print, frame, and mount approved as-built drawings in MPOE. Coordinate location with A/E.

1.16 QUALITY ASSURANCE

- A. Qualifications—Manufacturer
 - 1. Component manufacturers shall be ISO 9001:2000 and offer RoHS-compliant products.
 - 2. Installers shall have a manufacturer certificate of completion for the fire stop solution being proposed.
- B. Qualifications—Installer:
 - 1. At a minimum, seventy-five percent (75%) of the onsite Contractor field technicians shall be factory-certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall be available on-site for review for each field technician at all times.
- C. Workmanlike Manner
 - 1. Installers shall address their job functions for this Scope of Work from the guidance provided by ANSI/NECA-1-2015.
 - 2. Cable hangers, Saddles, Supports, and J-Hooks shall be routed inline and parallel to building lines.
 - a. All cable routing shall maintain an "Above" approach to cabling when crossing any obstruction – Cable hangers shall be installed to support the cable bundle above and away from physical damage or electrical interference from accidental contact with the UTP cabling system.
 - b. Cable hangers shall be installed on a minimum 3/8" threaded rod and installed at a uniform height above the finished floor wherever possible.
 - c. Maintain a minimum 6" clearance above the finished ceiling.
 - d. Cable hanger routing shall be identified on as-built conditions and record drawings.
 - 3. Cable hangers, Saddles, Supports, and J-Hooks shall be attached per the manufacturer's installation requirements and reviewed and confirmed with SEOR prior to rough-in.
 - 4. Cable hangers shall be required to maintain the maximum cable bundle size for the different ratings of PoE (power rating) listed on the cable jacket.
 - 5. Cable hangers are field-defined routing; therefore, all non-rated, fire-fated, acoustical-rated sleeves shall be the Contractor's responsibility for configuration, furnishing, install, and documentation of required sleeves.

6. This requirement includes manufacturer training for proper fire stop installation of technicians performing these installations

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Contractor shall review all drawings, data sheets, specifications, & **Golden West College** IT Standards and Specifications

2.2 POWER OVER ETHERNET (PoE)

- A. Check actual cable data sheets prior to the start of any work. Ensure all data and Class 2, 3, & 4 power requirements are met for the project.
- B. Methodology for PoE requirements that the Contractor shall comply with:
1. Follow the Cable Usage Chart in the Drawings set (cover sheet)
 2. Confirm U/UTP cable bundle size (quantity of cables per dressed harness)

	Type 1	Type 2	Type 3	Type 4
Name	PoE	PoE+	PoE++ UPoE	High Power PoE
PoE Standard	IEEE 802.3af	IEEE 802.3at	IEEE 802.3bt	IEEE 802.3bt
Max. Power Per Port	15.4W	30W	60W	100W
Power to PD	12.95W	25.5W	51W	71.3W
Twisted Pair Used	2-Pair	2-Pair	4-Pair	4-Pair
Supported Cables	Cat5e	Cat5e	Cat6A	Cat6A
Typical Application	IP Phone	Video Phone	MGMT Device	LED Lighting

2.3 FIRE STOP REQUIREMENTS

- 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 proceeding with the installation or use of products specified in this section.
- B. Methodology for fire stop requirements that the Contractor shall comply with:
1. In any area where a fire-rated wall, partition, floor, or ceiling is penetrated, the Contractor shall create the pathway and seal around all cables and sleeves with a UL-classified fire seal sufficient to return the structure to its original rating. Creation of such openings as are necessary for cable

passage between locations as shown on the drawings shall be the Contractor's responsibility. Any opening in a rated structure created by the Contractor that is larger than one inch in diameter shall be equipped with a metal sleeve secured and fire-stopped in place.

2. Comply with requirements in Section 07 84 13 "Penetration Firestopping." (Check Architect specifications for fire stopping)
3. Comply with TIA-569-B, Annex A, "Firestopping."
4. Comply with BICSI TDMM, "Firestopping Systems" Article.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal the annular space between the sleeve and pathway or cable, using joint sealant appropriate for the size, depth, and location of the joint. Comply with requirements in Section 07 92 00 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
2. Use pipe sleeves unless the penetration arrangement requires a rectangular-sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during the erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 4 inches above finished floor level. Install sleeves during the erection of floors for the building.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires a rectangular sleeve opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

2.4 RE-INSTALLATION

- A. No additional burden to the **Golden West 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 **Golden West College** prior to beginning any re-installation work.

2.5 CLOSEOUT ACTIVITIES

- A. The Contractor shall provide testing results and as-built conditions in the documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the **Golden West College** and A/E team.
- B. The Contractor is to submit all as-built drawings and any test documentation required prior to acceptance by the **Golden West College**.

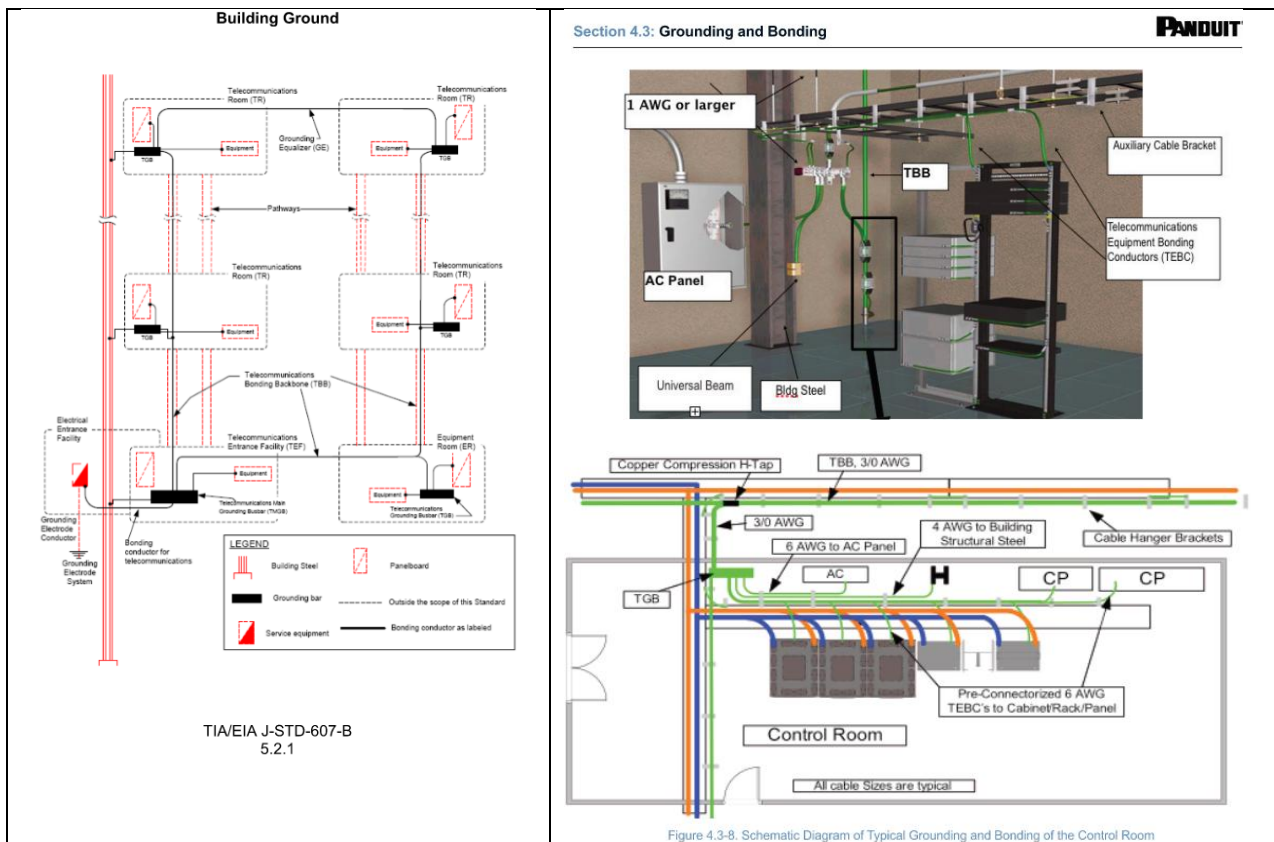
END OF SECTION 270500

SECTION 270526
GROUNDING BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Specifications for grounding and bonding components utilized to provide proper grounding and bonding for telecommunications cabinets, racks, cable trays, ladder trays, cables, and equipment.
 2. Grounding and bonding components with design criteria as a single manufacturer solution.



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 **Golden West College** reference.

1.5 WARRANTY

- A. Warranty:
 - 1. The contractor shall provide all extended warranty plans at no cost to the Golden West College IT Project Manager.
 - 2. The contractor shall warranty all workmanship per the manufacturer's required installation and attachment requirements.

Section 4.3: Grounding and Bonding

PANDUIT®

Busbar Hardware Kit

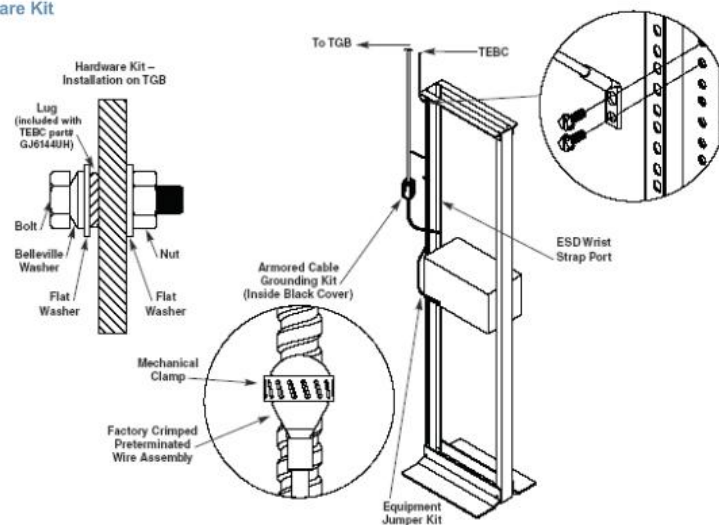


Figure 4.3-14. Busbar Hardware and Armored Fiber Grounding Kits

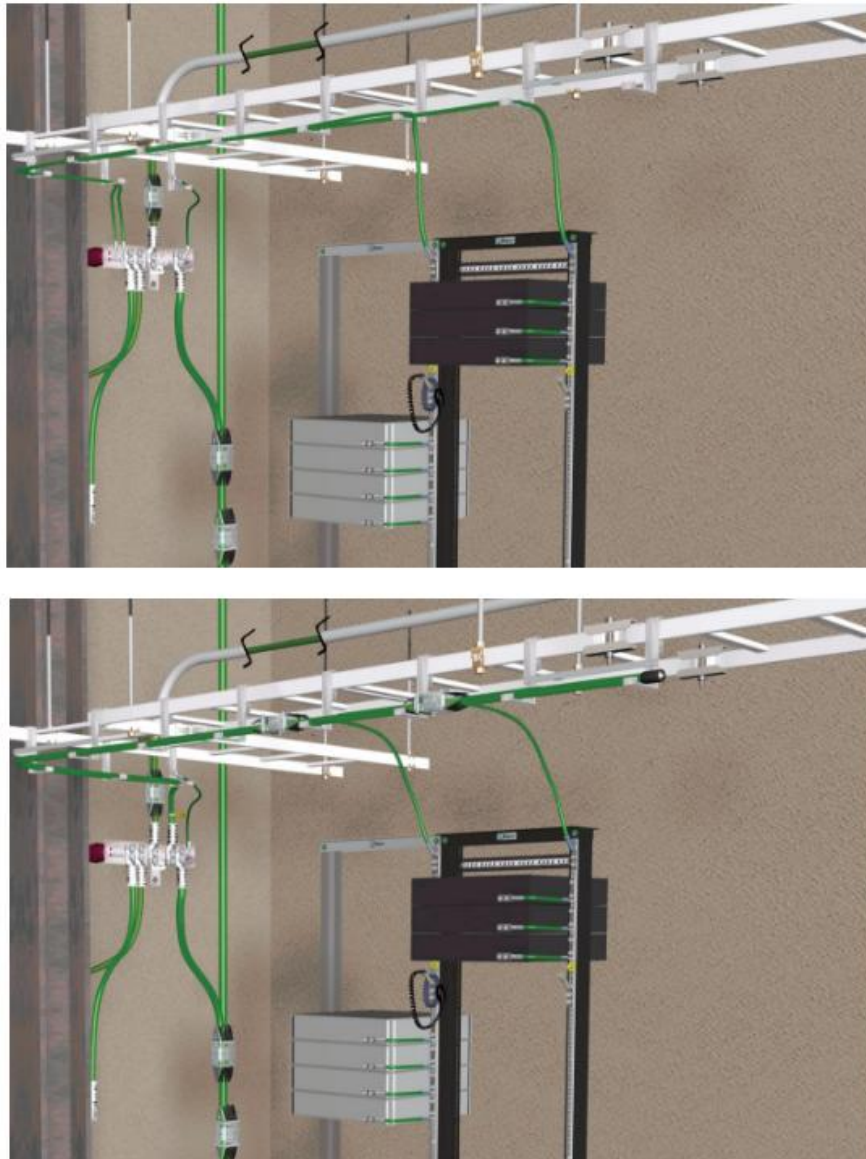


Figure 4.3-13. Telecommunications room bonding topologies (no access floor). Top – several TEBCs used to bond each rack directly to the TGB. Bottom – racks bonded to a single TEBC which then bonds to the TGB.

PART 2 - PRODUCTS

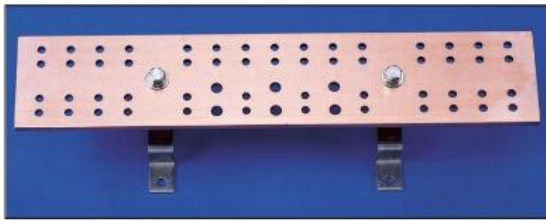


Figure 6-1
Example of a PBB

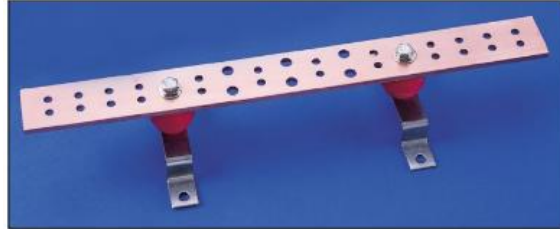


Figure 6-2
Example of an SBB

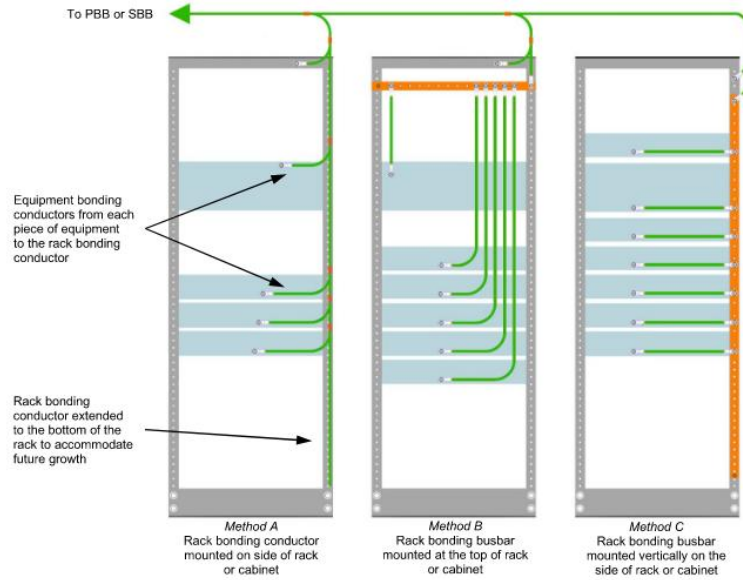
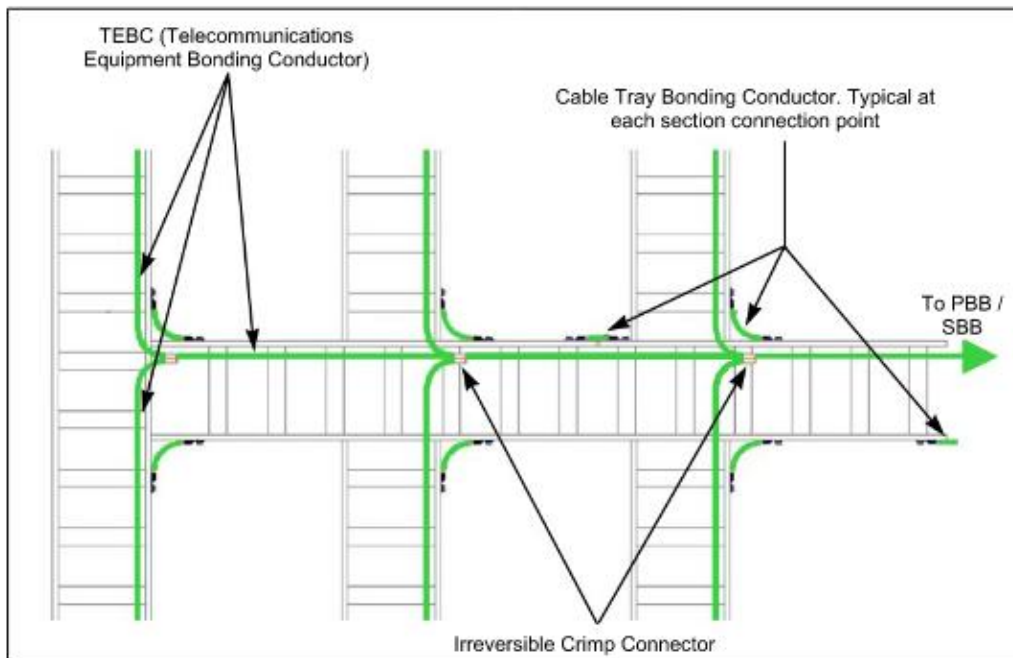


Figure 7-1
Example of Three Methods to Bond Equipment and Racks



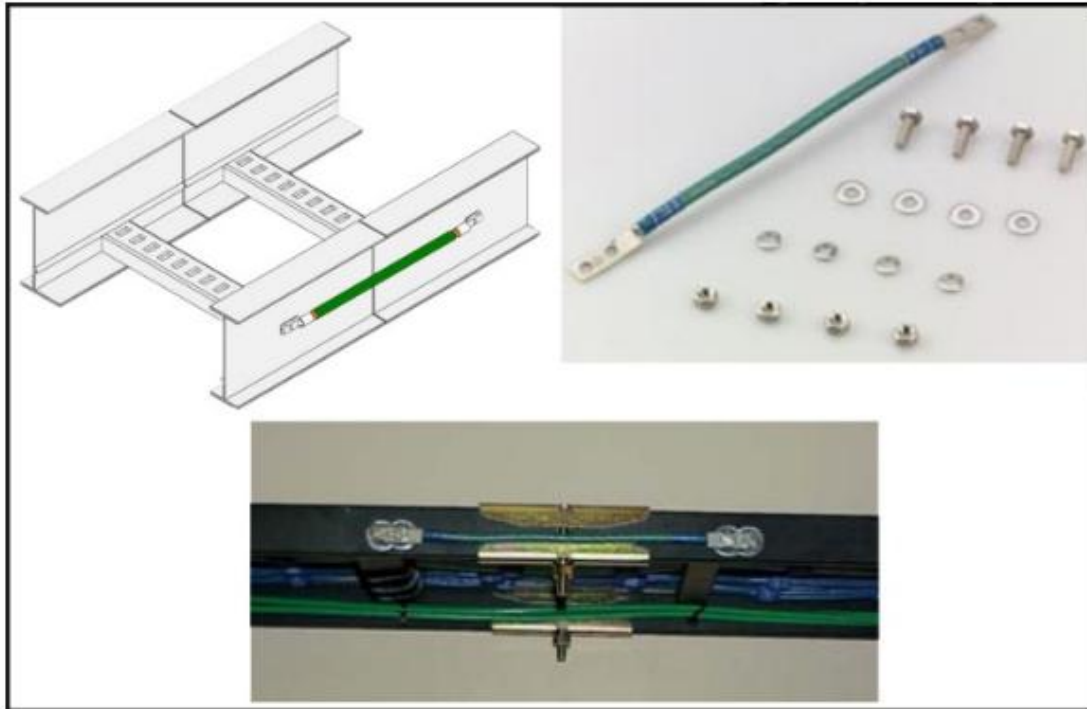


Figure 8-24
Example of a Bonding Jumper and its Installation Between Cable Tray Segments

2.1 GROUNDING AND BONDING SOLUTION

- A. **Golden West College** IT Standards and Specifications: Subject to compliance with requirements, provide the manufacturer or comparable product by one of the following:
 1. CPI
 2. Inwesco
 3. **Golden West 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 infrastructure requirement.
 2. All assembly components shall be from a single manufacturer's solution for the size of the telecommunications space it is being designed for.
- C. Description:
 1. The Subcontractor is responsible for bonding to ground all newly placed equipment and installed racks or cabinets per the ANSI/TIA 607, ANSI/BICSI-N3, & CPI Bonding & Grounding Equipment Installation Requirements. All systems and assemblies shall comply with 2022-CEC Article 250 & Chapter 8.

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.

SPECIFICATION STANDARD GROUNDING AND BONDING 27 05 26

1. Green insulated copper conductor, minimum as specified in the table below, size 6 AWG. The TBB shall be sized at 2 kcmil per linear foot of conductor length up to a maximum size of 3/ AWG Insulation shall meet fire ratings of its pathway.

TABLE 1			
Sizing of Telecommunication Bonding Backbone (TBB)			
TBB length FT	Grounding Conductor Size (AWG)	DC Resistance Per 100 Ft (Copper Conductor)	Short-Time Rating (A)
	8	0.0778	391
< 13 Ft	6	0.0491	621
14 - 20 Ft	4	0.0308	988
21 -26 Ft	3	0.0245	1245
27 - 33 Ft	2	0.194	1571
34 - 41 Ft	1	0.0154	1981
42 - 52 Ft	1/O	0.0122	2499
53 - 66 Ft	2/O	0.00967	3150
> 66 FT	3/O	0.00766	3972
	4/O	0.00608	5008
	Kcmil		
	250	0.00515	5917
	300	0.00429	7101
	350	0.00367	8284
	400	0.00321	9467
	500	0.00258	11834
	AWG = American Wire Gauge		
	DC = Direct Current		
	kcmil = Thousand circular mils		

3.2 INSTALLATION

- A. Process:
1. All newly installed racks and cabinets shall have installed a vertical busbar mounted along one equipment rail to serve as a clean, low-resistance bonding place for any equipment not equipped with a designated grounding pad.
 2. Smaller equipment without an integrated grounding pad shall be bonded to the vertical busbar using an anodized green thread-forming grounding screw that includes serrations under the head to cut through oxidation or paint on the equipment flange.
 3. Larger equipment (chassis switches) with a designated grounding terminal shall be bonded to the vertical busbar with an EBC (equipment bonding conductor) kit built for that purpose.

4. All grounding wire shall be a minimum #6 AWG stranded annealed ground wire; PVC sheathed with nylon. Meets UL83 for THHN or THWN and UL1063.
5. All OSP cabling terminated within the new campus MDF shall be terminated to a Building Entrance Terminal with gas fuses.
6. The Subcontractor shall clean (wire brush, scotchbrite pads) any metallic surface to be bonded down to bare metal and apply a film of anti-oxidation paste to the surfaces before effecting the bond.
7. All bonding lugs on racks and busbars shall be of two-hole irreversible compression type. Mechanical and single-hole lugs will not be accepted and shall be removed and replaced at the Subcontractor's expense.
8. Every rack or cabinet shall have an individual bonding conductor in the grounding network. Serially connecting (daisy-chaining) racks is forbidden and will not be accepted.
9. Rack Bonding Conductors (RBC) may tap into an overhead or underfloor aisle ground or run to the wall-mounted grounding busbar in smaller Telecommunications rooms containing five racks or less.
10. Armored cables shall be properly bonded to the earthing system with a kit built for that purpose.
11. All metallic conduit stub-ups shall be grounded. Where multiple stub-ups are made within an equipment enclosure, they shall be equipped with grounding bushings and bonded to the enclosure and the enclosure ground bus.
12. Each metallic raceway, pipe, duct, and other metal object entering the buildings shall be bonded together. The Subcontractor shall use #6 AWG green-insulated copper conductors.
13. Each identified telecommunications space within a building shall have a common signal reference ground. The signal reference ground shall conform to the following:
 - a. Within the building, all communication spaces shall be separately bonded to each other and connected to the primary building ground in accordance with the provisions of EIA/TIA 607. The communication ground shall not ground any additional equipment or be connected to any potential high-voltage source. All racks, frames, drain wires, and all installed communication equipment shall only be grounded to this common reference ground with a minimum size #6 AWG green insulated copper wire.
 - b. The Sub-contractor shall provide, as a minimum, a continuous #3/0 AWG copper electrical conductor connected to a 1/4" x 4" x 12" telecommunications grounding bus bar (TGB) 6" AFF on the plywood backboard of each IDF (or telecommunication space) to terminate chassis and other equipment grounds.
 - c. The ground wires from each IDF shall be routed directly to the Building Distribution Frame (BDF), terminated, and bonded together via a telecommunications main grounding bus bar (TMGB) of minimum 1/4" x 4" x 20" dimensions. This point of single reference for all closets in a building shall, in turn, be grounded with a minimum #3/0 AWG ground conductor to the main building ground. If a main building ground is unavailable, the ground wire from the BDF shall be grounded to the nearest electrical panel ground bus bar. The building ground for signal reference shall be the building service entrance ground.
14. Ground Bus Bar Identification.
 - a. The master ground bar shall be labeled as such.
 - b. Each subsidiary ground bar shall be labeled as such and have a unique identifier.
 - c. All ground bars shall have a warning label that states, "If this connector or cable is loose or shall be removed, please call the Telecommunications Manager." All ground bars will be connected to the building ground with continuous "3/0" AWG wire.
 - d. Each ground cable shall be labeled with a unique identifier.

3.3 RE-INSTALLATION

- A. No additional burden to **Golden West 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 **Golden West College** before beginning any re-installation work.

ANSI/TIA-607-B

ANNEX E (INFORMATIVE) CROSS REFERENCE OF TERMS

Preferred terms used in this Standard	Other industry terms
Telecommunications Main Grounding Busbar (TMGB)	Building Principal Ground (BPG) CO GRD Bus COG Facility Ground Main Earthing Terminal (MET) Master Ground Bar (MGB) OPGPB PGP Bus Principal Ground Point (PGP) Reference Point 0 (RP0) Zero Potential Reference Point)
Telecommunications Grounding Busbar (TGB)	Extended Reference Point 0 (Extended RP0) Floor Ground Bar (FGB) Approved Floor Ground
Telecommunications Bonding Backbone (TBB)	Equalizer Equalizing Conductor Grounding Equalizer (GE) Vertical Equalizer Vertical Ground Riser
Grounding Equalizer (GE)	Horizontal Equalizer

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 **Golden West College** and A/E team.
- B. Sub-contractor to submit all as-built drawings and any test documentation required before acceptance by **Golden West College**.

END OF SECTION 270526

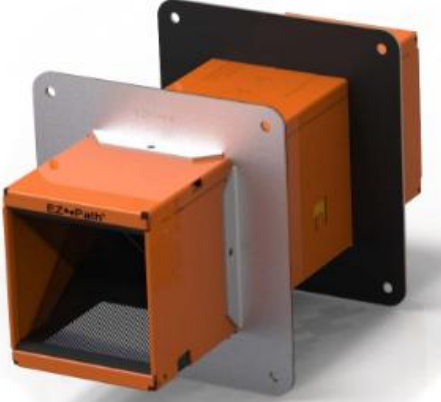

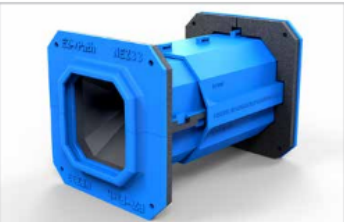
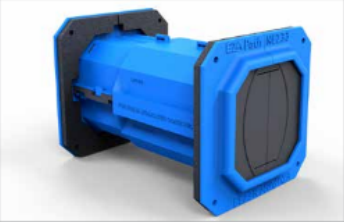
SECTION 270528
FIRESTOPPING, SMOKE, AND ACOUSTICAL SEALING TELECOMMUNICATIONS AND DATA CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes labor, materials, and equipment necessary to complete the installation required for the items specified under this Section, including but not limited to:
1. Firestopping through penetrations in fire-rated assemblies.

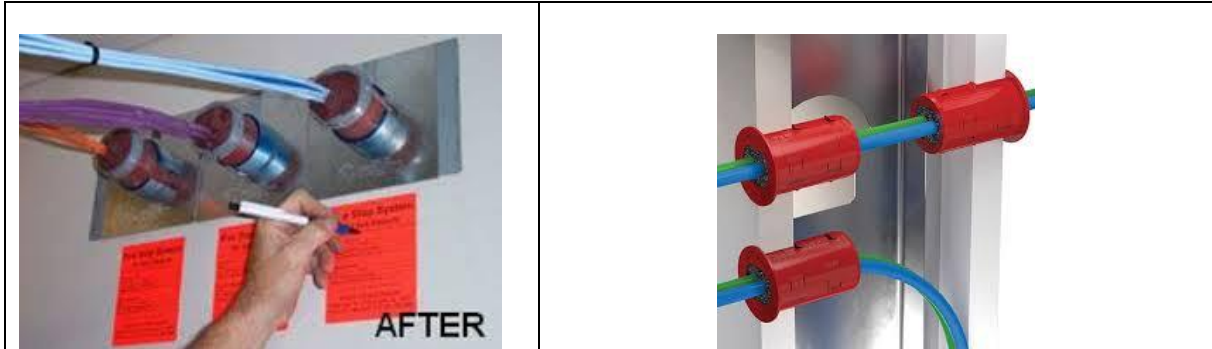
1.2 SMOKE AND ACOUSTICAL SEALING IN NON-RATED ASSEMBLIES.

	
	<p>▼ PRODUCT DESCRIPTION</p> <p>EZ-Path® Smoke & Acoustical Pathway is a pathway device designed to allow cables to penetrate non-rated walls and floors without the need for smoke sealing. This device features a built-in smoke sealing system that automatically adjusts to the amount of cables installed. Once installed in a barrier, cables can be easily added or removed at any time without the need to remove or reinstall caulking materials.</p> <p>Its unique profile allows a maximum number of cables to be installed in a relatively small area. The pathway measures approximately 4.5" (114 mm) x 4.5" (114 mm) and is adjustable to accommodate wall and floor thicknesses between 4" (102 mm) and 8" (203 mm).</p>
	<p>▼ APPLICATIONS</p> <p>EZ-Path® Smoke & Acoustical Pathway is designed for easy installation in non-rated floors and walls. Tested and approved cable capacities range from 0 to 100% visual fill. With its split body design, the device can be easily disassembled and installed around previously installed cables in existing construction.</p> <p>EZ-Path® Smoke & Acoustical Pathway provides exceptional cable capacity. A single unit installed in a wall exceeds the cable carrying capacity of a 4" (102 mm) sleeve utilizing typical putty firestop systems (35% cable loading). Multiple ganged devices utilizing available duplex, or quad wall plates provide additional capacity or segregation of cables by use, type, installer or vendor as desired.</p>

1.3 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.



1.4 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.

1.5 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. Product Data: Provide the manufacturer's standard catalog data for specified products, demonstrating compliance with referenced standards and listing the number of systems in which each product is to be used.
- C. Schedule of UL System Drawings for Fire-Rated Construction: Submit a schedule of all expected opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance ratings.

- D. UL System Drawings for Fire-Rated Construction: Furnish copies of all UL Systems identified in the schedule above. Include any engineering recommendations.
- E. Certificates: Product Certificate of Compliance from the manufacturer certifying material compliance with applicable code and specified performance characteristics.
- F. Installation Instructions: Submit the manufacturer's printed installation instructions.
- G. 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 **Golden West College** reference.

1.6 WARRANTY

- A. Warranty:
 - 1. The contractor shall provide all extended warranty plans at no cost to the **Golden West 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 PERFORMANCE REQUIREMENTS

- A. References:
 - 1. ANSI/TIA-1179-A "Healthcare Facility Telecommunications Infrastructure".
 - 2. ANSI/TIA-EIA-569-D "Telecommunications Pathways and Spaces"
 - 3. ASTM E90, "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements."
 - 4. ASTM E814, "Fire Tests of Through Penetration Firestops".
 - 5. ASTM E1725, "Standard Test Methods for Fire Tests of Fire-Resistive Barrier Systems for Electrical System Components".
 - 6. CAN/ULC S115, "Standard Method of Fire Tests of Firestops Systems."
 - 7. UL 1479, "Fire Tests of Through Penetration Firestops".
 - 8. National Fire Protection Association (NFPA) – NFPA 101: Life Safety Code.
 - 9. National Fire Protection Association (NFPA) – NFPA 70: National Electrical Code.
 - 10. Underwriters Laboratories Inc. (UL) – Fire Resistance Directory
- B. Fire-rated cable pathway devices shall be used in fire-rated construction for ALL low-voltage, video, data, voice cabling, optical fiber raceways, and certain high-voltage cabling where frequent cable moves, adds, and changes may occur. Pathways required for high-voltage cabling will be detailed on the prints. Such devices shall:
 - 1. Meet the hourly fire-rating of fire-rated wall and/or floor penetrated.
 - 2. Be tested for the surrounding construction and cable types involved.

3. Have UL Systems permit cable loads from “Zero to 100% Visual Fill.” This requirement eliminates the need for cable technicians to make fill-ratio calculations to ensure the cable load is within the maximum allowed by the UL System.
 4. Be “Maintenance-Free” by having a corresponding Evaluation Services Report from a Nationally Recognized Third-Party Laboratory. Maintenance-Free is defined as No action required by the cabling technician to open and/or close pathway for cable moves, adds, or changes, such as, but not limited to:
 - a. Opening or closing of doors.
 - b. Spinning rings are used to open or close the fabric liner.
 - c. Removal and or replacement of any material such as, but not limited to, firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.
 - d. Evaluation Services Report (ESR) from an accredited Nationally Recognized Third-party Laboratory certifying compliance with this definition of “Maintenance-Free” and all relevant codes and standards.
 5. Pathways shall be engineered such that two or more devices may be ganged together for larger cable capacities.
 6. Pathways shall be engineered to be re-enterable so they can be retrofitted and removed from around existing cables without cutting and re-splicing them.
 7. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction, and others the manufacturer of the device and the corresponding UL System number installed.
- C. Non-rated cable pathway devices shall be used in non-fire-rated construction for all low-voltage, video, data and voice cabling, optical fiber raceways and certain high-voltage cabling where frequent cable moves, adds and changes may occur. Pathways required for high-voltage cabling will be detailed on the prints. Such devices shall:
1. Limit the movement of smoke and sound-wall and/or floor penetrated.
 2. Restore the STC Rating of the penetrated assembly.
 3. Provide L Ratings of less than 1 CFM when empty and less than 2.5 CFM at all other loading up to 100 percent.
 4. Accommodate cable loads from; “Zero to 100% Visual Fill.”
 5. Not have an inner fabric liner that tightens around and compresses cables tightly together, encouraging potential cable damage or interference.
 6. Be “Maintenance-Free” maintenance-free is defined as No action required by the cabling technician to open and/or close the pathway for cable moves, adds, or changes, such as, but not limited to:
 - a. Opening or closing of doors.
 - b. Spinning rings are used to open or close the fabric liner.
 - c. Removal and or replacement of any material such as, but not limited to, firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.
 - d. Furnish a letter from the manufacturer certifying compliance with this definition of “Zero-Maintenance.”
 7. Pathways shall be engineered such that two or more devices may be ganged together for larger cable capacities.
 8. Pathways shall be engineered to be re-enterable so they can be retrofitted and removed from around existing cables without cutting and re-splicing them.
 9. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction, and others the manufacturer of the device and the corresponding UL System number installed.

- D. As an alternative to using a fire-rated or non-rated cable pathway device for a single or two low voltage cables (up to an aggregate cross-sectional area of 0.52 in. (14mm) O.D.) penetrating one or two-hour, gypsum board/stud wall assemblies or non-rated assemblies, either as a through-penetration or as a membrane-penetration, a fire-rated cable grommet may be substituted. The product shall consist of a molded, two-piece, plenum-rated grommet having a foam fire and smoke sealing membrane that conforms to the outside diameter of the individual cable. The grommet product shall be able to lock into place to secure the cable penetration within the wall assembly. The grommet shall be UL Classified and tested to ASTM E814 (UL 1479) requirements and CAN/ULC S115.
- E. Where non-mechanical pathways must be utilized, such as sealing (caulking) around single or grouped conduits, provide products that, upon curing, do not re-emulsify, dissolve, leach, breakdown, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water, or other forms of moisture characteristic during or after construction. Provide a letter from the manufacturer certifying compliance with this section.
- F. Cable pathway shall replace conduit sleeves in walls and floors, and the following;
 - a. When installed individually in floors, devices shall pass through core-drilled or preformed openings utilizing tested floor plates.
 - b. When multiple units are ganged in floors, devices shall be anchored by means of a tested grid.
 - c. When installed individually in walls, devices shall pass through core drilled openings utilizing tested wall plates or integrated flanges.
 - d. When multiple units are ganged in walls, devices shall be anchored by means of a tested adjustable gang bracket.
- G. The cable tray shall terminate at each barrier and resume on the other side so that cables pass independently through devices. The cable tray shall be properly supported on each side of the barrier.

2.2 MANUFACTURERS

- A. Acceptable Manufacturer: Specified Technologies Inc., 210 Evans Way, Somerville, NJ 08876. Tel: (800) 992-1180, Fax: (908) 526-9623, Email: techserv@stifirestop.com, Website: www.stifirestop.com.
- B. Substitutions: Not permitted. No known equal.
- C. Single Source: Obtain firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

2.3 MATERIALS

- A. General: Use only products tested for specific fire resistance-rated construction conditions or acoustical and smoke-related requirements conforming to construction assembly type, penetrating item type, annular space requirements, and rating involved for each separate instance.
- B. Firestop Sealants: Single-component latex formulations that, upon cure, do not re-emulsify during exposure to moisture; the following products are acceptable:
 - 1. Specified Technologies Inc. (STI) SpecSeal Series SSS Sealant.
 - 2. Specified Technologies Inc. (STI) SpecSeal Series LCI Sealant.

- C. Firestop Putty: Intumescent, non-hardening, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds; the following products are acceptable:
 - 1. Specified Technologies Inc. (STI) SpecSeal Series SSP Putty.
- D. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated on six sides with intumescent coating contained in a flame-retardant poly bag; the following products are acceptable:
 - 1. Specified Technologies Inc. (STI) SpecSeal Series SSB Pillows.
- E. Fire-Rated Cable Grommet: Molded, two-piece grommet with an integral fire and smoke-sealing foam membrane for sealing individual cable penetrations through framed wall assemblies. The grommet snaps together around the cable and locks tightly into the wall.
 - 1. Specified Technologies Inc. (STI) EZ-Firestop Grommets.
- F. Fire-Rated Cable Pathways: Device modules comprised of steel pathways with self-adjusting intumescent foam pads allowing 0 to 100 percent cable fill; the following products are acceptable:
 - 1. Specified Technologies Inc. (STI) EZ-PATH Fire Rated Pathway.
- G. Smoke and Acoustical Pathways: Device module comprised of a nonmetallic pathway with integral self-adjusting smoke and sound sealing system for cable penetrations through non-fire-resistance rated wall or floor assemblies, the following products are acceptable:
 - 1. Specified Technologies Inc. (STI) EZ-PATH Smoke & Acoustical Pathway.
- H. Protective Wrap: Endothermic Wrap incorporating foil scrim evaluated for protection of cable pathways and liquid fuel lines, as well as in through-penetration and membrane-penetration firestopping and testing to integrate protection of Electrical Metallic Tubing (EMT), Rigid Metallic Conduit (RMC), Cable Trays, single and/or multi containment liquid fuel lines. Wrap to have a maximum weight of no greater than 1.4 lbs/ft² and allow for the use of steel tie wire when installed around piping, conduits, and/or cable trays. The following products are acceptable:
 - 1. Specified Technologies, Inc. (STI) E-Wrap™ Endothermic Wrap

PART 3 - EXECUTION



3.1 EXAMINATION

- A. Before beginning installation, verify that substrate conditions previously installed under other sections are acceptable for installing firestopping in accordance with the manufacturer's installation instructions and technical information.
- B. Surfaces shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellants, and any other substances that may inhibit optimum adhesion.
- C. Provide masking and temporary covering to protect adjacent surfaces.
- D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 QUALITY ASSURANCE

- A. Products/Systems: Provide firestopping systems that comply with the following requirements:

Coast Community College District
GWC Admin, Business, Criminal Justice Demo
tBP/Architecture Project No. 21233.00

Firestopping for
Telecommunications and Data
Cabling-working
27 05 28 - 7

1. Firestopping tests are performed by a qualified testing and inspection agency. A qualified testing and inspection agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 2. Firestopping products are classified by qualified testing and inspection agency.
- B. Installer Qualifications: Experience in performing work of this section who is qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products in accordance with specified requirements.

3.3 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
1. The manufacturer's original, unopened, undamaged containers, with intact identification labels identifying the product and manufacturer, the date of manufacture, the lot number, the shelf life, if applicable, the qualified testing and inspection agency's classification marking, and mixing instructions for multi-component products.
 2. Handle and store products according to the manufacturer's recommendations published in technical materials. Store products wrapped or otherwise protected under clean and dry conditions until required for installation.
- B. Storage and Protection:
1. Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer.

3.4 PROJECT CONDITIONS

- A. Do not install products when ambient or substrate temperatures are outside the limitations recommended by the manufacturer.
- B. Do not install products when substrates are wet due to rain, frost, condensation, or other causes.
- C. Do not use materials that contain flammable solvents.
- D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- E. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

- 3.5 Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings

EZ-PATH FIRESTOP DEVICE CABLE FILL CHART

All Certificates for EZ-Path list the permissible cable loading as 0 to 100 percent visual fill. The following chart provides an estimate of the maximum number of cables that will fit within a single. EZ-PATH at 100 percent visual fill.

Outside diameter of cable	Number of cables per device		
	EZD 22	EZD 33	EZD 44
3.5 mm	69	330	770
4.5 mm	36	165	390
5.5 mm	24	117	264
6.0 mm	20	88	210
7.5 mm	14	54	150
8.0 mm	12	54	127
10 mm	8	35	86
14 mm	4	15	39
16 mm	-	12	28
18 mm	-	8	23
21 mm	-	6	16
22 mm	-	6	14
23 mm	-	5	11
24mm	-	5	11
26 mm	-	4	9
29 mm	-	2	8
32 mm	-	2	5
35 mm	-	-	4
38 mm	-	-	4
48 mm	-	-	3
60 mm	-	-	2
70 mm	-	-	1
75 mm	-	-	1

3.6 INSTALLATION

- A. General: Install systems in accordance with the Performance Criteria and the conditions of testing and classification specified in the published design.
- B. Manufacturer's Instructions: Comply with the manufacturer's instructions for the installation of products.

3.7 FIELD QUALITY CONTROL

- A. Keep areas of work accessible until inspection by authorities having jurisdiction.
- B. Where deficiencies are found, repair firestopping products so they comply with requirements.

3.8 ADJUSTING AND CLEANING

- A. Remove equipment, materials, and debris, leaving the area in undamaged, clean condition.

- B. Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.

3.9 SCHEDULES

Penetrant Type	Concrete Floor	Concrete Wall	Gypsum Board Wall
Blank Opening	C-AJ-0100, C-AJ-0101, C-AJ-0113, C-AJ-0116	C-AJ-0100, C-AJ-0101, C-AJ-0113, C-AJ-0116	W-L-0020, W-L-0034
Metal Conduits	C-AJ-1080, C-AJ-1240, C-AJ-1353	C-AJ-1080, W-J-1098, W-J-1100	W-L-1049, W-L-1222, W-L-1168
Plastic Conduits/ Raceways	C-AJ-2140, C-AJ-2292, F-A-2186, F-A-2210, F-A-2225	C-AJ-2038, C-AJ-2108, C-AJ-2578, C-AJ-2586, W-J-2018, W-J-2076	W-L-2059, W-L-2074, W-L-2093, W-L-2241
Cables	C-AJ-3214, C-AJ-3231, F-A-3015, F-A-3021, F-A-3054	C-AJ-3214, C-AJ-3231, W-J-3098, W-J-3099, W-J-3124, W-J-3150, W-J-3180	W-L-3219, W-L-3248, W-L-3287, W-L-3356, W-L-3377, W-L-3378, W-L-3379, W-L-3390
Cable Trays	C-AJ-3317, C-AJ-8181, C-AJ-4029, F-A-3015, F-A-3037	C-AJ-8181, W-J-4021, W-J-4022, W-J-4033, W-J-3098, W-J-3145, W-J-3158	W-L-3218, W-L-3271, W-L-3286, W-L-3306, W-L-4008, W-L-4029, W-L-4043, W-L-8073

3.10 DOCUMENTATION

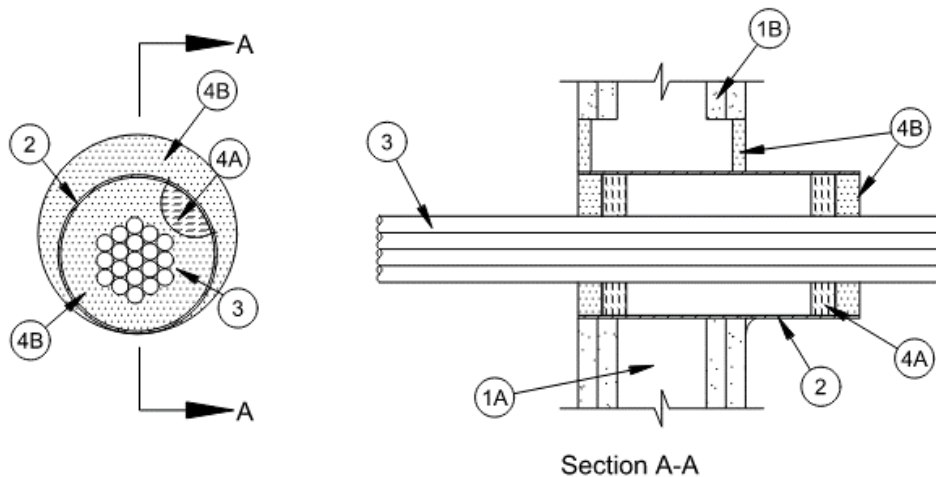
- A. Place system stickers on each side of wall penetrations.
- B. Place a reproduction (photo/copy) of the UL System description in a document protector and mount it to the wall next to the wall penetration.
1. Highlight the system description section that lists the allowed cable types.

END OF SECTION 270528

See Sample Data Sheets Following this Section.



ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings - 1 and 2 Hr (See Item 1)	F Ratings - 1 and 2 Hr (See Item 1)
T Rating - 3/4 Hr	FT Rating - 3/4 Hr
L Rating at Ambient - Less Than 1 CFM/sq ft (See Items 3 and 4B)	FH Ratings - 1 and 2 Hr (See Item 1)
L Rating at 400°F - Less Than 1 CFM/sq ft (See Items 3 and 4B)	FTH Rating - 3/4 Hr
	L Rating at Ambient - Less Than 5.1 L/S/m ² (See Items 3 and 4B)
	L Rating at 204°F - Less Than 5.1 L/S/m ² (See Items 3 and 4B)



- Wall Assembly** -- The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, V300, U400, V400, or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
 - Studs** -- Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.
 - Gypsum Board*** -- Thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300, V300, U400, V400 or W400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 6-1/2 in. (165 mm) when sleeve (Item 2) is installed. Max diam of opening is 4 in. (102 mm) when sleeve is not used.

The hourly F and FH rating of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.
- Steel Sleeve -- (Optional)** -- Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing (EMT), steel conduit, Schedule 5 (or heavier) steel pipe sleeve or min 0.016 in. thick (0.41 mm, No. 28 ga) galv steel sleeve installed flush with wall surfaces. The annular space between the steel sleeve and periphery of opening shall be min 0 in. (continuous point contact) to max 2 in. (51 mm). When Schedule 5 steel pipe or EMT is used, sleeve may be installed flush with or extend up to 18 in. (46 cm) beyond one or both wall surfaces. Steel sleeve may be installed at an angle not greater than 45 degrees from perpendicular. Schedule 5 steel pipe or EMT sleeves may extend continuously beyond one wall surface. Sleeve to be



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rigidly supported when extending from the wall surfaces.

3. **Cables** -- Aggregate cross-sectional area of cables in opening when a steel sleeve (Item 2) is not used, or within steel sleeve to be max 48 percent of the aggregate cross-sectional area of the opening or sleeve. Cables to be bundled and rigidly supported on both sides of wall assembly. When the sleeve is installed, the annular space between the cables and the sleeve shall be min 0 in. (point contact) to max 1-1/2 in. (38 mm). When the sleeve (Item 2) is not used, the annular space between the cables and the opening shall be a min 0 in. (point contact) to a max 1/2 in. (13 mm). When L Ratings for penetrants are required, min separation between cables and between cables and periphery of opening or the sleeve os 1/8 in. (3 mm). Cable bundle, using cables described below, may penetrate the wall at an angle not greater than 45 degrees. Any combination of the following types and sizes of copper conductor cable may be used:
 - A. Max 200 pair No. AWG (or smaller) copper conductor cable with polyvinyl chloride (PVC) or plenum-rated jacketing and insulation.
 - B. Max 3/C No. 2/0 AWG (or smaller) aluminum or copper conductor service entrance cable with PVC insulation and jacket.
 - C. Max 3/C No. 8 AWG (or smaller) nonmetallic sheathed (Romex) cable with copper conductors, PVC insulation and jacket.
 - D. Max 7/C No. 2/0 AWG (or smaller) multiconductor power and control cables with XLPE or PVC insulation and XLPE or PVC jacket.
 - E. Max RG/U (or smaller) coaxial cable with fluorinated ethylene or plenum-rated insulation and jacketing.
 - F. Max 62.5/48 fiber optic cable with PVC or plenum-rated insulation and jacketing.
 - G. Max 4 pair No. 24 AWG (or smaller) copper conductor data cable with PVC or plenum-rated insulation and jacket.
 - H. Max 4/C No. 2/0 aluminum or copper conductor aluminum or steel Metal-Clad# or Armored-Clad# cable.
 - I. Max 3/4-in. (19 mm) diam copper ground cable with or without a PVC jacket.
4. **Firestop System** -- The firestop system shall consist of the following:
 - A. **Packing Material** -- When required (See table in Item 4B), min 1 in. (25 mm) thickness of min 4.0 pcf (64 kg/m³) mineral wool batt insulation firmly packed into each end of sleeve (Item 2) as a permanent form. Packing material to be recessed from each end of sleeve as required to accommodate the required thickness of fill material. When the sleeve is not used, the packing material is not required.
 - B. **Fill, Void or Cavity Material* - Sealant or Putty** -- When sleeve (Item 2) is used, fill material applied to appropriate thickness within steel sleeve as shown in the table below, flush with edges of steel sleeve on both surfaces of wall. Min 1/2 in. (13 mm) thickness of fill material installed into annular space between sleeve and wall flush with both surfaces of the wall. Min 1/2 in. (13 mm) diam bead of sealant or "rope" of putty shall be applied around the perimeter of the sleeve on each side of the wall when sleeve extends beyond surface of wall and is installed at continuous point contact. When sleeve is not used, a min 5/8 in. (16 mm) thickness of fill material shall be applied within the annulus, flush with both surfaces of the wall. At point contact location, apply min 1/4 in. (6 mm) diam bead of fill material at cable/gypsum board interface on both sides of the wall.

Sealant or Putty Type	Thickness, In. (mm)	Packing Material Required
SpecSeal Series SSS Sealant or LCI Sealant	1/2 in. (13)	Yes
SpecSeal Series SSS Sealant or LCI Sealant	1 in. (25)	No
SpecSeal Putty	1 in. (25)	No

SPECIFIED TECHNOLOGIES INC -- SpecSeal Series SSS Sealant, SpecSeal LCI Sealant or SpecSeal Putty

L Ratings apply only when SpecSeal Series SSS or SpecSeal LCI Sealants are used.

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



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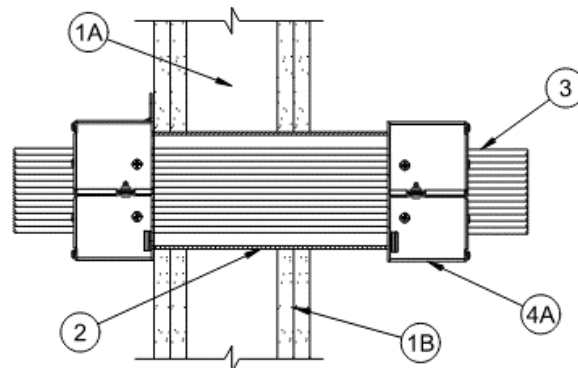
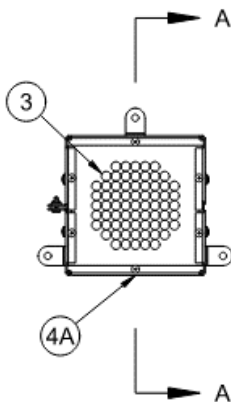
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ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings - 1 and 2 Hr (See Item 1)	F Ratings - 1 and 2 Hr (See Item 1)
T Ratings - 0 and 1/2 Hr (See Item 2)	FT Ratings - 0 and 1/2 Hr (See Item 2)
L Rating at Ambient - Less than 1 to 10.7 CFM/Device (See item 4C)	FH Ratings - 1 and 2 Hr (See Item 1)
L Rating at 400 F - Less than 1 to 10.7 CFM/Device (See item 4C)	FTH Ratings - 0 and 1/2 Hr (See Item 2)
	L Rating at Ambient - Less than 0.47 to 5.05 L/s/Device (See item 4C)
	L Rating at 204 C- Less than 0.47 to 5.05 L/s/Device (See item 4C)



Section A-A

1. **Wall Assembly** - The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, V300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
 - A. **Studs** - Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.
 - B. **Gypsum Board*** - Thickness, type, number of layers, fastener type and sheet orientation shall be as specified in the individual U300, V300, U400, V400 or W400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 5-1/2 in. (140 mm) when sleeve (Item 2) extends from wall surface. When sleeve is flush with wall surface, opening sized to outside diameter of sleeve. Max diam of opening is 4 in. (102 mm) when sleeve is not used.
- The F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall in which it is installed.**



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2. **Steel Sleeve** - (Optional) - Nom 1-1/2 in. (38 mm), 2 in. (51 mm), 3 in. (76 mm) or 4 in. (102 mm) diam steel electrical metallic tubing (EMT), steel conduit, Schedule 5 (or heavier) steel pipe sleeve or min 0.016 in. thick (0.41 mm, No. 28 ga) galv sheet steel sleeve installed flush with wall surfaces. The annular space between the steel sleeve and periphery of opening shall be min 0 in. (continuous point contact) to max 1 in. (25 mm). Sheet steel sleeve to be installed in continuous point contact only. When Schedule 5 steel pipe, steel conduit or EMT is used, sleeve may be installed flush with or extend up to 3 in. (76 mm) beyond one or both wall surfaces. When sleeve projects from wall surface, it may be provided with a metallic or nonmetallic conduit bushing. Steel sleeve may be installed at an angle not greater than 45 degrees from perpendicular. Schedule 5 steel pipe, steel conduit or EMT sleeves may extend continuously beyond one wall surface. Sleeve to be rigidly supported when extending from the wall surfaces.

When sleeve is flush with wall surface in 2 Hr rated assemblies, the T, FT, and FTH Ratings are 1/2 Hr. Otherwise, the T, FT, and FTH Ratings are 0 Hr.

3. **Cables** - Cables may represent a min 50 to max 100 percent visual fill within the loading area for the sleeve, a nom 2 in. (51 mm) diam opening or a nom 4 in. (102 mm) diam opening. Cables to be rigidly supported on both sides of the wall assembly. Any combination of the following types and sizes of cables may be used:
- A. Max 400 pair No. 24 AWG (or smaller) copper conductor telecommunication cable with polyvinyl chloride (PVC) or plenum-rated jacketing and insulation.
 - B. Max 750 kcmil single copper conductor power cable with XLPE jacket and insulation.
 - C. Max 7/C No. 12 AWG copper conductor control cable with PVC or XLPE jacket and insulation.
 - D. Max 3/C No. 2/0 AWG metal clad or armored cable with steel or aluminum jacket.
 - E. Max 3/C No. 8 AWG NM cable (Romex) with PVC insulation and jacket.
 - F. Max four pair No. 22 AWG (or smaller) copper conductor data cable with PVC or plenum rated jacketing and insulation.
 - G. Max four pair No. 22 AWG (or smaller) Cat 5, Cat 5E, Cat 6 or Cat 6A cable with PVC or plenum rated jacketing and insulation.
 - H. Coaxial cable with fluorinated ethylene or PVC insulation and jacketing having a max diam of 5/8 in. (16 mm).
 - I. Optical fiber cable with PVC or polyethylene (PE) jacket and insulation and having a max diam of 5/8 in. (16 mm).
 - J. Max RG6/U coaxial cable with fluorinated ethylene, polyethylene (PE), PVC or plenum rated jacketing and insulation.
4. **Firestop System*** - The firestop system shall consist of the following:
- A. **Firestop Device** - A firestop device consisting of a rectangular galv steel housing with intumescent curtain sized to the specific diam of the sleeve or opening. Firestop device installed in accordance with the accompanying installation instructions on each side of the wall. Firestop device secured to end of sleeve when sleeve extends from wall surface. When sleeve extends continuously beyond one wall surface, firestop device shall be installed only on the side of the wall with a sleeve termination. When sleeve is flush with wall surface or when sleeve is not used, firestop device secured to assembly using provided anchor tabs by means of 1/8 in. (3.2 mm) diam by 1-3/4 in. (44 mm) long steel molly bolts or toggle bolts in conjunction with min 1-1/4 in. (32 mm) diam steel fender washers.
SPECIFIED TECHNOLOGIES INC - EZ PATH Retrofit Device EZDR200 or EZDR400
 - A1. **Firestop Device*** - (Not Shown) - When nom 1-1/2 in. (38 mm) or nom 3 in. (76 mm) diam steel sleeve is used, an appropriately sized steel plate adaptor kit shall be used in conjunction with Item 4A. The steel plate shall be installed in accordance with the accompanying installation instructions.
SPECIFIED TECHNOLOGIES INC - EZ PATH Retrofit Device Plate Kit EZPR150 or EZPR300
 - B. **Fill, Void or Cavity Material* - Sealant or Putty** - (Optional, Not Shown) Any existing XHHW sealant or putty either partially or fully installed into one or both ends of the steel sleeve. When annular space is present between the sleeve and the periphery of the opening, a min 5/8 in. (16 mm) thickness of any existing XHHW sealant or putty shall be applied within the annulus, flush with both surfaces of wall.
 - C. **Fill, Void or Cavity Material* - Sealant or Putty** - (Optional, Not Shown) - Min 1/2 in. (13 mm) thickness of sealant or putty applied within annulus, flush with both ends of sleeve. When annular space is present between the sleeve and the periphery of the opening, a min 1/2 in. (13 mm) thickness of sealant or putty shall be applied within the annulus, flush with both surfaces of the wall.



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Device	Max Visual Cable Fill	Putty or Sealant	L-Rating (CFM)		Sleeve Size in. (mm)
			Ambient	400°F	
EZDR200	50%	No	3.3	3.3	2 (51)
EZDR200	51% - 75%	No	3.7	3.7	2 (51)
EZDR200	76% - 100%	No	4	4	2 (51)
EZDR200	50%	Yes	Less Than 1	Less Than 1	2 (51)
EZDR200	51% - 75%	Yes	1.5	1.5	2 (51)
EZDR200	76% - 100%	Yes	1.8	1.8	2 (51)
EZDR400	50%	No	7.8	7.8	4 (102)
EZDR400	51% - 75%	No	8	8	4 (102)
EZDR400	76% - 100%	No	10.7	10.7	4 (102)
EZDR400	50%	Yes	1.3	1.3	4 (102)
EZDR400	51% - 75%	Yes	3.7	3.7	4 (102)
EZDR400	76% - 100%	Yes	5.2	5.2	4 (102)

SPECIFIED TECHNOLOGIES INC - SpecSeal Series SSS Sealant, SpecSeal LC150 Sealant, SpecSeal LCI Sealant, SpecSeal SIL300 Sealant or SpecSeal Putty

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



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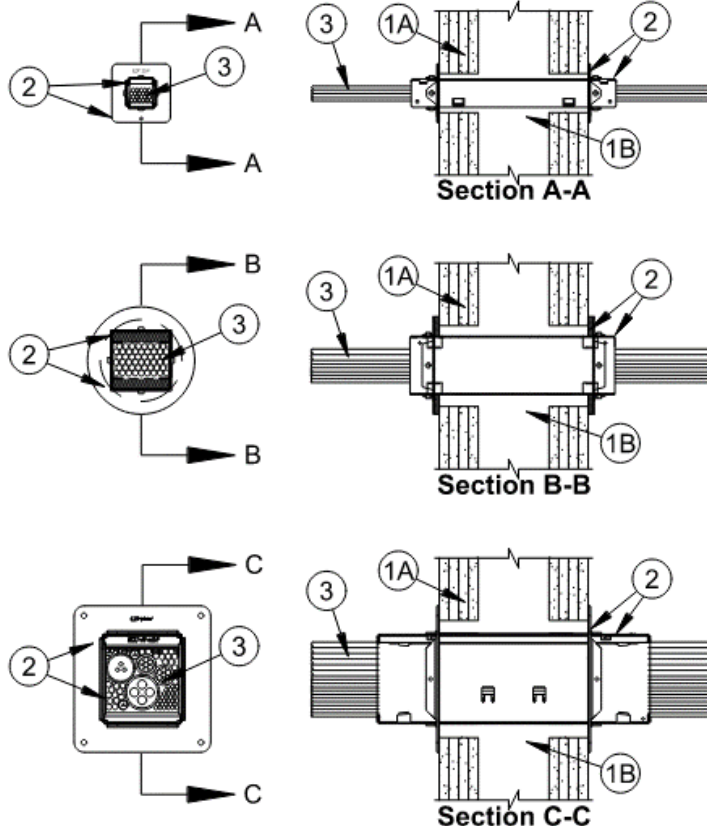
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Classified by
Underwriters Laboratories, Inc.
to ANSI/UL 1479 (ASTM E814) and CAN/ULC S115

System No. W-L-3377



ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings - 1, 2, 3 and 4 Hr (See Items 1 and 3)	F Ratings - 1, 2, 3 and 4 Hr (See Items 1 and 3)
T Rating - 3/4, 1, 1-1/2 and 2 Hr (See Item 3)	FT Rating - 3/4, 1, 1-1/2 and 2 Hr (See Item 3)
L Rating At Ambient - Less than 1 to 7 CFM/Device Module (See Item 2)	FH Ratings - 1, 2, 3 and 4 Hr (See Items 1 and 3)
L Rating At Ambient - Less than 1 to 7 CFM/Device Module (See Item 2)	FTH Rating - 3/4, 1, 1-1/2 and 2 Hr (See Item 3)
	L Rating At Ambient - Less than 1 to 7 CFM/Device Module (See Item 2)
	L Rating at 400 F - Less than 1 to 3 CFM/Device Module (See Item 2)



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1. **Wall Assembly** - The 1, 2, 3 or 4 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described within the individual U300, U400, V400 or W400 Series Wall or Partition Designs in the UL Fire Resistance Directory and shall incorporate the following construction features:
 - A. **Studs** - Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced max 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.
 - B. **Gypsum Board*** - Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design. See Table for opening sizes.

The hourly F and FH Ratings are dependent upon the hourly rating of the wall in which it is installed.
2. **Firestop Device*** - Series 22 EZ Path device modules consist of a 1.4 by 1.4 by 10-1/2 in. (36 by 36 by 267 mm) long galv steel tube with an intumescent material lining. Series 33 EZ Path device modules consist of a 3 by 3 by 10-1/2 in. (76 by 76 by 267 mm) long galv steel tube with an intumescent material lining. Series 44+ EZ Path device modules consist of a 4 by 4-5/8 by 14 in. (102 by 118 by 356 mm) long galv steel tube with an intumescent material lining. Firestop device modules to be installed in accordance with the accompanying installation instructions. Firestop device modules secured in place by means of steel wall plates installed with gasketing material supplied with product. Steel wall plates installed on both sides of wall and secured to each device by means of steel screws provided with device. Firestop device module is to be installed with ends projecting an equal distance beyond each surface of the wall assembly. The annular space between the device and opening shall be min 0 in. (point contact) to max 1/8 in. (3 mm) for Series 22 device, max 1/2 in. (13 mm) for Series 33 device and max 1/4 in. (6 mm) for Series 44 device. The opening size and L Ratings for each device vary according to whether device module is blank (no cables) or loaded (with cables) and which cable type and size is used, as tabulated below:

SPECIFIED TECHNOLOGIES INC - EZ PATH Series 22, 33 or 44+ Fire Rated Pathway

Device	Max Cable Fill	Cable Type	L-Rating (CFM)		Opening Size Diam or Dimensions, in. (mm)
			Ambient	400° F	
Series 22	0%	-	1.4	1.4	2 (51) or 1-3/4 x 1-3/4 (44 x 44)
Series 22	1-25%	3A	Less Than 1	Less Than 1	2 (51) or 1-3/4 x 1-3/4 (44 x 44)
Series 22	26-50%	3A	Less Than 1	Less Than 1	2 (51) or 1-3/4 x 1-3/4 (44 x 44)
Series 22	51-75%	3A	Less Than 1	Less Than 1	2 (51) or 1-3/4 x 1-3/4 (44 x 44)
Series 22	76-100%	3A	Less Than 1	Less Than 1	2 (51) or 1-3/4 x 1-3/4 (44 x 44)
Series 22	100%	3F	Less Than 1	Less Than 1	2 (51) or 1-3/4 x 1-3/4 (44 x 44)
Series 33	0%	-	Less Than 1	Less Than 1	4 (102) or 3-1/4 x 3-1/4 (82 x 82)
Series 33	100%	3A	4	3	4 (102) or 3-1/4 x 3-1/4 (82 x 82)
Series 33	100%	3F	1.3	Less Than 1	4 (102) or 3-1/4 x 3-1/4 (82 x 82)
Series 33	100%	3G, 3H	7	2	4 (102) or 3-1/4 x 3-1/4 (82 x 82)
Series 33	100%	3I	1.8	1.8	4 (102) or 3-1/4 x 3-1/4 (82 x 82)
Series 44+	0%	-	Less Than 1	Less Than 1	6 (152) or 4-1/8 x 4-3/4 (120 x 120)
Series 44+	1-25%	3A-3I	1.5	1.5	6 (152) or 4-1/8 x 4-3/4 (120 x 120)
Series 44+	26-50%	3A-3I	2.3	2.3	6 (152) or 4-1/8 x 4-3/4 (120 x 120)
Series 44+	51-75%	3A-3I	2.3	2.3	6 (152) or 4-1/8 x 4-3/4 (120 x 120)
Series 44+	76%-100%	3A-3I	2.3	2.3	6 (152) or 4-1/8 x 4-3/4 (120 x 120)



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- 2A. **Firestop Device* - Extension Module** - (Optional, Not Shown) - Module attached to ends of Series 33, Series 44+ firestop device (Item 2) to increase its length to facilitate installation in thicker walls. Each module consists of a galv steel tube with an intumescent material lining. Extension module to be installed in accordance with the accompanying installation instructions. When module is used, firestop device (Item 2) and extension module(s) secured in place by means of steel wall plates installed with gasketing material supplied with product. Steel wall plates installed on both sides of wall and secured to each device or extension module(s) by means of steel set screws provided with wall plates. Firestop device and extension module(s) assembly to be installed with ends projecting an equal distance beyond each surface of the wall assembly.

SPECIFIED TECHNOLOGIES INC - EZ PATH Series 33 or Series 44+ Extension

3. **Cables** - Cables may represent a 0 to max 100 percent visual fill within the loading area for the firestop device module. Cables to be rigidly supported on both sides of the wall assembly. Any combination of the following types of cables may be used:
- A. Max 400 pair No. 24 AWG (or smaller) copper conductor telecommunication cable with polyvinyl chloride (PVC) or plenum-rated jacketing and insulation.
 - B. Max 750 kcmil single copper conductor power cable with XLPE jacket and insulation
 - C. Max 7/C No. 12 AWG copper conductor control cable with PVC or XLPE jacket and insulation.
 - D. Max 3/C No. 2/0 AWG metal clad or armored cable with steel or aluminum jacket.
 - E. Max 3/C No. 8 AWG NM cable (Romex) with PVC insulation and jacket.
 - F. Max four pair No. 22 AWG (or smaller) copper conductor data cable with PVC or plenum rated jacketing and insulation.
 - G. Coaxial cable with fluorinated ethylene or PVC insulation and jacketing having a max diam of 5/8 in. (16 mm).
 - H. Optical fiber cable with PVC or polyethylene (PE) jacket and insulation and having a max diam of 5/8 in. (16 mm).
 - I. Max RG6/U coaxial cable with fluorinated ethylene, polyethylene (PE), PVC or plenum rated jacketing and insulation.

When Series 22 EZ Path device modules are used and when the hourly rating of the wall assembly is 1 hr, the T, FT and FTH Ratings are 3/4 hr except that for Items 3F, 3G and 3H, the T, FT and FTH Ratings are 1 hr. When the hourly fire rating of the wall assembly is 2 hr or greater, the T, FT and FTH Ratings are 3/4 hr when cables are installed. When no cables are installed within the device module, the T, FT and FTH Ratings are 1 hr in 1 hr walls and 1-1/2 hr for 2, 3 and 4 hr walls. When Item 3A, 3B, 3C, 3D or 3E is used, the maximum F and FH Ratings are 2 hr. When max 200 pair No. 24 AWG telecommunication cable and/or 350 kcmil power cable is used or when Item 3F, 3G, 3H or 3I is used, the maximum F and FH Ratings are 4 hr.

When Series 33 EZ Path device modules are used and when the hourly rating of the wall assembly is 1 hr, the T, FT and FTH Ratings are 3/4 hr. When the hourly fire rating of the wall assembly is greater than 1 hr, the T, FT and FTH Ratings are 3/4 hr when Item 3A, 3B, 3C, 3D or 3E is used. Otherwise the T, FT and FTH Ratings are 1 hr. When Item 3A, 3B, 3C, 3D or 3E is used, the maximum F and FH Ratings are 2 hr. When max 200 pair No. 24 AWG telecommunication cable is used or when Item 3F, 3G, 3H or 3I is used, the maximum F and FH Ratings are 4 hr.

When Series 44 + EZ Path device modules are used and when Item 3A, 3B, 3C, 3D or 3E is used, the max F and FH Ratings are 3 hr and the T, FT and FTH Ratings are 1 hr. When Item 3F or 3G is used, the max F and FH Ratings are 4 hr and the T, FT and FTH Ratings are 1-1/2 hr. When Item 3H or 3I is used, the max F and FH Ratings are 4 hr and the T, FT and FTH Ratings are 2 hr. When device empty, the T, FT and FTH Ratings are 1-1/2 Hr.

+Bearing the UL Listing Mark

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



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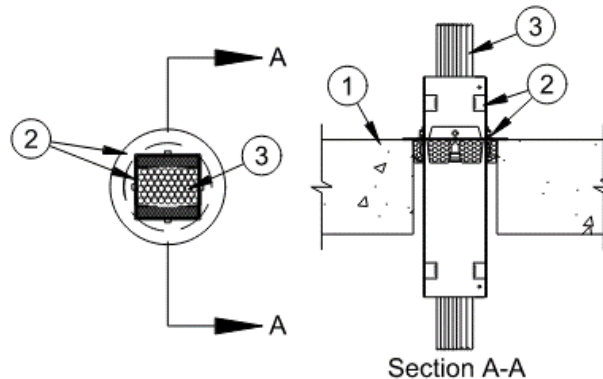
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F Ratings - 2, 3 and 4 Hr (See Items 1 and 3)	F Ratings - 2, 3 and 4 Hr (See Items 1 and 3)
T Ratings - 1/4, 1/2, 1-3/4 and 2 Hr (See Items 1, 2, 3 and 4)	FT Ratings - 1/4, 1/2, 1-3/4 and 2 Hr (See Items 1, 2, 3 and 4)
L Rating At Ambient - Less Than 1, 1.3, 4 or 7 CFM/Device Module (See Item 3)	FH Ratings - 2, 3 and 4 Hr (See Items 1 and 3)
L Rating At 400 F - Less Than 1, 2 or 3 CFM/Device Module (See Item 3)	FTH Ratings - 1/4, 1/2, 1-3/4 and 2 Hr (See Items 1, 2, 3 and 4)
	L Rating At Ambient - Less Than 1, 1.3, 4 or 7 CFM/Device Module (See Item 3)
	L Rating At 400 F - Less Than 1, 2 or 3 CFM/Device Module (See Item 3)



- 1. Floor Assembly** - Reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete. **The min concrete thickness for a 2 hr F and FH Ratings and for a 1/4 hr T, FT and FTH Ratings is 2-1/2 in. (64 mm). The min concrete thickness for a 3 hr F and FH Ratings and for a 1/2 hr T, FT and FTH Ratings is 4-1/2 in. (114 mm). The min concrete thickness for a 4 hr F and FH Ratings and for a 1-3/4 hr or 2 hr T, FT and FTH Ratings is 6 in. (152 mm). Diam of opening to be 4 in. (102 mm).**
- 2. Firestop Device*** - One firestop device module centered within the opening. The firestop device module consists of a 3 by 3 by 10-1/2 in. (76 by 76 by 267 mm) long galv steel tube with an intumescent material lining. Firestop device module to be installed in conjunction with kick-in plate in accordance with the accompanying installation instructions. Kick-in plate consists of steel plate with vertical flanges on the top surface and with spring steel locking clips and intumescent foam wedges on the bottom surface. Kick-in plate secured to firestop device module with steel set screws in each of the four vertical flanges. Device with kick-in plate inserted into 4 in. (102 mm) diam core hole from top of floor and pushed into opening until bottom of plate is flush with the top surface of the floor to lock the device in position. The firestop device module is to be installed with its ends projecting an equal distance above and below the floor surfaces. **For 1-3/4 or 2 hr T, FT and FTH Ratings, the firestop device module is to be installed to project 6 in. (152 mm) above the floor and 4-1/2 in. (114 mm) into the floor. When the firestop device module is cast or grouted into the floor assembly the T, FT and FTH Ratings are 2 hr.**

SPECIFIED TECHNOLOGIES INC - EZ PATH Series 33 Fire Rated Pathway



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3. **Cables** - Cables may represent a 0 to 100 percent visual fill within the loading area for the firestop device module. Cables to be rigidly supported on both sides of the floor assembly. Any combination of the following types of cables may be used:
- A. Max 400 pair No. 24 AWG (or smaller) copper conductor telecommunication cable with polyvinyl chloride (PVC) or plenum-rated jacketing and insulation.
 - B. Max 750 kcmil single copper conductor power cable with XLPE jacket and insulation
 - C. Max 7/C No. 12 AWG copper conductor control cable with PVC or XLPE jacket and insulation.
 - D. Max 3/C No. 2/0 AWG metal clad or armored cable with steel or aluminum jacket.
 - E. Max 3/C No. 8 AWG NM cable (Romex) with PVC insulation and jacket.
 - F. Max four pair No. 22 AWG (or smaller) copper conductor data cable with PVC or plenum rated jacketing and insulation.
 - G. Coaxial cable with fluorinated ethylene or PVC insulation and jacketing having a max diam of 5/8 in. (16 mm).
 - H. Optical fiber cable with PVC or polyethylene (PE) jacket and insulation and having a max diam of 5/8 in. (16 mm).

When Item 3A is used, the max size of cable for 1-3/4 hr or 2 hr T, FT and FTH Ratings is 100 pair. When Item 3A or 3B is used, an extension module (Item 4) is required to attain 1-3/4 hr or 2 hr T, FT and FTH Ratings. Otherwise, the T, FT and FTH Ratings are 1/2 hr.

When Item 3A is used, the max size of cable is 200 pair for the 3 hr F and FH Ratings. Otherwise, the F and FH Ratings are 2 hr.

The L Rating for each empty firestop device module is less than 1 cfm at ambient and at 400F. When Item 3A is used, the L Rating for each firestop device module with 100 percent visual cable fill is 4 cfm at ambient and 3 cfm at 400F. When Item 3F is used, the L Rating for each firestop device module with 100 percent visual cable fill is 1.3 cfm at ambient and less than 1 cfm at 400F. When Item 3G or 3H is used, the L Rating for each firestop device module with 100 percent visual cable fill is 7 cfm at ambient and 2 cfm at 400F.

4. **Firestop Device* - Extension Module** - (Optional, Not Shown) - Module attached to top of 3 by 3 by 10-1/2 in. (76 by 76 by 267 mm) long firestop device (Item 2) to increase its length. Each module consists of a 3 by 3 by 6 in. (76 by 76 by 152 mm) long galv steel tube with an intumescent material lining. Extension module to be installed in accordance with the accompanying installation instructions. **When Item 4 is used with Item 3A or 3B, the T, FT and FTH Ratings are 1-3/4 or 2 hr dependent upon the use or non-use of the kick-in plate.**

SPECIFIED TECHNOLOGIES INC - EZ PATH Extension

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* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



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SECTION 270529
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 I 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

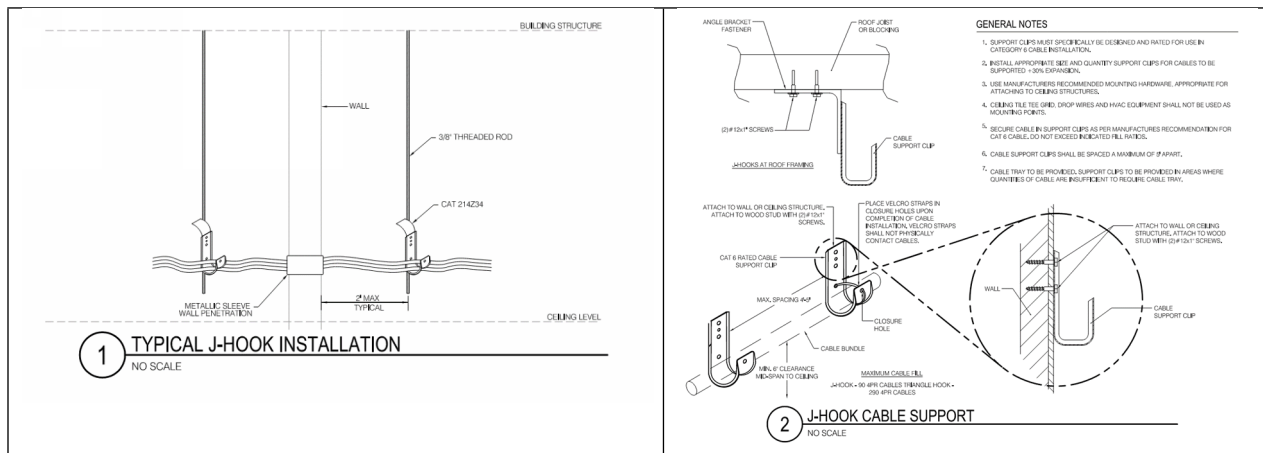
- A. Project Submittals – See Section 270500 Appendix A Project Submittals for contractor requirements for training validation, credentials, scaled shop drawings data sheet, and specialty product sample submittal(s) prior to site work.

- 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 **Golden West College** reference.

1.5 WARRANTY

- A. Warranty:
1. The contractor shall provide all extended warranty plans at no cost to the **Golden West 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. **Golden West College IT Standards and Specifications:** Subject to compliance with requirements:
1. Erico – Caddy CableCat Support System – **Golden West College IT Standard**
 2. Or **Golden West 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. Four-inch (0'4") Cat214z34, two-inch (0'2") J-Hook Supports Cat324z34
 - b. Stiffy Series 200 with comfort cradle Low Voltage supports
- 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. **Golden West College** IT Standards and Specifications: Subject to compliance with requirements:
 1. All Thread Rod – **Golden West College** IT Standard
 2. Or **Golden West 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. Threaded rod installation to the concrete deck above shall be made via a 3/8" Hilti-KB-TZ2 Expansion anchor.
- C. Description:

2.3 1/4" CEILING HANGER (AKA PENCIL-ROD, CEILING-WIRE) FOR CEILING ATTACHMENT – IMPACT-SHOT ATTACHMENT,

- A. **Golden West College** IT Standards and Specifications: Subject to compliance with requirements:
 1. CPI
 2. Or **Golden West 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.

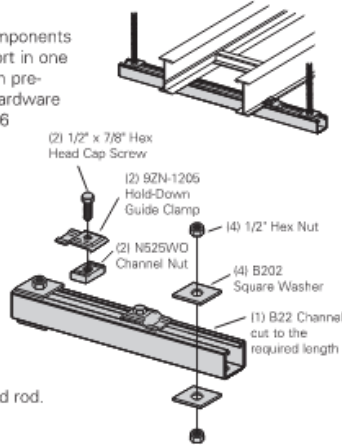
Trapeze Support Kit

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.

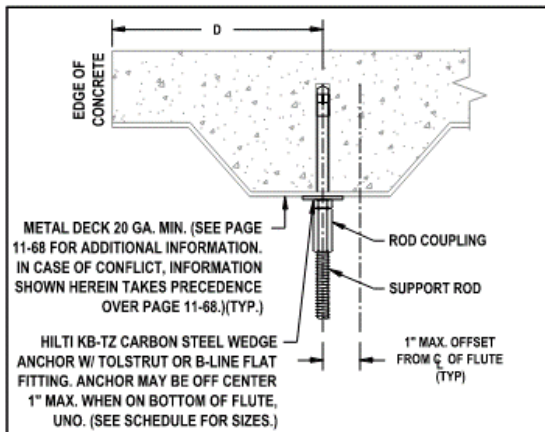


Catalog No.	Tray Width in. (mm)	Channel Length in. (mm)	Uniform Load lbs (kN)
9P-5506-22SH(t)	6 (152)	16 (406)	1600 (7.11)
9P-5509-22SH(t)	9 (229)	18 (457)	1250 (5.56)
9P-5512-22SH(t)	12 (305)	22 (559)	1125 (5.00)
9P-5518-22SH(t)	18 (457)	28 (711)	865 (3.85)
9P-5524-22SH(t)	24 (610)	34 (864)	700 (3.11)
9P-5530-22SH(t)	30 (762)	40 (1016)	590 (2.62)
9P-5536-22SH(t)	36 (914)	46 (1168)	510 (2.27)

• (t) Insert 3/8" for 1/2" 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)		B-LINE SOLID CHANNEL
				MAX. VERTICAL LOAD		
				SINGLE (LB)	DOUBLE (LB)	
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 $\phi=2.5$ PER ASCE 7-10, TABLE 13.6-1 TO SATISFY ACI-318-11.

3.2 INSTALLATION

A. Process:

- Follow the manufacturer's instructions and recommended industry standards and guidelines.
- The installed non-continuous support system must be an independent support structure for the voice/data communication system.
 - Cable bundles are to be sized as PoE+++ (90W) for all Cat6A U/UTP CMP cables.
 - Sleeves are part of the independent cable support solution and shall be included in scaled shop drawings and project costing.
 - No plastic or composite independent cable supports that do not have a metal strength member above areas with pedestrian foot traffic.
- 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 **Golden West 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 **Golden West 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 **Golden West College** and A/E team.
- B. Sub-contractor to submit all as-built drawings and any test documentation required before acceptance by the **Golden West College**.

END OF SECTION 270529

SECTION 270533
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 **Golden West College** IT standard cable manufacturer’s requirements.
 - c. Industry best practices for low-voltage/signal cabling. Cable fill shall follow ANSI-recognized cable quantities 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 **Golden West College** reference.

1.5 WARRANTY

- A. Warranty:
 - 1. The contractor shall provide all extended warranty plans at no cost to the **Golden West 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. Or **Golden West College** IT approved equal.
- B. RMC Conduit
 - 1. JM Eagle
 - 2. Or **Golden West College** IT approved equal.
- C. PVC Conduit
 - 1. JM Eagle
 - 2. Or **Golden West College** IT approved equal.
- D. Pull Boxes
 - 1. Hoffman Engineering Co (aka NVent)
 - 2. Or **Golden West College** IT approved equal.
- E. Back Boxes
 - 1. Thomas & Betts
 - 2. Or **Golden West College** IT approved equal.

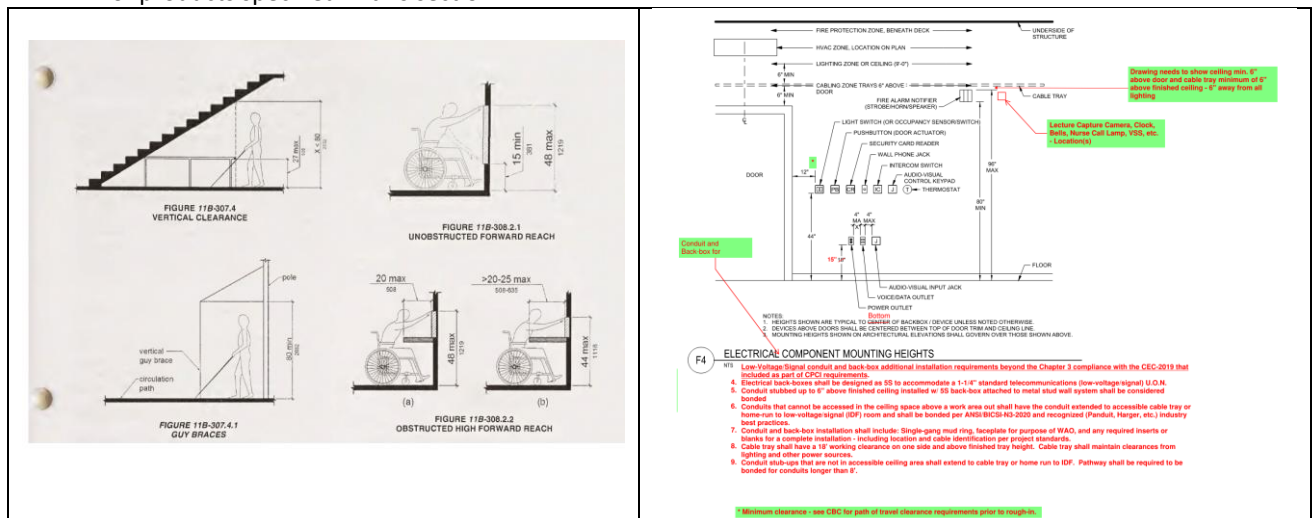
2.2 TELECOMMUNICATIONS CONDUIT AND BACKBOXES

- 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 1/2" 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 **Golden West College** IT 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:

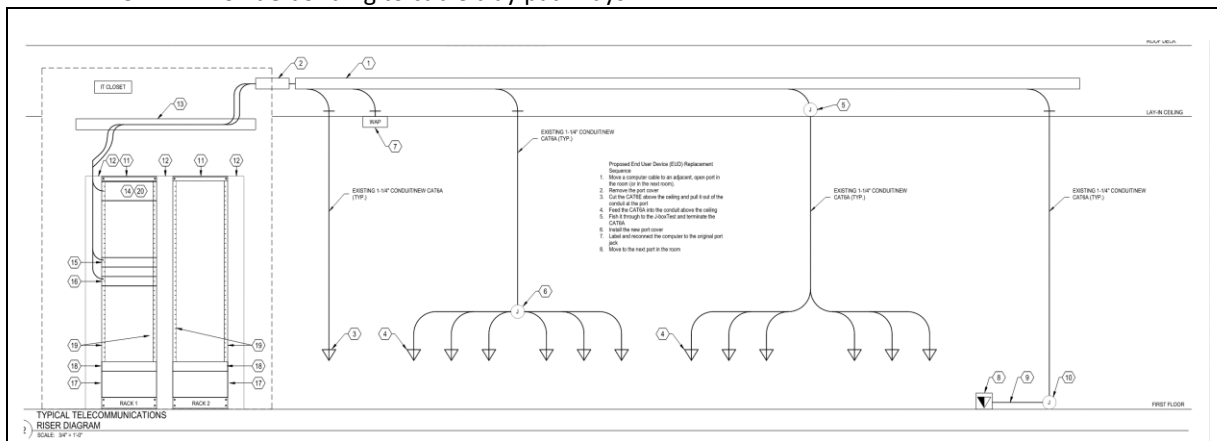
1. Install Pull boxes in easily accessible locations.
2. Install Horizontal cabling boxes immediately above suspended ceilings.
3. A pull box should not be used in lieu of a bend.
4. Conduits that enter the pull box from opposite ends with each other should be aligned.
5. For direct access to a box located 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)

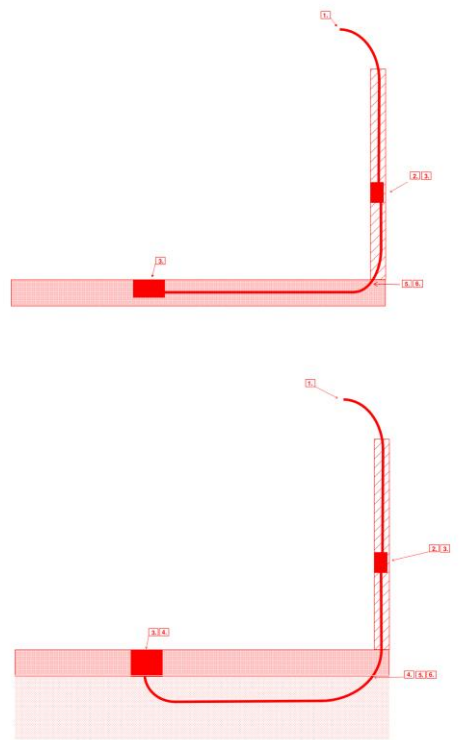
B. Back Boxes

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.

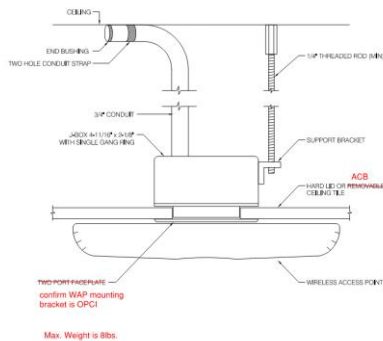


KEYNOTES

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 EXISTING 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 ADDITIONAL 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. TELECOMMUNICATIONS CHANEL RACK, 19" RAILS, #12-24 TAPED EIA HOLE PATTERN, 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 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 6A 48 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 CIRCUITS WITH L21-30R RECEPTACLES. SEE T-502 FOR MORE DETAILS.
19. NEW ORTRONICS POWER DELIVERY UNIT (PDU), BASIS OF DESIGN R0-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.



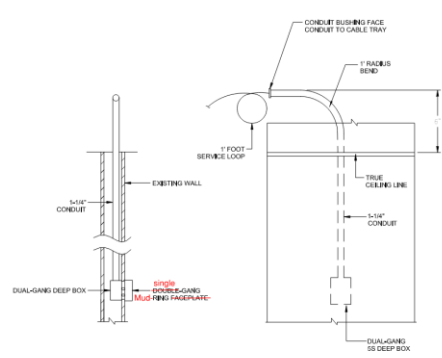
1. Conduit that does not have clear access shall extend to cable tray or home-run to IDF.
2. Location (ATTN) of back-box is dependent on use:
1. DBR - 60" UOM
2. DBR - 48" UOM
3. MFD/CP - 18" UOM
Note:
Conduit back-box attached to metal studs is considered bonded per this design standard
3. Conduit terminations are required to be fitted with non-slag bushings and within floor boxes and pedestals require bonding strap.
4. Cabling is required to transition from a rated jacket to a moisture-blocking jacket at a termination that is ANSI/TIA-568-D approved.
5. Conduit 90-degree segments shall be factory sweeps at 1/4" OD of conduit.
Conduits that require more than 180-degrees in charge of direction shall be required to be de-rated cable fill capacity by:
+10-15% - 90-degree bend
+10-25% - 180-degree bend
Additional distance or de-rated conduits shall not exceed 100' between pulling points.
Notes:
- Cable manufacturers maximum pulling tension shall be followed for all pulls.
- Factory terminated specialty cables (ODM, USB, CP-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 100 ft Equipment Cord and (1) Cat6A 100 ft Patch-Cord per WAP Connection

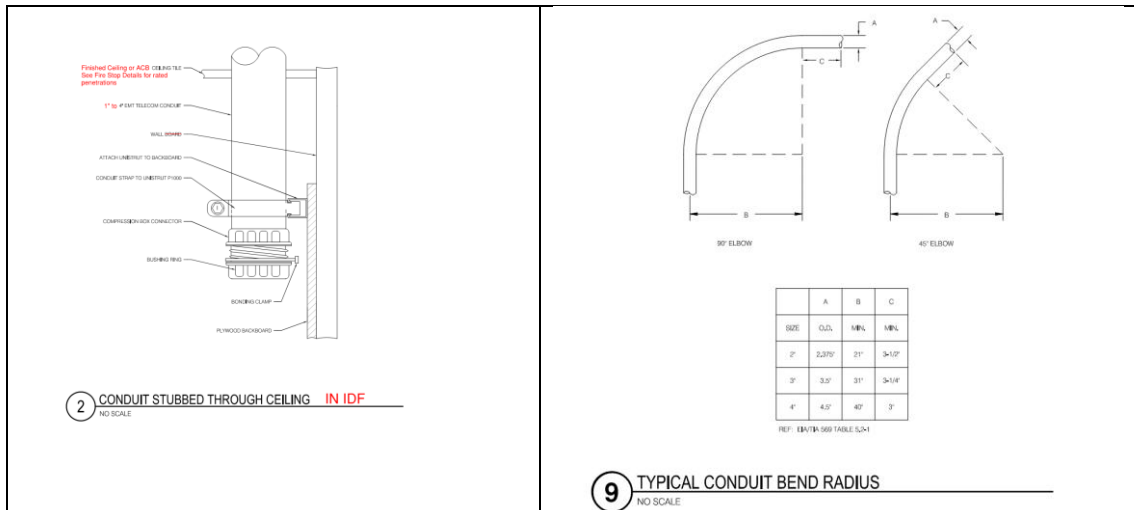


3 TYPICAL OUTLET CONCEALED CONDUIT TO ACCESSIBLE CEILING

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 is 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 **Golden West College** 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 **Golden West College** 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 **Golden West College** Representative will review/observe the completed installation. Once the **Golden West College** 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 **Golden West 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 **Golden West College** 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 **Golden West College** and A/E team.
- D. Sub-contractor to submit all as-built drawings and any test documentation required before acceptance by the **Golden West College**

END OF SECTION 270533

SECTION 270553
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 **Golden West College IT** reference.

1.5 WARRANTY

- A. Warranty:
 1. The contractor shall provide all extended warranty plans at no cost to the **Golden West 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 IDENTIFICATION LABELS

- A. Basis-of-Design Product: Subject to compliance with requirements:
 1. Brady Label System
 2. Or **Golden West 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 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 **Golden West College's** labeling scheme for all voice data communications system components.
 5. the sub-contractor is responsible for providing labels sized to show **Golden West College'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 **Golden West College'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 **Golden West College 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 **Golden West College 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.

2.2 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

2.3 INSTALLATION

- A. Process:
 - 1. The **Golden West College** -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 **Golden West College** 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 (Identify 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.

2.4 RE-INSTALLATION

- A. No additional burden to the **Golden West 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 **Golden West College** before beginning any re-installation work.

2.5 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 **Golden West College** and A/E team.
- B. Sub-contractor to submit all as-built drawings and any test documentation required before acceptance by the **Golden West College** IT.

END OF SECTION 270553

SECTION 270800
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 **Golden West College** reference.

1.5 WARRANTY

- A. Warranty:
 1. The contractor shall provide all extended warranty plans at no cost to the **Golden West 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 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 - 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.
- 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 **Golden West College** and A/E team.
- B. Sub-contractor to submit all as-built drawings and any test documentation required before acceptance by the **Golden West College** IT.

END OF SECTION 270800

SECTION 271119
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 **Golden West College** reference.

1.5 WARRANTY

- A. Warranty:
 - 1. The contractor shall provide all extended warranty plans at no cost to the **Golden West 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 COPPER HORIZONTAL CABLING PATCH PANELS

- A. Manufacturer List:
 - 1. Panduit
 - a. Category 6 and Category 6A 24 Port
 - b. Category 6 and Category 6A 48 Port
 - 2. Or **Golden West 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 requirements for each situation
- 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. Sumitomo (OSP Backbone fiber installations)
 2. Corning (Intrabuilding Backbone fiber installations)
 3. Or **Golden West College** IT Approved Equal
- 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.
- C. Description:
1. 19-inch Rack mountable fiber optic termination shelf with maximum 12 panels 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 pigtailed mounted in connector housings assembled by the manufacturer of the single mode fiber optic cable.
 5. All fibers shall be terminated on Duplex-LC couplings mounted on enclosed patch panels. Couplers shall be mounted on a panel that snaps into the enclosure.
 6. The enclosure shall be designed to accommodate a changing variety of connector types by changing panels on which connector couplings are mounted.
 7. The panel enclosure shall be sized to accommodate the total quantity of fiber strands as described in the specifications and drawings.
 8. Termination panels shall be enclosed assemblies. The enclosures shall incorporate a hinged or retractable front cover designed to protect the connector couplings and fiber optic jumpers.
 9. The patch panel enclosure shall provide for strain relief of incoming cables and shall incorporate radius control mechanisms to limit bending of the fiber to the manufacturers recommended minimums.
 10. Access to the inside of the patch panel enclosure during installation shall be from the front and rear.
 11. The patch panel enclosure shall be configured to require only front access when patching. The enclosure shall provide a physical barrier to access of backbone cables.

12. The enclosure shall incorporate a storage cassette, tray, or other mechanism designed to allow identification, access and termination of individual fibers.
 13. The fiber optic patch panel shall be rated to match or exceed the ANSI/TIA/EIA rated wiring terminated on the panel.
 14. For Intrabuilding products provide Corning products.
 15. For Interbuilding products provide Sumitomo 12-Port (6 adapter) SM APC Green FTLA06D2.
- D. Single-Mode splice-on Connector is acceptable.
1. All optical fiber housings shall be complete factory-provided assemblies that contain all components including LC duplex connector adapter panels and internal/external bend radius, strain relief and cable clamp components that are provided in a housing which includes an accessible rear access hatch.
 2. 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.
 3. 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 optical fiber strands being terminated.
- E. Product Options:
1. The indicated manufacturers shall be the basis of the design and each component selected shall address the particular infrastructure requirements.

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 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 **Golden West College**.
- 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 Golden **West College**.

3.3 RE-INSTALLATION

- A. No additional burden to **Golden West College** 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 **Golden West College** 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 **Golden West College** and A/E team.
- B. Contractor to submit all as-built drawings and any test documentation required before acceptance by the **Golden West College** IT

END OF SECTION 271119

SECTION 271123
CABLE MANAGEMENT AND OVERHEAD LADDER (TYPE) RACK FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1



Universal Runway

Traditional pathway solution for distribution over racks in equipment rooms. Note that cross-members are fixed in place.

1.2 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

1.3 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.

1.4 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.

1.5 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 **Golden West College** reference.

1.6 WARRANTY

- A. Warranty:
 - 1. The contractor shall provide all extended warranty plans at no cost to the **Golden West 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 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.

2.2 HORIZONTAL CABLE MANAGEMENT

- A. Manufacturer List:
 - 1. CPI
 - a. Motive System
 - 1) 2 Unit -Part Number 35431-702
 - 2) 1 Unit -Part Number 35432-701
- 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. 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.
- D. Accessory Products:
1. Provide any accessory products related to the wire management components to provide a complete and functional infrastructure system.

2.3 LADDER RACK

- A. 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
- 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. 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

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 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.

3.2 INSTALLATION

- A. 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.

3.3 RE-INSTALLATION

- A. No additional burden to **Golden West 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 **Golden West College** before beginning any re-installation work.

3.4 CLOSEOUT ACTIVITIES

- A. The contractor shall provide documentation of all telecommunications system components under this section utilized throughout the site for review and reference by the **Golden West College** and A/E team.
- B. The contractor is to submit all as-built drawings and any test documentation required before acceptance by the **Golden West College**.

END OF SECTION 271123

**SECTION 271300
COPPER BACKBONE CABLE FOR COMMUNICATIONS SYSTEMS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Provides specifications for high pair count UTP copper backbone cabling to distribute network signals between telecommunications distribution spaces.
 - 2. Backbone Multi-Pair UTP 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. 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 as-built drawings a minimum of two (2) weeks after completion of all Division- 27 work for A/E and **Golden West College** reference.

1.5 WARRANTY

A. Warranty:

1. The contractor shall provide any and all extended warranty plans at no cost to the **Golden West College** IT Project Manager.
2. The contractor shall warranty all workmanship per the manufacturer's required installation and attachment requirements per this contract.

PART 2 - PRODUCTS

2.1 BACKBONE MULTI-PAIR CABLING

A. Basis-of-Design Product: Subject to compliance with requirements:

1. General Cable
2. **Golden West 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 requirements.

Filled Core Cables

Filled Solid Cable

RDUP (RUS) PE-39 AL

Telecommunications

Spec. 2002

Core Construction:

Conductors:

- Solid, annealed copper, sizes 18, 22 and 24 AWG

Insulation:

- Solid, high density polyethylene, color coded in accordance with telephone industry standards

Twisted Pairs:

- Insulated conductors are twisted into pairs with varying tie lengths to minimize crosstalk

Core Assembly:

- 25 pairs and less pairs are assembled together in a single group
- More than 25 pairs pairs are arranged in groups, each group having a color-coded unit binder

Filling Compound:

- The entire core assembly is completely filled with ETPR compound, filling the interstices between the pairs and under the core tape

Core Wrap:

- Non-hygroscopic dielectric tape applied longitudinally with an overlap

Sheath:

Aluminum Shield:

- Corrugated, copolymer coated, 0.005" aluminum tape applied longitudinally with an overlap
- The sheath interfaces are flooded with an adhesive water-blocking compound

Jacket:

- Black, linear low density polyethylene

Applications:

- Intended for duct and direct buried installations where protection against water and moisture entry is required and may also be installed aerially

Compliance:

- Rural Development Utility Program (RDUP) 7 CFR 175.380 (RUS PE-39)
- RUS1 Compliant effective 1/1/15


Packaging:


- Standard lengths are shipped on non-returnable wood reels
- Non-standard packaging is available upon request


Nominal Cable Data

CABLE NUMBER	PAIRS	AWG	O.D. (INCHES)	WEIGHT (LBS/100FT)	STANDARD LENGTH (FT)
7524507	6/18		0.60	140	5000
7524515	12/18		0.75	250	5000
7524523	25/18		0.97	480	5000
7524556	6/22		0.45	90	5000
7524564	12/22		0.56	165	5000
7524572	25/22		0.71	245	5000
7524580	50/22		0.95	425	5000
7524598	100/22		1.20	765	2500
7524606	200/22		1.70	1485	2500
7524614	6/24		0.43	70	5000
7524622	12/24		0.51	105	5000
7524646	25/24		0.61	170	5000
7524655	50/24		0.81	285	5000
7524663	75/24		0.92	415	5000
7524671	100/24		1.00	525	5000
7524689	150/24		1.20	745	5000
7524697	200/24		1.30	965	2500
7524705	200/24		1.40	1385	2500
7524713	400/24		1.90	1810	2500
7524721	600/24		2.20	2750	1250
7524739	800/24		2.70	4015	1250
7524980	100/24		3.10	5480	1000

Also see the Change Utilized table. Contact your Customer Service Representative for latest information.







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OSP – U/UTP Cat3 Cable

C. Description:

1. All voice and data ISP and OSP copper backbone cables are to be rated per the constructed conditions and verified by the contractor before installation. Per code, a plenum CMP cable is always installed when a communications cable is exposed in a plenum air space. The contractor is responsible for bidding, purchasing, installing, and verifying the rating of the ISP and OSP cable for the specific construction conditions.
2. Backbone cables exposed to moisture shall contain moisture-blocking materials to prevent damage to cable performance.
3. Backbone multi-pair UTP cable shall be Category-3 copper UTP, twenty-four (24) AWG cable.
4. The performance criteria for the UTP backbone cable shall be in accordance with the specific standards for the particular cable's rating. A category-3 rated cable must perform up to or beyond the current specification parameters for the published category-3 rating by TIA/EIA 568-D.2.
5. Installed cable shall have appropriate cable construction, including external jacket properties when installed in aerial, outdoor, underground, and corrosive environments.

D. Accessory Products:

1. Provide any accessory products related to the UTP copper backbone cabling required to provide a complete and functional infrastructure system.

PART 3 - EXECUTION

3.2 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.

3.3 INSTALLATION

A. Process:

1. Install all copper backbone/station cables per the manufacturer's recommended installation instructions under ANSI/TIA 568D-Series, ANSI/TIA 758, and BICSI OSP design guidelines in this project drawing set.
2. Install all cables with proper attention to bend radii, pulling method, attachment method, and pulling forces. The cable manufacturer's specifications for each cable type shall be followed exactly.
3. Backbone cable 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.
4. All cables shall be pulled using an appropriate measuring device to ensure that the specified force is not exceeded, as noted in manufacture installation guidelines.
5. Install backbone cables with attention to aesthetic means and methods when routing cabling

within IT spaces.

6. No backbone cable shall be left unsupported for more than four (4) feet, three (3) feet preferred, vertically or horizontally at any time.
7. All backbone cables shall be clearly labeled on both ends and in an accessible location no more than one (1) foot from each cable end.

3.4 RE-INSTALLATION

- A. No additional burden to the owner 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 owner prior to beginning any re-installation work.

3.5 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 (analog – continuity test) required prior to acceptance by the Owner.

END OF SECTION 271300

SECTION 271323
COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

PART 1 - GENERAL

SUMMARY

- A. Section Includes:
 - 1. Provides optical fiber backbone cabling specifications to distribute optical network signals between telecommunications distribution spaces and equipment.
 - 2. Backbone Single-mode Optical Fiber Cable

RELATED DOCUMENTS

- A. **Golden West College Project #24-0141** contract documents and general terms and conditions.
- B. Section 270500 and all divisions of the specification and general provisions of the Construction Documents.
- C. Architectural, mechanical, electrical, and all technology drawings.
- D. Refer to Structural Seismic Requirement design documents Specifications, if available, for Non-Structural Components for all structural bracing and support of telecommunications equipment.

CLOSEOUT SUBMITTALS


- E. As-Built Drawings:
 - 1. Submit all as-built documentation per the general requirements of the construction documents.
 - 2. Cabling as-built drawings must contain detailed location and identification information coordinated with the as-built cable schedules.
 - 3. All cabling must meet or exceed applicable TIA/EIA testing requirements and any additional parameters outlined in the Commissioning of Communications specification section 27 08 00.
 - 4. Test results must be submitted for **Golden West College** IT review and approval, adhering to the General Contractor schedule milestones for the project's active systems integration.
 - 5. See **Golden West College** standard testing requirements in section 27 08 00 before fiber procurement.
 - a. Factor test attached to the role.
 - b. Contractor provided light meter verification on arrival.
 - c. OLTS testing to include:
 - 1) Factory launch/tail cables
 - 2) Smart loop-back
 - 3) "Fail" test image capture.

QUALITY ASSURANCE

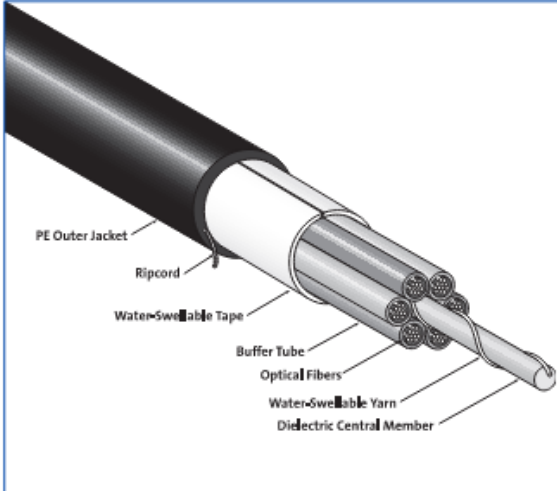
- F. Qualifications – Manufacturer
 - 1. Component manufacturers shall be ISO 9001:2000 and offer RoHS-compliant products.
- G. Qualifications – Installer:
 - 1. At a minimum, seventy-five percent (75%) of the onsite contractor-provided field technicians shall be factory-certified within 12 months by the manufacturer of the selected telecommunications system components being installed. Proof of certification shall be available on-site for review for

each field technician at all times.

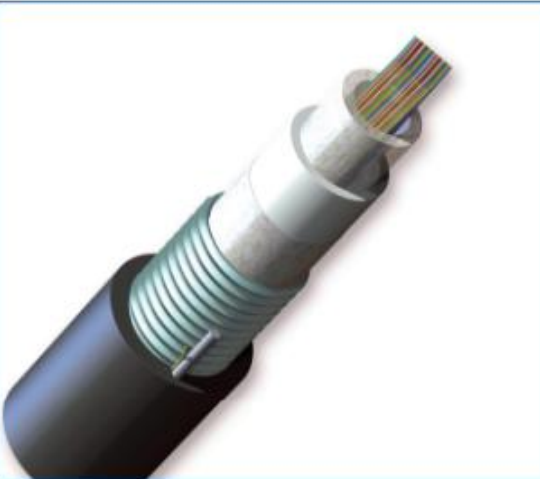
PART 2 - PRODUCTS



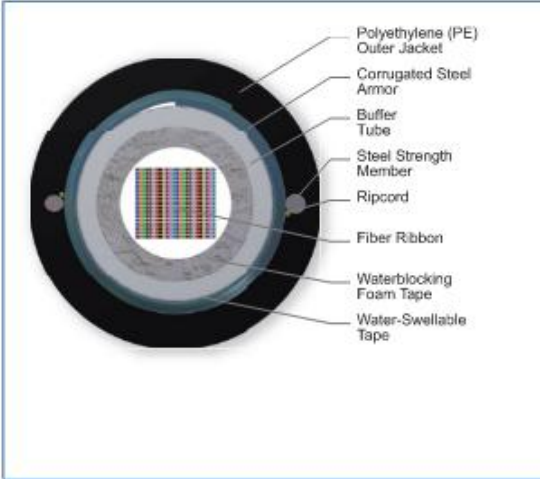
ALTOS All-Dielectric Gel-Free Cable | Photo LAN1278



ALTOS All-Dielectric Gel-Free Cable
| Drawing ZA-3405



SST-UltraRibbon Gel-Free Armored Cables, 432 Fibers | Photo PIM2420



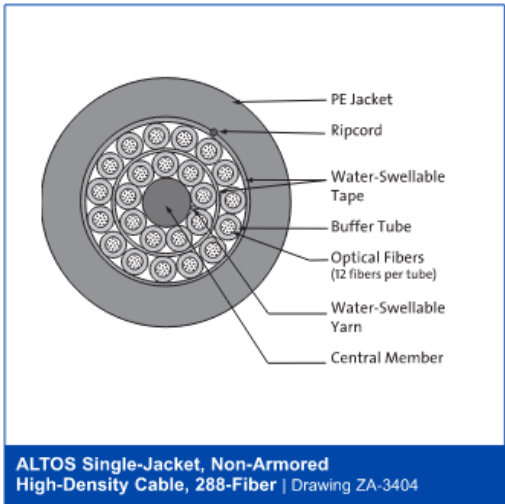
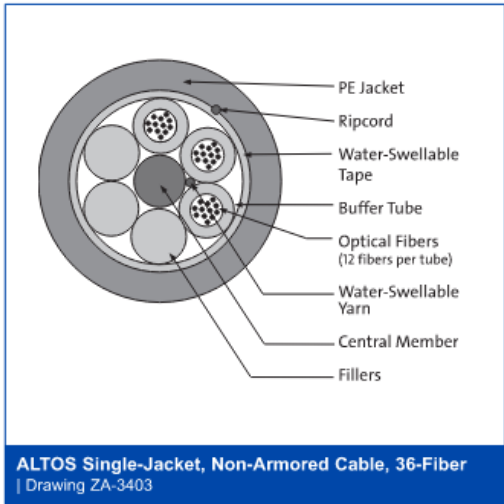
SST-UltraRibbon Gel-Free Armored Cables, 432 Fibers | Photo PIMtbd

Coming Cable Systems recommends storing cable in a proper temperature environment prior to installation to allow the cable temperature to meet installation temperature range specifications for best installation results.

Fiber Count	Maximum Fibers per Tube	Number of Tube Positions	Number of Active Tubes	Central Member	Nominal Cable Weight kg/km (lb/1000 ft)	Nominal Outside Diameter mm (in)	Minimum Bend Radius Loaded cm (in)	Minimum Bend Radius Installed cm (in)
2-72	12	6	1-6	Dielectric	73 (49)	10.5 (0.41)	15.8 (6.2)	10.5 (4.1)
73-96	12	8	7-8	Dielectric	98 (66)	12.2 (0.48)	18.3 (7.2)	12.2 (4.8)
97-144	12	12	9-12	Dielectric	162 (109)	15.8 (0.62)	23.7 (9.3)	15.8 (6.2)
145-216	12	18	13-18	Dielectric	147 (99)	16.0 (0.63)	24.0 (9.4)	16.0 (6.3)
217-288	12	24	19-24	Dielectric	196 (131)	18.2 (0.72)	27.3 (10.7)	18.2 (7.2)

Fiber Count	Weight	Buffer Tube Diameter	Nominal Outer Diameter	Min. Bend Radius Installation	Min. Bend Radius Operation
432	276 kg/km (186 lb/1000 ft)	15.4 mm (0.61 in)	21.1 mm (0.83 in)	317 mm (12.5 in)	211 mm (8.3 in)
Armored					
288	375 kg/km (252 lb/1000 ft)	14.0 mm (0.55 in)	21.5 mm (0.85 in)	323 mm (12.7 in)	215 mm (8.5 in)
360	389 kg/km (261 lb/1000 ft)	14.6 mm (0.57 in)	22.0 mm (0.87 in)	330 mm (13.0 in)	220 mm (8.7 in)
432	412 kg/km (277 lb/1000 ft)	15.4 mm (0.61 in)	22.6 mm (0.89 in)	339 mm (13.3 in)	226 mm (8.9 in)

* Note: Actual diameter may vary by ± 5 percent.



specifications |

Maximum Tensile Loads	Short-Term:	2700 N (600 lbf)
	Long-Term:	890 N (200 lbf)
Temperatures	Storage:	-40° to +70°C (-40° to +158°F)
	Installation:	-30° to +70°C (-22° to +158°F)
	Operation:	-40° to +70°C (-40° to +158°F)
Common Installations	Outdoor lashed aerial and duct; indoor when installed according to National Electrical Code® (NEC®) Article 770	
Design and Test Criteria	ANSI/ICEA S-87-640	

BACKBONE - SINGLE-MODE OPTICAL CABLING

- A. Basis-of-Design Product: Subject to compliance with requirements:
 1. Corning
 2. Sumitomo
 3. **Golden West College** approved alternative using Corning – laser-optimized glass
- B. Product Options:
 1. The manufacturers noted above shall be the only manufacturers acceptable to the Owner and A/E.
- C. Description:

1. All backbone OM4 LOMMF cables shall be capable of 10 Gb/s Ethernet signal transmission to 550 meters at 3500/500 MHz/km effective modal bandwidth, while allowing the use of low-cost, 850 nm vertical cavity surface emitting laser (VCSEL). Maximum attenuation for a LOMMF cable shall be no greater than 3.0dB per kilometer using 850nm and 1.0dB per kilometer using 1300nm wavelengths respectively.
2. All backbone single-mode optical fiber cable shall be capable of 10 Gb/s Ethernet signal transmission to 10,000 meters in the 1310nm operating window. Maximum attenuation for a single-mode cable shall be no greater than 0.4dB per kilometer using 1310nm and 0.3dB per kilometer using 1550nm wavelengths respectively.
3. Each optical fiber strand shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification and all EIA/TIA 568-C.3 and 568-C.3-1 performance parameters.
4. All optical fibers inside each individual cable shall be provided in counts indicated in the drawings and usable to the fullest capacity specified by the manufacturer and meet required specifications at all times.
5. Indoor/Outdoor backbone multi-mode/single-mode optical fiber cables shall be:
 - a. Individual jacketed, tight buffered fiber type.
 - b. Cable construction shall be a multi-mode/single-mode hybrid in a single protective outer sheath.
 - c. The individual fibers are grouped in jacketed subunits color coded per TIA- 598.
 - d. Have integrated dielectric central and strength members.
6. The optical fiber cables shall be rated per the installation environment as required by the local Authority Having Jurisdiction and/or National Fire Codes. Select an appropriate cable construction, including external jacket properties, when installing optical fiber cables in aerial, outdoor, underground and corrosive environments.
7. All MMF/SMF shall meet or exceed TIA compliant network cable-testing device certification by an independent laboratory, such as ETL, for verification of high speed, TIA/EIA T568C-compliant performance.

D. Cable sizes defined in Contract Documents.

1. 12-strand Single-mode mode – abf, Sumitomo Future Flex AirBlown fiber.
2. 12-strand Single-mode – Riser Rated

E. Accessory Products:

1. Provide any accessory products related to the optical fiber backbone cabling required to provide a complete and functional infrastructure system.

2.2 INNERDUCT SYSTEMS

A. Description:

1. Outside plant shall be constructed with High Density Polyethylene-rated plastic (HDPE)
2. Inside Plant shall be constructed of riser rated Polyethylene-rated plastic.
3. Shall be 25mm or 32mm in diameter as called for on the drawings or as required to provide a maximum of 40% fill.
4. Orange is an acceptable color.
5. Shall be UL listed to 2024 standard.
6. Shall be corrugated in design.
7. Shall be available with two and three-way couplers to join two ends together at pull points.

B. Products:

1. Carlon
2. **Golden West College** approved alternative using Corning – laser-optimized glass

2.3 DUCT PLUGS

- B. Description:
1. All Duct Plugs shall be constructed of high impact plastic components with durable elastic gaskets.
 2. Shall be installed for all innerducts where water may be present.
 3. Triplex and/or Quadplex Plugs shall be installed around each innerduct installed in an underground system to organize and support innerducts within conduits.
 4. Fiber Optic Duct Plugs shall be installed inside each innerduct surrounding installed fiber optic cabling.
 5. Shall be sized for diameter of the innerduct and fiber optic cable.
 6. Expandable Plugs shall be provided within buildings for all un used underground conduits.
 7. All duct plugs shall be water and air tight.
- C. Acceptable Manufacturer:
1. Triplex Plugs
 2. **Golden West College** approved alternative using Corning – laser-optimized glass

B.

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 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.

INSTALLATION

- B. Process:
1. Install all backbone cables per the manufacturer's required installation instructions under the guidelines of TIA/EIA 568C and BICSI and in quantities indicated in the drawings.
 2. Install all cables with proper attention to bend radii, pulling method, attachment method, and pulling forces. The cable manufacturer's requirements for each cable type shall be followed exactly.
 3. Backbone cable shall be visually inspected for non-compliant 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.
 4. All cables shall be pulled using an appropriate measuring device to ensure that the specified force is not exceeded, as noted in the manufacturer's requirements.
 5. Install backbone cables with attention to aesthetic means and methods when routing cabling within IT spaces. No backbone cable shall be left unsupported for more than three (3) feet vertically or horizontally at any time.
 6. Fiber optic cables shall be placed in neat bundles separated from other communications cabling. Fiber optic cables shall be neatly placed and bundled with Velcro ties to the horizontal and vertical cable management and runways at minimum 4-foot intervals, not to exceed every 4th rung, plus

- all locations where the cables change direction.
7. Provide radius drop-out fittings at all locations where fiber optic cables transition from vertical to horizontal cable management systems.
 8. All backbone cables shall be securely fastened to the termination shelf with a manufacturer's strain relief bracket and termination panel cable clamp in a way that does not damage the optical fiber strands or impede the performance of the media. This secure fastening method shall also serve to ensure a secure termination environment.
 9. A minimum of three feet (3'-0") of each optical fiber strand shall be left protected within the termination shelf for any future re-termination of a particular optical fiber strand.
 10. All backbone cables shall be clearly labeled on both ends and in an accessible location no more than one (1) foot from each cable end.

RE-INSTALLATION

- A. No additional burden to the owner regarding costs, network down-time, 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 owner before beginning any re-installation work.

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 **Golden West College IT**.

END OF SECTION 271323

**SECTION 271500
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 **Golden West College** reference.

1.5 WARRANTY

A. Warranty:

1. The contractor shall provide all extended warranty plans at no cost to the **Golden West College IT Project Manager**.
2. The contractor shall warranty all workmanship per the manufacturer's required installation and attachment requirements.

PART 2 - PRODUCTS

GenSPEED® Category 6 Cables Datacom

GenSPEED® 6000 Enhanced Category 6 Cable
Optimally Balanced Enhanced Performance

Features and Benefits

- Innovative cross-web design allowing for maximum pair separation, increasing key electrical performance parameters
- Performance guaranteed to 350 MHz
- TRU-Mark® print legend contains footage markings from 1000' to 0'
- Third-party verified for guaranteed performance
- Made in U.S.A.

Applications

- IEEE 802.3: 1000 BASE-T, 100 BASE-TX, 10 BASE-T, PoE, PoE+
- ANSI/TIA 568: 1000 BASE-TX
- CDL Token Ring, ATM
- Digital Video
- Broadband and Baseband Analog Video

Standard Complies

- ANSI/TIA 568-C.2
- NEC/CEC Type CMP (UL 1666) for Non-Plenum
- NEC/CEC Type CMP (NFPA 262) for Plenum
- UL 444
- RoHS Compliant Directive 2011/65/EU
- ANSI/TIA 862 (Building Automation)
- IEC 6116-732
- IEC 6116-732
- ISO/IEC 11801 Ed. 2.0 (Class E)

CONSTRUCTION

Conductors

- 23 AWG solid bare annealed copper

Insulation

- Non-Plenum: Polyolefin
- Plenum: Fluoropolymer

Color Code

- Pair 1: Blue-White/Blue
- Pair 2: Orange-White/Orange
- Pair 3: Green-White/Green
- Pair 4: Brown-White/Brown

Separator

- Cross-web

Rip Cord

- Applied longitudinally under jacket

Jacket

- Non-Plenum: Flame-Retardant PVC
- Plenum: Low-Smoke, Flame-Retardant PVC

PHYSICAL DATA

	CMR (Non-Plenum)	CMP (Plenum)
Nominal Cable Diameter (in)	0.235	0.215
Nominal Cable Weight (lbs/1000 ft)	28	28
Minimum Bend Radius (in)	1.0	1.0
Maximum Pulling Force (lbs)	32	32
Temperature Rating (°C)		
Installation:	0 to +60	0 to +60
Operation:	-20 to +75	-20 to +75

PART NUMBERS
Standard packaging: 1000' Pull-Pac® II

Jacket Color	Pull-Pac® II		Spool-Pac®		Spool	
	CMR (Non-Plenum)	CMP (Plenum)	CMR (Non-Plenum)	CMP (Plenum)	CMR (Non-Plenum)	CMP (Plenum)
White	7132900	7131900	7132940	7131940	7132950	7131950
Yellow	7132902	7131902	7132942	7131942	7132952	7131952
Gray	7132903	7131903	7132943	7131943	7132953	7131953
Red	7132904	7131904	7132944	7131944	7132954	7131954
Orange	7132905	7131905	7132945	7131945	7132955	7131955
Green	7132906	7131906	7132946	7131946	7132956	7131956
Black	7132907	7131907	7132947	7131947	7132957	7131957
Pink	7132908	7131908	7132948	7131948	7132958	7131958
Purple	7132909	7131909	7132949	7131949	7132959	7131959

Data subject to change without notice.

General Cable **GenSPEED®**

GenSPEED® Category 6A Cables Datacom

GenSPEED® 10,000 Category 6A U/FTP (STP) Cable
An Individually Shielded 10 Gig Option for Peace of Mind

Features and Benefits

- Individually pair shielded design allows for maximum pair separation, increasing key electrical performance parameters and providing EMI protection
- Typical positive PSACR beyond 500 MHz for increased available bandwidth
- Improved cable temperature rating (90°C Plenum, 75°C Riser) for greater protection against increased operating temperatures
- TRU-Mark® print legend contains footage markings from 1000' to 0'

Applications

- IEEE 802.3: 10G BASE-T, 10G BASE-TX, 10G BASE-TX, PoE, PoE+
- ANSI/TIA 568: 10G BASE-TX
- Digital Video
- Broadband and Baseband Analog Video
- CDL Token Ring, ATM

Standard Complies

- ANSI/TIA 568-C.2
- NEC/CEC Type CMP (UL 1666) for Non-Plenum
- NEC/CEC Type CMP (NFPA 262) for Plenum
- UL 444
- RoHS Compliant Directive 2011/65/EU
- ANSI/TIA 862 (Building Automation)
- IEC 6116-732
- ISO/IEC 11801 Ed. 2.0 (Class 6A)

CONSTRUCTION

Conductors

- 23 AWG solid bare annealed copper

Insulation

- Non-Plenum: Foamed HDPE
- Plenum: Foamed Fluoropolymer

Color Code

- Pair 1: Blue-White
- Pair 2: Orange-White
- Pair 3: Green-White
- Pair 4: Brown-White

Shield

- Each pair is individually shielded with an aluminum foil

Drain Wire

- 24 AWG stranded (7/32) solid tinned copper

Jacket

- Non-Plenum: Flame-Retardant PVC
- Plenum: Low-Smoke, Flame-Retardant PVC

PHYSICAL DATA

	CMR (Non-Plenum)	CMP (Plenum)
Nominal Cable Diameter (in)	0.305	0.295
Nominal Cable Weight (lbs/1000 ft)	43	47
Minimum Bend Radius (in)	2.44	2.34
Maximum Pulling Force (lbs)	32	32
Temperature Rating (°C)		
Installation:	0 to +60	0 to +60
Operation:	-20 to +75	-20 to +90

ELECTRICAL PERFORMANCE

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)	PSANEXT (dB)	PSAACR (dB)
1	0.1	20.0	77.0	77.0
4	0.2	18.0	77.0	75.0
10	0.3	16.0	77.0	73.0
16	0.4	15.0	77.0	72.0
20	0.5	14.0	77.0	71.0
25	0.6	13.0	77.0	70.0
31.25	0.7	12.0	77.0	69.0
40	0.8	11.0	77.0	68.0
50	0.9	10.0	77.0	67.0
63	1.0	9.0	77.0	66.0
80	1.1	8.0	77.0	65.0
100	1.2	7.0	77.0	64.0
125	1.3	6.0	77.0	63.0
160	1.5	5.0	77.0	62.0
200	1.7	4.0	77.0	61.0
250	1.9	3.0	77.0	60.0
312.5	2.1	2.0	77.0	59.0
400	2.3	1.0	77.0	58.0
500	2.5	0.0	77.0	57.0
630	2.7	-1.0	77.0	56.0
800	3.0	-2.0	77.0	55.0

Note: Values are expressed in dB per 100 m (328 ft) length @ 20°C.

*PSACR & ACR not specified in ANSI/TIA 568-C.2

CROSS-SECTION

PART NUMBERS
Standard packaging: 1000' Spool

Jacket Color	Spool		Jacket Color	Spool	
	CMR (Non-Plenum)	CMP (Plenum)		CMR (Non-Plenum)	CMP (Plenum)
Blue	7132786	7131786	Red	7132790	7131790
Orange	7132787	7131787	Orange	7132791	7131791
Yellow	7132788	7131788	Green	7132792	7131792
Gray	7132789	7131789	Purple	7132793	7131793

Note: New stock items may be subject to minimum order quantities. Other colors available.

Data subject to change without notice.

General Cable **GenSPEED®**

GenSPEED 6000 Enhanced Cat6A

GenSPEED 10000 Cat6A

2.1 FOUR PAIR CATEGORY 6A CABLING

- A. Basis-of-Design Product: Subject to compliance with requirements:
1. Panduit/General

- a. Category 6 General Cable GenSPEED 6000 Enhanced
 - b. Category 6A General Cable GenSPEED 10000 Category 6A
- 2. **Golden West College** 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.

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 **Golden West College** 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-eighth 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 271513

SECTION 271543
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. 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 **Golden West College** reference.

1.5 WARRANTY

- A. Warranty:
 - 1. The contractor shall provide all extended warranty plans at no cost to the **Golden West 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 COPPER UTP CONNECTORS

- A. Basis-of-Design Product: Subject to compliance with requirements:
 - 1. Panduit: Category UTP Category 6 Connectors, #7131940
 - 2. Panduit: Category UTP Category 6A Connectors, #CJ6X88TGVL (Wireless outlet at patch panel).
 - 3. Panduit: Category UPT Category 6A Modular Jack, #8P8C (Wireless outlet, modular plug)
 - 4. Or **Golden West College** IT approved equal.
- B. Product Options:
 - 1. The manufacturers noted above shall be the only manufacturers acceptable to **Golden West College** 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 SINGLE MODE OPTICAL FIBER PIGTAIL CONNECTORS ASSEMBLIES

- A. Manufacturer List:
 - 1. Corning
- B. Product Options:
 - 1. The manufacturers noted above shall be the only manufacturers acceptable to **Golden West College** and A/E.
 - 2. **Golden West College** 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. 1 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.

2.3 MULTIMODE OPTICAL FIBER CONNECTORS (FIELD TERMINATE)

- A. Manufacturer List: Not currently part of **Golden West College** IT Standard
 - 1. Corning

2.4 OUTLET HOUSING COMPONENTS

- A. Manufacturer List:
 - 1. Panduit
- B. Product Options:
 - 1. The manufacturers noted above shall be the only manufacturers acceptable to the **Golden West College** 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 **Golden West College**. 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 **Golden West College** 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 **Golden West College** IT-approved labeling scheme.



3.3 RE-INSTALLATION

- A. No additional burden to **Golden West 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 **Golden West College** 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 **Golden West College** and A/E team.
- B. Contractor to submit all as-built drawings and any test documentation required before acceptance by the **Golden West College**.

END OF SECTION 271543

**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 **Golden West College** reference.

1.5 WARRANTY

- A. Warranty:
 - 1. The contractor shall provide all extended warranty plans at no cost to the **Golden West 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 COPPER U/UTP PATCH CORDS

- A. Basis-of-Design Product: Subject to compliance with requirements:
 - 1. Panduit: Category 6 and Category 6A UTP.
 - a. For Category 6 Data and Voice provide Panduit UTP28SP*^.
 - b. For Category 6A Wireless Data provide Panduit UTP28X*^.
- 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 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 568D 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 push-pull strain relief boot and 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 **Golden West College** 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 **Golden West College** 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 **Golden West College**.
 6. the communication contractor will be responsible for providing installation of all Category 6A and Fiber patch cords per direction and coordination of the **Golden West College** IT dept.

3.3 RE-INSTALLATION

- A. No additional burden to the **Golden West 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 **Golden West College** 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 **Golden West College** and A/E team.
- B. Contractor to submit all as-built drawings and any test documentation required prior to acceptance by the **Golden West College** IT.

END OF SECTION 271619

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. Contractor shall furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all site clearing work as required and as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.
- B. Removal of surface debris; removal of paving and curbs; removal of trees, shrubs, and other plant life; topsoil excavation; and repair of damaged vegetation and/or irrigation systems/system components.
- C. Removal of concrete and bituminous surfacing.

1.2 RELATED SECTIONS

- A. Section 01 71 23: Field Engineering.
- B. Section 01 57 13: Storm Water Pollution Prevention.
- C. Section 31 22 00: Grading.

1.3 REFERENCE STANDARDS

- A. The work provided herein shall conform to and be in accordance with the Contract Plans, General Conditions/Specifications and Special Provisions, as well as the Standard Specifications for Public Works Construction ("GREENBOOK"), 2024 Edition, adopted by the Southern California Chapter, American Public Works Association; herein referred to as the "Standard Specifications".

1.4 REGULATORY REQUIREMENTS

- A. Comply strictly to Rule 403 Fugitive Dust, South Coast Air Quality Management District.
- B. Coordinate clearing Work with utility companies.

1.5 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.
- D. Do not direct vehicle or equipment exhaust towards protection zones.
- E. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.
- F. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

- 2.1** Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section 31 22 00 – Grading, part 2.01-D.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that existing plant life designated to remain is tagged or identified.
- B. Protect and maintain benchmarks and survey control points from disturbance during construction.
- C. Identify a waste area for placing removed materials.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to the requirements of authorities having jurisdiction.

- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 PROTECTION

- A. Protect existing structures and site improvements indicated to remain from damage by approved methods and/or as authorized by the Owner Representative. Removal of all protections shall be when work of this Section is completed or when so authorized by the Owner Representative.
- B. Protect Existing Utilities indicated or made known to remain traversing the job-site and serving existing adjacent facilities.
- C. Protect Existing Trees and Shrubs indicated to remain by providing temporary surrounding fencing so located a sufficient distance away so that trees and shrubs will not be damaged by site-clearing operations.
 - 1. Protection Barrier: A protection barrier shall be installed around the shrubs or trees to be preserved. The barrier shall be constructed of a durable fencing material, such as plastic construction fencing, snow fence, or chain link. The barrier shall be placed at or beyond the drip line. "Drip line" as referred to herein means a line which may be drawn on the ground around the tree directly under its outermost branch tips and which identifies that location where rainwater tends to drip from the tree. Placement of barrier to be approved by Owner Representative (Grounds Supervisor). If barrier is placed inside the drip line, then 3/4 inch plywood must be placed over the root zone up to the drip line. The fencing shall be maintained in good repair throughout the duration of the project, and shall not be removed, relocated, or encroached upon without permission of the Owner Representative (Grounds Supervisor).
 - 2. Storage of Materials: There shall be NO storage of materials or supplies of any kind within the area of the protection barriers. Concrete, cement, asphalt materials, block, stone, sand and soil shall not be placed within the drip line of the tree(s).
 - 3. Fuel Storage: Fuel storage shall NOT be permitted within 150 feet of any tree to be preserved. Refueling, servicing and maintenance of equipment and machinery shall NOT be permitted within 150 feet of protected trees.
 - 4. Vehicles/equipment: NO parking or driving of vehicles or storage of equipment shall be permitted within the drip line of any tree to be preserved.

5. Debris and Waste Materials: Debris and waste from construction or other activities shall NOT be permitted within protected areas. Wash down of Concrete, cement or asphalt handling equipment, in particular shall NOT be permitted within 150 feet of protected areas.
6. Grade Changes: Grade changes can be particularly damaging to trees. Any grade changes should be approved by the Owner Representative (Grounds Supervisor) before construction begins and precautions taken to mitigate potential injuries.
7. Damages: Any damages or injuries to the preserved trees (including pruning or cutting of such trees not in conformity with the International Society of Arboricultural Pruning Guidelines and ANSI A300 Pruning Standards) shall be reported immediately to the Owner Representative (Grounds Supervisor). Severed roots shall be pruned cleanly to healthy tissue, using proper pruning tools. Broken branches/limbs shall be pruned according to International Society of Arboricultural Pruning Guidelines and ANSI A300 Pruning Standards. In the event that any damage, injury, improper pruning or cutting of a protected tree is deemed to be so substantial as to require its replacement (such determination to be made in the sole discretion of the Owner Representative), Contractor shall replace such tree with the same species and variety of tree, up to a box size of 48 inches, or if no such replacement is available, with a substitute species or variety as determined in the sole discretion of the Owner Representative. Any replacement tree shall be approved in advance by the Owner Representative. The value of the tree to be replaced shall be determined by a Certified Arborist selected by Contractor from the Owner's approved list of Registered Consulting Arborists. To the extent that the value of the replaced tree as determined by the Certified Arborist exceeds the cost of the replacement tree, Contractor shall be liable to Owner for such difference in value in addition to all costs associated with replacement of the damaged tree.
8. Removal of Existing Tree or Shrub: Prior to removing or cutting any trees designated for removal, the contractor shall coordinate with the Owner's Ground Supervisor. In the event that Contractor, a Subcontractor, Sub-Subcontractor, material supplier or anyone else performing the Work of the Contract willfully, negligently or mistakenly removes any tree or shrub not designated for removal, Contractor shall immediately report such removal to the Owner Representative (Grounds Supervisor). Contractor shall replace such tree with the same species and variety of tree, up to a box size of 48 inches, or if no such replacement is available, with a substitute species or variety as determined in the sole discretion of the Owner Representative. Any replacement tree shall be approved in advance by the Owner Representative. The value of the tree to be replaced shall be determined by a Certified Arborist selected by Contractor from the Owner's approved list of Registered Consulting Arborists. To the extent that the value of the replaced tree as determined by the Certified Arborist exceeds the cost of the replacement tree, Contractor shall be liable to Owner for such difference in value in addition to all costs associated with replacement of the damaged tree.
9. Unauthorized Tree Removal or Injury: Criminal Penalties: Reference is made to California Penal Code §384a which provides that any person who willfully or negligently

cuts, destroys, mutilates or removes any tree or shrub or portion thereof growing on public land without a written permit from the owner of said public land is guilty of a misdemeanor, subject to a fine of up to \$1,000, imprisonment in county jail for up to 6 months, or both. Contractor is advised that, in addition to all remedies provided herein and in the Contract Documents, the Owner shall cooperate with appropriate authorities in prosecuting and enforcing Penal Code §384a and other criminal sanctions as appropriate concerning trees and shrubs located on Owner property.

10. Preventive Measures: Before construction begins fertilization of the affected areas to be applied at a rate to be determined by the Owner Representative (Grounds Supervisor).
- D. Protect bench marks, survey control points, and existing structures from damage or displacement.
 - E. Protection of Persons and Property (existing structures and site improvements):
 1. Provide barricades, warning signs at open depressions and holes on adjacent property and public accesses.
 2. Provide operating warning lights during hours from dusk to dawn each day or as otherwise required.
 3. Protect existing remaining structures, utilities, sidewalks, pavements other facilities from damage as caused by settlement, undermining, washout or other hazards created by site-clearing operations of this Section.
 - F. Use means necessary to prevent dust from becoming a nuisance to the public, to neighbors and to others performing work on or near the job-site.
 - G. Maintain access to the job-site at all times.

3.4 CLEARING AND GRUBBING

- A. Clear areas required for access to site and execution of Work.
- B. Remove all rubbish and debris existing and resulting from work operations of this Section as soon as possible, do not allow to pile up. Do not burn rubbish and debris on the job-site.
- C. Where active utility lines need to be capped or plugged, perform such work in accordance with requirements of the Utility Company.

3.5 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Excavate and remove associated plumbing piping.

- C. Prior to demolition work, the Contractor shall notify the Owner Representative to identify the existing items for salvage purposes. The materials identified for salvage shall be returned to the Owner in a timely manner agreed upon by the Owner Representative.

3.6 CONCRETE AND BITUMINOUS SURFACE REMOVAL

- A. Where noted on the construction drawings, break up and completely remove all existing concrete surfacing, curbs, gutters, walks and bituminous surfacing to limits indicated to be removed. All cutting shall be done to a neat and even line with proper tools or a concrete cutting saw. Minimum depth of cut shall be 1-1/2", unless otherwise specified. Remove any concrete broken beyond the indicated limits to the nearest joint or score line and replace with new concrete to match the existing.
- B. Removed concrete and bituminous materials shall be disposed of off-site unless otherwise noted on the construction drawings. All such items to be removed shall be disposed of off the property in a legal manner.
- C. Bituminous pavement saw cutting shall conform to the provisions of Section 300-1.3.2 (a) of the Standard Specifications. The residue resulting from the saw cutting operations shall not be permitted to flow beyond the specific work location and shall be removed the same day.
- D. Removal of concrete curb / curb & gutter covered by this section shall include saw-cutting and removal of a twelve (12") inch wide section of the adjacent bituminous pavement.
- E. When saw cutting concrete curb / curb & gutter, the cuttings shall be continuously wet vacuumed to prevent the materials from entering catch basins, storm water conveyances, or waters of the State. Vacuumed cuttings shall be disposed of according to applicable regulations.
- F. Concrete curb and concrete curb and gutter shall be removed to the lines, grades and locations shown on the plans in accordance with Section 300-1.3.2 of the Standard Specifications.
- G. Concrete removal in sidewalk and driveway areas shall extend to existing score lines unless specifically indicated otherwise on the Plans or in the Project Special Provisions, or unless otherwise approved by the Engineer.
- H. Reinforcing or other steel may be encountered in portions of concrete to be removed. No additional compensation will be allowed for the removal of concrete containing reinforcing or other steel.
- I. In those areas where existing bituminous surfacing is removed to make way for new planting or lawn areas, remove soil 6" below existing exposed soil surface. Removed soil may be used only as fill under buildings or other areas to be paved, only if approved by the Owner Inspector. Legally dispose of off site, if material is not approved as fill material.

3.7 REPAIRS

- A. During demolition and construction, ensure that trees, shrubs and other plant material and vegetation are protected inside and outside of the work zone and that the vegetation is being watered, maintaining the proper moisture content according to the season. Failed vegetation, including sod, due to lack of water, and/or plant material destroyed during construction period are to be replaced to equal or better size and condition at no additional cost to the Owner.
- B. If the irrigation system is damaged or modified during construction, it shall be repaired to the Owners standards, and shall be in equal or better condition than prior to damage or modification. All repairs shall be, inspected and approved by the Owner Representative (Grounds Supervisor) prior to backfilling or covering of said repairs. The Owner representative requires forty-eight hours prior notice, when contractor requests inspection of completed repairs. All repairs shall be made so as to ensure proper operation prior to the close of the contract at no additional cost to the Owner.
- C. Controller Wires: If damaged, cut or removed, repair by splicing, soldering and silicone sealing. To ensure proper operation, reconnect the wires to the valve to correspond with the map on the controller to the correct station.
- D. Hydraulic Tubes: If damaged/cut or removed, repair by replacing the tubing using equal or better material.
- E. Valves: If damaged, repair/replace with equal or better material. All valves are to be flushed/cleaned thoroughly.
- F. Mainlines: If damaged, repair/replace with equal or better material. All lines are to be flushed/cleaned thoroughly.
- G. Lateral Lines: If damaged, repair/replace with equal or better material. All lines are to be flushed/cleaned thoroughly.
- H. Irrigation Heads: If damaged, repair/replace with equal or better material. All heads are to be flushed and filters cleaned thoroughly.
- I. Controllers: If damaged repair/replace with equal or better material.
- J. Backflow Prevention Devices: If damaged, repair/replace with equal or better material.
- K. Gate/Ball/Quick Coupler Valves: If damaged repair/replace with equal or better material.
- L. Valve Boxes: If damaged, repair/replace with equal or better material. Concrete boxes and concrete lids with the appropriate markings for identification shall be used. The top of the box shall be buried below finish grade, equal to existing depth or deeper. The top of the valve stems shall be 6" below the underside of the top of the box.
- M. Construction in grass areas: Sod shall be removed by sod cutting at a soil depth of 2", stored on site, and watered on a daily basis. Upon completion of work, stored sod shall be reinstalled

over the areas disrupted due to construction. An option may be to bypass cutting the sod, however at the completion of the project, finish grading and installation of new Hybrid Bermuda GN -1 sod over the areas disrupted by construction shall be required.

3.8 EXCESS MATERIALS DISPOSAL

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

3.9 SITE CLEANUP

- A. Cleanup of branches, limbs, logs, or any other debris resulting from any operations shall be promptly and properly accomplished. The work area shall be kept safe at all times until all operations are completed. Under no circumstances shall the accumulation of brush, limbs, logs, or other debris be allowed in such a manner as to result in a hazard to the public. All debris shall be cleaned up each day before the work crew leaves the site, unless permission is given by the Owner to do otherwise. All lawn areas shall be raked, all streets and sidewalks shall be swept, and all brush, branches, rocks or other debris shall be removed from the site. Areas are to be left in a condition equal to or better than that which existed prior to the commencement of operations.

END OF SECTION

SECTION 31 22 00

GRADING

PART 1 - GENERAL

1.01 SUMMARY

- A. The work of this section shall include excavation, unclassified cut, unclassified fill, removing existing unsatisfactory material, preparing areas to be filled, spreading and compacting of fill in the areas to be filled, and all other work necessary to complete the grading of the site. It shall be the Contractor's responsibility to place, spread, moisten or dry, and compact the fill in strict accordance with these specifications to the lines and grades indicated on project plans or as directed in writing by the Geotechnical Engineer. Included with this Work are the following:
 - 1. General exterior grading, cutting and filling, including grading for building area, paving, planting areas, banks and hillsides.
 - 2. Excavating, filling, backfilling, and compacting for site pavement, planting areas, buildings, and other structures.
 - 3. Excavating and backfilling trenches.
 - 4. Shoring plan guidelines.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Section 01 71 23 - Field Engineering.

1.02 DEFINITIONS

- A. Excavation consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.
- B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- C. Borrow: Soil material obtained off site when sufficient approved soil material is not available from excavations.
- D. Base Course: The layer placed between the subgrade and surface pavement in a paving system.
- E. Drainage Fill: Course of washed granular material supporting slab on grade placed to cut off upward capillary flow of pore water.

- F. Permeable Backfill: Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations.
- G. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor's expense.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below ground surface.
- I. Utilities include underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.03 SUBMITTALS TO CONSTRUCTION MANAGER

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Imported Soils: CONTRACTOR shall provide the services of a licensed environmental professional (licensed State of California Professional Engineer [PE Civil], Registered Geologist [RG] or Registered Environmental Assessor II [REA II]) familiar with environmental site assessment and waste classification and disposal requirements. The CONTRACTOR shall provide an independent approved California Department of Health Services certified testing laboratory, to perform sampling and testing of imported fill materials.
- C. Test Reports: In addition to test reports required under field quality control, submit the following:
 - 1. One optimum moisture-maximum density curve for each soil sample.
 - 2. Laboratory analysis of each soil material proposed for fill or backfill from borrow sources.
- D. Excavation support & protection (shoring) shop drawings for informational purposes: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems.

1.04 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. 2022 California Building Code, Title 24, Part 2, Volume 2 of 2, Appendix J, Grading.
 - 2. ASTM D422 - Method for Particle Size Analysis of Soils

3. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
 4. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54 kg) and 18-inch (457-mm) Drop.
 5. ASTM D2216 - Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.
 6. ASTM D2922 - Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depths).
 7. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depths).
 8. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
 9. AASHTO T217 - Determination of Moisture in Soils by Means of a Calcium Carbide Gas Pressure Meter.
 10. ASTM D4829 - Expansion Index Test.
- B. Conditions/Specifications and Special Provisions, as well as the Standard Specifications for Public Works Construction ("GREENBOOK"), 2024 Edition, adopted by the Southern California Chapter, American Public Works Association; herein referred to as the "Standard Specifications".
- C. Professional Observation: A soils engineer will be retained by the Owner for purposes of inspection, testing and approval of all work under this section. Perform work of this Section under inspection and approval of the soils engineer. Give soils engineer not less than 48 hours advance notice of readiness for inspection.
- D. The soils engineer will have the authority over all filling, grading, and compaction operations, including interruption of work if deemed necessary due to improper work
- E. Pre-Grading Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."
1. Before commencing earthwork operations, meet with representatives of the governing authorities, Owner, Architect, consultants, Geotechnical Engineer, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

1.05 CONSTRUCTION MONITORING

- A. All earthwork and foundation construction should be monitored by a qualified engineer/technician under the supervision of a Geotechnical Engineer, including;
 - 1. Observation of all site preparations;
 - 2. Observation of shoring installation, if needed;
 - 3. Observation of all site excavations;
 - 4. Test and approval of all import soil;
 - 5. Observation of placement of all compacted fills and backfills;
 - 6. Observation of all surface and subsurface drainage systems;
 - 7. Observation of all foundation and pile excavations;
 - 8. Observation of subgrade preparation for paved and building areas.
- B. The Geotechnical Engineer of Record should be notified at least three (3) days in advance of the start of construction. A joint meeting between the Contractor and Geotechnical Engineer is recommended prior to the start of construction to discuss specific procedures and scheduling. The Geotechnical Engineer should be present to observe the soil conditions encountered during construction, to evaluate the applicability of the recommendations presented in the Soils Report to the soil conditions encountered, and to recommend appropriate changes in design or construction if conditions differ from those described herein. The Geotechnical Engineer of Record should inspect and approval all imported backfill material prior to its placement as backfill, approve the subgrade beneath all fills, fill placement and bottom of all foundation excavations before concrete or steel is placed.
- C. The Geotechnical Engineer shall submit compaction reports to the Construction Manager and the Civil Engineer at the completion of the work, including test results and plot plans indicating the locations from which the tested samples of fill were taken. The Geotechnical Engineer shall keep the Construction Manager informed on the progress of the grading work.

1.06 SUBSURFACE CONDITIONS

- A. Where investigations of subsurface conditions have been made by the Owner with respect to subsurface conditions, utilities, foundation, or other structural designs, and that information is shown in the Plans, it represents only a statement by the Owner as to the character of materials which have actually been encountered by the Owner's investigation. This information is only included for the convenience of Bidders.
- B. Investigations of subsurface conditions are made for the purpose of design only. The Owner assumes no responsibility with respect to the sufficiency or accuracy of borings

or of the log of test borings or other preliminary investigations or of the interpretation thereof. There is no guaranty, either expressed or implied, that the conditions indicated are representative of those existing throughout the Work, or any part of it, or that unanticipated conditions may not occur. When a log of test borings is included in the Plans, it is expressly understood and agreed that said log of test borings does not constitute a part of the Contract. The log of test borings represents only an opinion of the Owner as to the character of the materials to be encountered, and is included in the Plans only for the convenience of the Bidders. Making information available to Bidders is not to be construed in any way as a waiver of the provisions of the first paragraph of this Section, and Bidders must satisfy themselves through their own investigations as to conditions to be encountered.

1.07 GRADING

- A. If the Contractor encounters any suspected cultural resource, or unique archaeological or paleontological resource, during the course of construction, the Contractor shall halt or divert work and notify the District Representative immediately. The District will evaluate the situation and if warranted, will consult with a qualified archeologist or paleontologist to determine further actions.
- B. If human remains are encountered unexpectedly during construction excavation and grading activities, the State Health and Safety Code Section 7050.5 requires that no further disturbance shall occur until the County Coroner has made the necessary findings as to origin and disposition pursuant to PRC Section 5097.98, and the Contractor will notify the District Representative immediately. If the remains are determined to be of Native American descent, the coroner has 24 hours to notify the Native American Heritage Commission.

1.08 PROJECT CONDITIONS

- A. Contractor shall determine existing conditions under which the Contractor will operate in performing the Work.
- B. Information on Drawings does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.
- C. Existing utilities: Locate existing underground utilities in all areas of work prior to excavation or commencement of work. If utilities are to remain in place provide adequate means of protection during earthwork operations.
 - 1. Should uncharted, or incorrectly charted piping or other utilities be encountered during excavation, consult Utility Owner immediately for direction. Cooperate with Owner and Utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of Utility Company.
 - 2. Do not interrupt existing utilities serving facilities occupied or used by Owner, or others, except when permitted in writing by Owner's Representative, and then only after acceptable temporary services have been provided.

3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut off of services if lines are active.
- D. Noise and Dust Abatement: Exercise all reasonable and necessary means to abate dust, dirt rising and undue noise. Perform necessary sprinkling and wetting of construction site to allay dust as required by applicable codes and ordinances.
- E. Water for Grading: Contractor shall obtain and pay for all water required for his grading operation. This may include, but is not limited to, payment of deposits to utility for construction meter, and payment of all monthly service and water charges. Construction meter shall be in place throughout construction period unless alternative arrangements are made with the local water purveyor to provide construction water for all purposes. Contractor shall be aware of water moratoriums and restrictions and shall immediately advise Owner of effects on construction schedules.
- F. Existing Conditions: Prior to commencing work at site, verify agreement of existing conditions with indicated conditions. Notify Owner's Representative in writing of discrepancies found. Start of work without notification constitutes acceptance of conditions, without cause for extra compensation.
- G. Field obstructions, grade differences or differences in dimensions may exist that might not have been considered or observed during design of this project. Contractor shall promptly notify the Engineer and the Agency having jurisdiction by telephone and in writing upon discovery of and before disturbing, any physical conditions differing from those represented by approved plans and specifications. In the event this notification is not performed, the Contractor shall assume full responsibility for necessary revisions.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. General: All soils materials to be used throughout the site shall be approved for use by the Geotechnical testing engineer. Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.
- B. No earthwork analysis has been completed with respect to the volumes of soils to be excavated, placed, or imported in order to provide the finished grades shown on the plans. The Contractor is solely responsible for verifying the earthwork quantities necessary to complete the project.
- C. Satisfactory Soil Materials: The on-site soils should provide adequate quality fill material provided they are free from significant organic matter and other deleterious materials, and are at acceptable moisture contents.
- D. Borrow / Imported Fill Material: Soil excavated from site or imported conforming to requirements for fill material.

1. Imported soils should be equal to, or better than, the on-site soils in strength, expansion, compressibility, and soil chemistry characteristics. In general, imported material should be free of organic matter and deleterious substances, have 100% passing a 2-inch sieve and an Expansion Index less than 20. Imported soils can be evaluated prior to their use but will not be prequalified by the geotechnical consultant. Approval of import soils will be given only after the material is on the project, either in-place, or stockpiled in adequate quantity to complete the project.
- E. Engineered Fill: The onsite soil is suitable for use as engineered fill, provided it is free of debris and oversized material (greater than 8 inches in largest dimension). Any soil to be placed as fill, whether onsite or imported material, should be accepted by a soils engineer. All fill soil should be placed in thin, loose lifts, moisture-conditioned, per the geotechnical report and compacted to a minimum 90 percent relative compaction as determined by ASTM Test Method D15571
- F. Bedding Material for Trenches:
1. Bedding sand shall be as defined by Standard Specifications, Section 200-1.5, and shall be free of expansive material and organic matter. On-site soils are not considered suitable for bedding of utilities.
 2. Sand providing a sand equivalent of at least 30. Sand bedding shall be placed and compacted mechanically or by jetting per S.P.P.W.C. Green Book section 306-6.5 (2021 Edition).
 3. The use of gravel is not acceptable as bedding unless approved by the civil engineer of record prior to ordering the product.
- G. Backfill Material for Trenches:
1. The on-site soils have been determined to be suitable for being used for backfilling purposes in trenches. Utility trenches should be backfilled with granular materials and mechanically compacted. Fill materials should be compacted to a minimum relative compaction of 90 percent unless indicated otherwise. The relative compaction should be determined by ASTM D1557.

2.02 ACCESSORIES

- A. Detectable Warning Tape: Acid and alkali-resistant polyethylene film metallic warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep.
1. Tape Colors: Provide tape colors to utilities as follows:
 - a. Red: Electric, Fire Water.

- b. Yellow: Gas, oil, steam, and dangerous materials.
- c. Orange: Telephone and other communications.
- d. Blue: Water systems, with "Caution: Water Line Below."
- e. Green: Sewer systems, with "Caution: Sewer Line Below."
- f. Green: Storm systems, with "Caution; Storm Drain Line Below."

2.03 EXCAVATION SUPPORT & PROTECTION – SHORING PLAN

- A. The CONTRACTOR shall have at the Worksite, copies or suitable extracts of: Construction Safety Orders, Tunnel Safety Orders and General Industry Safety Orders issued by the State Division of Industrial Safety. The CONTRACTOR shall comply with provisions of these and all other applicable laws, ordinances, and regulations.
- B. Before excavating any trench 5 feet or more in depth, the CONTRACTOR shall submit a detailed plan to the Owner showing the design of shoring, bracing, sloping, or other revisions to be made for the Workers' protection from the hazard of caving ground during the excavation of such trench. If the plan varies from the shoring system standards, the plan shall be prepared by a registered Civil Engineer. No excavation shall start until the DISTRICT has accepted the plan and the CONTRACTOR has obtained a permit from the State Division of Industrial Safety. A copy of the permit shall be submitted to the DISTRICT.
- C. The INSPECTOR will provide a competent person trench/excavation certification form to the CONTRACTOR. It shall be completely filled out before any worker has access to trench or excavation and returned to the INSPECTOR before the end of the first working day. The CONTRACTOR shall certify by this form the name of the competent person administering the Work, the soil classification, and the type of excavation protective system provided and/or installed.
- D. The CONTRACTOR shall completely fence all excavations to provided protection against anyone falling into the excavation and to the satisfaction of the INSPECTOR. The fencing shall be in place at all times except when workers are present and actual construction operations are in progress.
- E. The fencing material shall be chain link fabric or welded wire fabric and 6 feet high, constructed according to one of the following:
 - 1. Tensioned fencing material and have top and bottom tension wires securely fastened to driven steel posts or other equally rigid elements at a maximum spacing of 12 feet; or
 - 2. Untensioned fencing materials securely fastened to extended trench shoring elements at a maximum spacing of 8 feet and fastened to continuous top and bottom rails constructed of nominal 2 in x 4 in lumber or equally rigid material.

Framed panels with suitable supporting elements fastened together to form a continuous fence may also be used.

- F. Payment for performing all work necessary to provide safety measures shall be included in the prices bid for other items of work except where separate bid items for excavation safety are provided, or required by law.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protect adjacent property and existing improvements and structures as necessary to prevent undermining, caving of cuts, and miscellaneous damage.
- B. Provide cribbing, sheeting, and shoring necessary to safely retain the earth banks and protect excavations and adjoining grades from caving and other damage resulting from excavating together with suitable forms of protection against bodily injury to personnel employed on the work and the general public. Be responsible for the design, installation, and maintenance of required cribbing and shoring and shall meet the approval of the State Division of Industrial Safety and local governing agencies requirements.
- C. Utility lines and structures shown shall be protected and treated as indicated. Where work not shown is encountered, report it to the Architect before proceeding with excavation. Encase active lines in sleeves where they pass through concrete; remove inactive lines as directed, and plug the remaining ends. Bear the costs for repairs to damaged or broken utilities and any damages related thereto.
- D. Protect existing improvements and adjacent properties from storm damage and flood hazard originating on this project until final acceptance by the Owner. Prevent silt run-off from the limits of work in accordance with governmental requirements.
- E. A minimum 6-foot high, temporary chain link fence and gates, (pair 26' wide, minimum) shall be erected prior to any grading operations at the construction limits perimeter. Coordinate the exact location with Architect and Inspector.

3.02 DEWATERING

- A. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area. Any water entering an excavation shall be immediately pumped out and the exposed excavation allowed to dry.
- B. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

3.03 GRADE STAKES

- A. The Contractor's Surveyor will set grade stakes. The Surveyor shall be a California registered land surveyor or licensed Civil Engineer. The Surveyor shall be hired and paid by the Contractor, and shall be subject to the approval of the District. Contractor shall notify the District at least 48 hours before staking is to be started. The District will determine if work is ready for staking.
- B. All work shall conform to the lines, elevations, and grades shown on the Construction Plans. Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Engineer. In the absence of such report, the Contractor shall be responsible for any error in the grade of the finished work.
- C. Protect and maintain stakes in place until their removal is approved by the District. Grade or location stakes lost or disturbed by Contractor, shall be reset by the Surveyor at the expense of Contractor.
- D. Grades for underground conduits will be set at the surface of the ground. The Contractor shall transfer them to the bottom of the trench.

3.04 EXCAVATION

- A. Unclassified Excavations: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork", except as modified herein.
- B. In preparation for grading, the construction areas should be cleared of surface vegetation, concrete, pavement and any loose surficial soils. Any unsuitable material encountered should be properly disposed of and not incorporated into any new fill.
- C. Excavate to the depths, lines and grades indicated on the approved Grading Plan. Excavate sufficiently over-size to permit installation and removal of concrete forms and other required work. Should soil of inadequate density and bearing capability be encountered at the elevations indicated on the drawings, or where new fill is to be placed upon existing loose fill material exposed by excavation, the excavation shall be carried to the depth required to attain soil of bearing quality as determined by the Geotechnical Engineer.
- D. A California Licensed Surveyor (LS) must provide grade stakes and elevations for the Geotechnical Engineer to verify that the over-excavation depths, shown on the construction drawings for asphalt concrete pavement and concrete pavement structural sections, have been achieved prior to re-compaction.
- E. Should footing excavations exceed required dimensions or should sloughing occur, fill such extra space with concrete at no additional cost to the contract. If unsuitable material is found at the indicated depths, immediately notify the Inspector.
- F. Notify the Inspector 48 hours before foundation excavations are ready for inspection.

- G. The bottoms of footings shall be free of loose material, debris, and water before concrete is placed.
- H. Cut banks shall be neatly trimmed to the required finish surface as the cut progresses, or the Contractor shall have the option of leaving the cuts full and finish grading by mechanical equipment which shall produce the finish surfaces as shown on the Drawings.
- I. Surplus earth not needed for filling and grading shall be disposed of in a legal manner off the site.
- J. All applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health Act of 1970, and the Construction Safety Act should also be followed.
- K. Bills of lading or equivalent documentation will be submitted to the IOR on a daily basis.
- L. Upon completion of import operations, provide the OAR a certification statement attesting that all imported material has been obtained from the identified source site.

3.05 HAZARDOUS MATERIALS

- A. All import fill material shall be characterized, handled, and documented in accordance with applicable US EPA and State of California hazardous waste and hazardous materials regulations.
- B. "Contaminated" shall mean any soil or geotechnical material at a concentration, which would require disposal at a regulated facility (i.e., California hazardous or RCRA hazardous).
- C. Owner's Authorized Representative (OAR) must be notified at least 72 hours prior to the disposal of any hazardous waste or hazardous material. No material disposal or reuse can take place without prior written approval of the OAR.

3.06 EXCAVATION, BACKFILL & COMPACTION FOR UTILITIES

- A. Field conditions may require deviations from information indicated on Drawings. Such changes in work shall be covered by a Change Order, indicating an increase or decrease in the Contract sum.
- B. Before excavation, Contractor shall contact the "Underground Service Alert of Southern California" (USASC) for information on buried utilities and pipelines.
- C. When connections are to be made to any existing pipe, conduit, or other appurtenances, the actual elevation or position of which cannot be determined without excavation, the Contractor shall excavate for, and expose, the existing improvement before laying any pipe or conduit. The Engineer shall be given the opportunity to inspect the existing pipe or conduit before connection is made. Any adjustments in line or grade which may be necessary to accomplish the intent of the plans will be made,

and the Contractor will be paid for any additional work resulting from such change in line or grade.

- D. Trenches, ditches, pits, sumps, and similar items which are outside the barricaded working area shall be barricaded to conform to Cal OSHA standards.
- E. Trenches over 5'-0" in depth shall conform to the Construction Safety Orders of the California Division of Industrial Safety, see Section 2.3 EXCAVATION SUPPORT & PROTECTION – SHORING PLAN.
- F. Safe and suitable ladders which project 2 feet above the top of the trench shall be provided for all trenches over 4 feet in depth. One ladder shall be provided for each 50 feet of open trench, or fraction thereof, and be so located that workers in the trench need not move more than 25 feet to a ladder.
- G. Where indicated and/or required to excavate in lawn areas, protect adjoining lawn areas outside of the Work area. Replace or install removed sod upon completion of backfill by installing sod level with adjacent lawns. If installation of removed sod fails, furnish sod and install to match existing lawns.
- H. Backfill over excavations to the required elevations with earth, gravel, sand, or concrete and compact as required. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. Slope adjacent grades away from excavations to minimize entry of water.
- I. Do not excavate trenches parallel to footings closer than 18" from the face of the footing or below a plane having a downward slope of 2 horizontal to one vertical, from a line 9" above bottom of footings.
- J. If soft, spongy, unstable, or other unsuitable material is encountered upon which the bedding material or pipe is to be placed, this material shall be removed to a depth ordered by the Engineer and replaced with bedding material suitably densified. Additional bedding so ordered, over the amount required by the Plans or Specifications, will be paid for as provided in the Bid. If the necessity for such additional bedding material has been caused by an act of failure on the part of the Contractor or is required for control of groundwater, the Contractor shall bear the expense of the additional excavation and bedding.
- K. Unless indicated otherwise on the plans are within this specification, excavate trenches to the required depths for utilities, such as pipes, conduit and tanks, with minimum allowances of 6 inches at the bottom and 6 inches at the sides for bedding of unprotected piping or as required for concrete encasement of conduits as indicated on Drawings. Maximum allowances at the sides for trenching shall be 12 inches. Grade bottom of trenches to a uniform smooth surface. Remove loose soil from the excavation before installing sand bedding or concrete encasement.

- L. Where portions of existing structures, walks, paving, etc. must be removed or cut for pipe or conduit installation, replace the material with equal quality, finished to match adjacent work.
- M. Provide a minimum clear dimension of 6 inches from sides of wall excavation to outer surfaces of buried pipes or conduits installed in the same trench or outside surfaces of containers and/or tanks.
- N. DO NOT place backfill until the bedding and pipe work installed has been inspected, tested and approved by the Inspector. Remove excavated rocky material unsuitable for backfill from the site prior to final backfilling.
- O. Bedding material immediately around a utility line and to a point 12 inches above the line should consist of sand, fine-grained gravel, or cement slurry to support the line and protect it.
- P. Bedding zone shall be defined as the area containing the material specified that is supporting, surrounding, and extending to 12" (inches) above the top of pipe.
- Q. Bedding material shall first be placed on a firm and unyielding subgrade so that the pipe is supported for the full length of the barrel. There shall be 6" (inch) minimum of bedding below the pipe barrel and 1" (inch) clearance below a projecting bell for sewer, storm drain and water pipe. The material in the bedding zone shall be placed and densified by mechanical compaction only.
- R. Mechanically compacted backfill shall comply with section 306-1.3.2 of the Standard Specifications for Public Works Construction.
- S. Above the bedding, up to finished subgrade at areas other than landscape areas and up to one foot below flatwork and pavements, utility trenches should be backfilled with granular materials and mechanically compacted to at least 90%.
- T. Concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches of footings. Place concrete to level of bottom of footings.
- U. Fill voids with approved backfill materials as shoring bracing and sheeting is removed.

3.07 INSPECTION & TESTING AT TRENCHES

- A. Pipe will be inspected in the field before and after laying. If any cause for rejection is discovered in a pipe after it has been laid, it shall be subject to rejection. Any corrective work shall be approved by the Engineer and shall be at NO cost to the Owner.
- B. The Inspector or Geotechnical Engineer will inspect all subgrades and excavations prior to placing bedding & backfill materials.
- C. DO NOT place backfill until the bedding and pipe work installed has been inspected, tested and approved by the Inspector. Remove excavated rocky material unsuitable for backfill from the site prior to final backfilling.

- D. Utility backfill compaction test shall be performed in accordance with ASTM D1557, method "C".
- E. Utility backfill in place density test per ASTM D 1556 (sand cone) or other test method as considered appropriate by the Geotechnical Engineer.
- F. Hydrostatic pressure tests shall be done only after backfill has been placed and final compaction has been achieved.

3.08 APPROVAL OF SUBGRADE

- A. Notify Geotechnical Engineer when excavations have reached required over-excavation subgrade.
- B. When Geotechnical Engineer determines that unforeseen unsatisfactory soil is present, continue work only after receiving direction from the Contracting Officer.
- C. Reconstruct subgrades damaged by rain, accumulated water or construction activities as directed by the Soils Engineer.

3.09 UNAUTHORIZED EXCAVATION

- A. Fill of unauthorized excavation below bottoms of foundations or wall footings will be engineered fill.
- B. Fill unauthorized excavations under other construction as directed by the Soils Engineer.
- C. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Geotechnical Engineer.

3.10 STORAGE OF SOIL MATERIALS

- A. After the site has been stripped of all debris, vegetation and organic materials, excavated on site soils may be reused as engineered fill provided they meet the satisfactory soils material conditions in Section 2.01, part C. High in-site moisture contents will require aeration prior to placement as engineered fill.
- B. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees. Cover to prevent wind-blown dust.

3.11 PLACEMENT OF ENGINEERED FILL

- A. Compaction Testing:
 - 1. The Geotechnical Engineer's representative shall observe the excavation, filling, and compacting operations and shall make density tests in the fill material so that he can state his opinion as to whether or not the fill was constructed in

accordance with the specifications. If the surface is disturbed, the density tests shall be made in the compacted materials below the disturbed zone. When these tests indicate that the density or moisture content of any layer of fill or portion thereof does not meet the specified density or moisture content, the particular layer or portions shall be reworked until the specified density and moisture content have been obtained.

2. Sampling and testing of materials for determination of compliance with the specified compaction requirements will be conducted by the Geotechnical Engineer's representative at any location and time as the Owner may determine.
3. The Contractor shall be responsible for excavation of the test pits and for providing and installing any shoring, ladders, or other equipment necessary to protect the testing personnel. The Contractor shall also suspend operations as necessary and at no cost to the owner for the purpose of conducting such testing.
4. Test pits shall be excavated in the backfill by the Contractor as directed by the Engineer for the purpose of testing the backfill compaction. At the option of Engineer, density tests may be taken on a lift of compacted backfill immediately before placing the next lift.
5. Any settlement noted in backfill, fill, or in structures built over the backfill or fill within the one-year warranty period will be considered to be caused by improper compaction methods and shall be corrected at the Contractor's expense. Structures damaged by settlement shall be restored to their original condition by the Contractor at the Contractor's expense.
6. When initial compaction testing performed by the Engineer indicates the required density has not been obtained, the Contractor shall re-compact or replace the backfill as necessary to meet the specified minimum density.
7. The Contractor shall be responsible for rescheduling compaction testing with the Engineer and shall bear all costs for subsequent retesting in the areas of noncompliance. Costs associated with retesting and scheduling delays shall be the sole responsibility of the Contractor. The Engineer will deduct the costs for testing of materials and work found to be unacceptable, as determined by the tests performed by the Owner and the costs for testing of material sources identified by the Contractor which are not used for the work, from moneys due or to become due to the Contractor. The amount deducted will be determined by the Engineer.

3.12 BACKFILL - GENERAL

- A. Backfill excavations promptly, but not before completing the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for record documents.
3. Testing, inspecting, and approval of underground utilities.
4. Concrete formwork removal.
5. Removal of trash and debris from excavation.
6. Removal of temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.13 GRADING

- A. Rough & Fine Grading: Rough grade area sufficiently high to require cutting by fine grading.
- B. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 1. Provide a smooth transition between existing adjacent grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
 3. Grade area for paving to a depth below finish grades indicated, equal to base and pavement thickness to be constructed.
 4. Cut banks neatly to required finish grades as cut progresses, or leave cuts full and finish grading by mechanical equipment, which will produce finish grades indicated on Drawings.
 5. Grade filled banks full and compact beyond grade of finish bank so that when trimmed to finish grades, soil is compacted to density specified for final slope face.
 6. Bring areas to be graded to approximate finish grades and then scarify, moisten and roll to obtain required density. Scarify, moisten and roll resulting high and low areas to obtain required finish grades by cutting and filling.
 7. Grade future planting areas so that, upon cultivation and fertilization, they will conform to finish grades indicated for planting areas.
 8. Protect all utilities.
- C. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 1. Building pad tolerance plus or minus ½ inch (0.05-foot).
 2. Lawn or Unpaved Areas: Plus or minus (0.10-foot).

3. Walks: Plus or minus (0.04-foot).
 4. Pavements: Plus or minus (0.04-foot).
- D. Grading Inside Building Lines: Finish subgrade to a tolerance of ½ inch when tested with a 10-foot straightedge.

3.14 FIELD QUALITY CONTROL

- A. The CONTRACTOR shall provide an independent approved California Department of Health Services certified testing laboratory, to perform sampling and testing of import/export fill materials in accordance with the terms as specified in Section 01 31 32: Import Materials Testing.
- B. A Geotechnical Engineer, designated by the Owner, will be engaged to perform continuous inspection of the placing and compacting of all fills and backfills within the limits of grading of this project. All work shall be done in accordance with the approved plans and these specifications and as recommended and approved by the Geotechnical Engineer. Revised recommendations relating to conditions differing from the approved soils engineering and engineering geology reports shall be submitted to the owner, inspector, architect and the civil engineer. Costs for all such inspections and tests shall be paid by the Owner. The Contractor shall be responsible for notifying the Geotechnical Engineer in advance so that he may be present to perform his services as needed.
- C. The Geotechnical Engineer shall submit compaction reports to the Construction Manager and the Architect at the completion of the work, including test results and plot plans indicating the locations from which the tested samples of fill were taken. The Geotechnical Engineer shall keep the Construction Manager informed on the progress of the grading work.
- D. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
1. Perform field in-place density tests according to ASTM D 1556 (sand cone method) or other test method as considered appropriate by Geotechnical Engineer.
 - a. Field in place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.
 - b. When field in place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at

beginning of work, on each different type of material encountered, and at intervals as directed by the Architect.

2. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
 3. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.
 4. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in place density test for each 150 feet or less of trench, but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.
- F. Owner's inspector will inspect foundation excavations when completed and ready for forms, after forms are in place, and before first placement of concrete.

3.15 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and re establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace material to depth directed by the Architect; reshape and recompact at optimum moisture content to the required density.
- C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.16 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.1 REQUIREMENT

- A. The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated in the Contract Documents and specified herein.
- B. The following types of pavement shall be covered in this Section:
 - 1. Paving for utility trenching, parking lots, playgrounds, areas between buildings, adjacent to planting and turf areas, and as indicated on Construction Documents.
- C. Related Sections:
 - 1. Section 31 22 00: Grading.
 - 2. Section 32 12 36: Seal Coats.
 - 3. Section 32 17 13: Pavement Markings.

1.2 QUALITY ASSURANCE

- A. The work provided herein shall conform to and be in accordance with the Contract Plans, General Conditions/Specifications and Special Provisions, as well as the Standard Specifications for Public Works Construction ("GREENBOOK"), 2024 Edition, adopted by the Southern California Chapter, American Public Works Association; herein referred to as the "Standard Specifications".
- B. The Owner's inspector shall test the temperature of each batch of asphaltic concrete prior to placement. At the time of delivery to the work site, the temperature of mixture shall not be lower than 260 degrees F or higher than 320 degrees F, the lower limit to be approached in warm weather and the higher in cold weather. If asphaltic concrete temperature is not within these tolerances the affected batch shall be rejected. Any and all costs due to the rejected asphaltic concrete shall be the responsibility of the paving contractor.

1.3 ESTABLISHMENT OF GRADES

- A. The Contractor's Surveyor will set grade stakes. The Surveyor shall be a California registered land surveyor or licensed Civil Engineer. The Surveyor shall be hired and paid by the Contractor, and shall be subject to the approval of the Owner. Contractor shall notify the Owner at least 48 hours before staking is to be started. The Owner will determine if work is ready for staking.
- B. All work shall conform to the lines, elevations, and grades shown on the Construction Plans. Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Engineer.

In the absence of such report, the Contractor shall be responsible for any error in the grade of the finished work.

- C. Protect and maintain stakes in place until their removal is approved by the Owner. Grade or location stakes lost or disturbed by Contractor, shall be reset by the Surveyor at the expense of Contractor.
- D. Areas having drainage gradients of 2 percent or more shall have elevation stakes, set with instrument, at grid intervals of 25 feet. Intermediate stakes may be set by using a tightly-drawn string line over the tops of adjacent stakes. Grade stakes must be set at all grade breaks, grade changes, etc.
- E. Areas having drainage gradients of less than 2 percent shall have elevation stakes, set with instrument, at 10 foot intervals. Grade stakes must be set at all grade breaks, grade changes, etc.

1.4 SUBMITTALS

- A. Mix Designs: The CONTRACTOR shall formulate a job-mix formula using the Hveem method in accordance with Standard Specifications Section 203-6.2 and submit it to the ENGINEER for approval. The resultant mixture shall have Hveem properties conforming to Standard Specifications Section 203-6.4.3.
- B. Samples:
 - 1. Prior to the delivery of specified aggregate to the site, the CONTRACTOR shall submit samples of the material for the INSPECTOR's acceptance in accordance with Standard Specifications Section 4-1.4. Samples shall be typical of materials to be furnished from the proposed source and in conformance with the specified requirements.
 - 2. Aggregate base gradation and quality certifications shall be dated within 30 days of the submittal.
- C. Certificates
 - 1. Twenty days prior to the delivery of aggregates, asphalt materials, and paving mixes to the project site, the Contractor shall submit to the Engineer certificates and test results of compliance of such materials with these specifications.
 - 2. Submit certificates of compliance from the supplier for bituminous materials for paint binder, asphaltic concrete, and seal coat.
 - 3. Submit weigh master's certificates or certified delivery tickets for each truck load of asphaltic material delivered to the project site.
 - 4. Upon completion of the weed control treatment, and as a condition for final acceptance, furnish a written certificate stating the brand name of the sterilant and the manufacturer, and that the sterilant used had at least the minimum required concentration, and that the rate and method of application complied in every respect with the conditions and standards contained herein.

1.5 QUALITY CONTROL

- A. Asphaltic Concrete Producers Qualifications: Use only materials furnished by a bulk asphaltic concrete producer regularly engaged in production of hot mix, hot laid bituminous concrete.
- B. Applicator Qualifications: Paving machine and roller operators shall be fully trained and experienced in the installation of asphaltic concrete paving on projects of similar size and complexity.
- C. Regulatory Requirements: The quantity of volatile organic compounds (V.O.C.) used in weed killer, seal coat, primer and other materials shall not exceed the limits permitted under the current regulations of the local authorities having jurisdiction.

1.6 ENVIRONMENTAL LIMITATIONS

- A. Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
 - 1. Tack Coats: Minimum surface temperature of 60 deg F.
 - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

1.7 PAVEMENT-MARKING PAINT

- A. Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Base Course Material For Use Under Asphalt Pavement: Crushed base material shall consist of materials that meet the provisions listed below.
 - 1. Crushed Aggregate Base (CAB) per Section 200-2.2, 3/4" maximum of the Standard Specifications for Public Works Construction (Green Book).
 - 2. Crushed aggregate base (CAB) shall consist of native rock without naturally occurring asbestos or recycled materials. The Contractor shall submit written documentation, which identifies the source, volume, and proposed transport date of the material for review and approval by the Owner's Construction Manager prior to importing the material. A statement on company letterhead from the source, stamped by either a California Professional Geologist or Engineer, which states that the subject materials are native rock, do not contain any recycled materials and that the source does not mine

ultramafic materials, a source of natural occurring asbestos shall be included in the submittal to Owner's Construction Manager.

3. Crushed Miscellaneous Base (CMB) per Section 200-2.4, fine sieve, of the Standard Specifications for Public Works Construction (Green Book). Prior to import, submit written certification to OAR that crushed Miscellaneous Base (CMB) does not contain Polychlorinated biphenyls (PCB) above laboratory detection limits when tested in accordance with EPA Method 8082
- B. Asphalt Surfacing Materials: Furnish asphalt surfacing meeting the following requirement, furnished from a commercial asphalt central mixing plant.
1. Paint Binder/Tack Coat: Asphalt emulsion shall be CSS-1 or CSS-1h and shall conform to the requirements of Standard Specifications Section 203-3 Emulsified Asphalt.
 2. Asphalt Concrete Composition & Grading:
 - a. Asphalt concrete in all areas shall conform to Standard Specification Section 203-6.5.4, Type III-C3-PG-64-10.
 - b. Asphalt performance grade shall be PG-64-10.
 - c. Rubberized asphalt paving is not allowed.
- C. Weed Control:
1. The soils sterilant shall be in accordance with current EPA acceptable standard and the California Department of Pesticide Regulations for soils sterilant. Sterilant shall be selected as appropriate for the environment in which is it to be placed. Contractor shall be licensed with the State of California to apply sterilant. Sterilant shall be commercial grade for commercial application. Payment for soil sterilization will include full compensation for application and all materials and incidental work required.
 2. Apply Dow Elanco Spike 80DF, or approved equal, to top of crushed aggregate base under all asphalt paving at locations shown on civil plans. Spike 80DF weed control should be applied at the rate of seven pounds per acre. If another manufacturer is used follow their recommendations.
- D. Headers and Stakes:
1. Headers: Redwood, Construction Heart Grade, size 2 x 6, unless otherwise indicated on construction drawings
 2. Stakes: 2 x 4 redwood or 2 x 3 Douglas fir, Construction Grade.
 3. Nails: Common, galvanized, 12d minimum.

PART 3 - EXECUTION

3.1 HEADERS

- A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.
- B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of adjacent undisturbed earth.
- C. Fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid grade a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on centers with top of stakes set one inch below top of header. Provide a minimum of 2-12d galvanized common nails through each stake.
- D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.
- E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.
- F. Provide additional stakes and anchorage as required to fasten headers in place

3.2 SUBGRADE PREPARATION

- A. Subgrade Preparation:
 - 1. Refer to asphalt pavement detail 9 on sheet C3.00 for requirements.
- B. The subgrade preparation recommendations on C3.00 are based on the assumption that soils encountered during field exploration are representative of soils throughout the site. However, there can be unforeseen and unanticipated variations in soils between points of subsurface exploration. For this reason, the actual subgrade preparation will have to be determined on the basis of in-grading observations and testing performed by representatives of the project geotechnical consultant.
- C. A California Licensed Surveyor (LS) must provide grade stakes and elevations for the Geotechnical Engineer to verify that the over-excavation depths, shown on the construction drawings for asphalt concrete pavement structural sections, have been achieved prior to re-compaction.
- D. Subgrade tolerances: Subgrade for pavement shall not vary more than 0.02' from the specified grade and cross section established by the Engineer. Subgrade for subbase or base material shall not vary more than 0.04' from the specified grade and cross section. Variations within the above specified tolerances shall be compensating so that the average grade and cross section specified are met.
- E. Correct irregularities by dressing down or filling as may be required, to bring areas to true subgrade elevations.

- F. Where filling is required, scarify the subgrade to bond the new material to the in place material; use additional material as required, subject to the approval of the Architect, and provided by the Contractor.
- G. Remove excess material from the site to a legal disposal area.

3.3 APPLICATION GENERAL

- A. Finish elevations, extent of asphalt paving and locations of type of asphalt and class of base shall be as indicated and specified herein and on the Construction Documents. Bring subgrade elevations sufficiently below the finish elevations of the paving so as to accommodate the thickness of paving and base.

3.4 APPLICATION OF BASE COURSE

- A. Install base course material, encompassing spreading and compacting, in accordance with the S.S.P.W.C. Section 301-2, Untreated Base.
- B. Aggregate bases material shall be installed in layers not exceeding 4-inches and compacted to a minimum of 95% relative density.
- C. After preparing the subgrade all traffic on the subgrade shall be avoided. Should it be necessary to haul over the prepared subgrade, the CONTRACTOR shall drag and roll the traveled way as frequently as may be necessary to remove ruts, cuts, and breaks in the surface. All cuts, ruts, and breaks in the surface of the subgrade that are not removed by the above operations shall be raked and hand tamped. All equipment used for transporting materials over the prepared subgrade shall be equipped with pneumatic tires.
- D. Continued use of sections of prepared subgrade for hauling, so as to cut up or deform it from the true cross-section, will not be permitted. The CONTRACTOR shall protect the prepared subgrade from all traffic.
- E. Maintain the surface in its finished condition until the succeeding layer is placed.

3.5 PLACING ASPHALT CONCRETE SURFACING:

- A. Asphalt binder (tack coat) shall be applied to all existing pavement surfaces to be overlaid and/or joined per section 302-5.4 of the Standard Specifications. Asphalt binder (tack coat) shall be applied to existing surfaces to be surfaced and between layers of asphalt concrete, except when eliminated by the Engineer. A layer of asphalt binder (tack coat) shall be applied to all vertical-cut faces and between subsequent AC lifts.
- B. Asphalt Concrete Pavement:
 - 1. All work shall be in accordance with Section 302-5 of the Standard Specifications, except as noted herein. Asphalt concrete work shall include full-depth patching and variable thick asphalt concrete transition areas. The Contractor shall, on a daily basis, provide

the Inspector with copies of certificates of weight for all materials delivered to the job site and/or incorporated in the work. At no time shall the coarse aggregate that has segregated from the mix be scattered across the paved mat.

2. Asphalt concrete shall not be placed on any surface, which contains ponded water or excessive moisture in the opinion of the Engineer. If paving operations are in progress and rain or fog forces a shut down, loaded trucks in transit shall return to the plant, and no compensation will be allowed therefore. The Contractor shall furnish and use canvas tarpaulins to cover all loads of asphalt from the time that the mixture is loaded until it is discharged from the delivery vehicle, unless otherwise directed in writing by the Engineer
3. The Inspector will examine the base before the paving has begun. The Contractor will correct any deficiencies before the paving is started.
4. Successive courses may be laid upon previously laid courses as soon as the previous course has cooled sufficiently to show no perceivable displacement under equipment or loaded material delivery trucks and a tack coat has been applied.
5. Wherever AC pavement does not terminate against a curb, gutter, or another pavement, the Contractor shall provide and install a redwood or pressure treated Douglas fir header at the line of termination.
6. Smoothness of asphalt shall conform to section 302-5.6.2 of the Standard Specifications
7. Density shall conform to the below requirements:
 - a. In-place density of the Asphalt Concrete will be based on test results from a nuclear gauge and core samples taken in accordance with CTM 375, "Determining the in Place Density and Relative Compaction of Asphalt Concrete Pavement" except as modified below. The Inspector will determine when core sample testing shall be completed.
 - b. Asphalt Concrete shall be compacted to not less than 95.0 percent for a single test and not less than an average in place density of 96.0 percent relative compaction of the Laboratory Test Maximum Density as determined by, Caltrans Testing Method (CTM) 375 except as modified by these specifications.
 - c. The materials testing laboratory, paid for by the contractor, will obtain random samples of the hot mix asphalt material from behind the paving machine in accordance with Caltrans Testing Method (CTM) 125, "Methods for Sampling Highway Materials and Products in Roadway Structural Sections", to determine the Laboratory Test Maximum Density of the asphalt mixture in accordance with CTM 308.
 - d. Asphalt Concrete compaction shall be accepted based upon passing tests taken from the nuclear gauge. In the event that the nuclear gauge testing presents failing results, then core samples will be the determination for the in place density and acceptance or rejection of the compaction.
 - e. When core testing is to be performed to determine the relative compaction after nuclear gauge testing has not produced passing tests, the materials testing laboratory will obtain four 4" diameter core specimens (or four 6" diameter core specimens) for determination of relative density of the completed pavement. The four cores shall represent the sample frequency requirements specified in CTM 375.

8. Pavement at all longitudinal joints shall have a Field Density of 95%, as described in 302-5.6.2 of the Standard Specifications. When the test results of the field cores are less than 95% Relative Compaction, the Contractor shall remove a 1 foot wide section on each side of the longitudinal joint. The Contractor shall replace the removed pavement with an asphalt mix that meets the job specification at no additional cost to the Owner.

3.6 FLOOD TESTING

- A. Flood Test: BEFORE ACCEPTANCE, ALL NEW ASPHALT PAVEMENT SHALL BE WATER TESTED TO ENSURE PROPER DRAINAGE AS DIRECTED BY THE INSPECTOR. THE CONTRACTOR SHALL PROVIDE WATER FOR THIS PURPOSE. THE FLOODING SHALL BE DONE BY WATER TANK TRUCK. DEPRESSIONS WHERE THE WATER PONDS TO A DEPTH OF MORE THAN 0.01 FOOT SHALL BE FILLED OR THE SLOPE CORRECTED TO PROVIDE PROPER DRAINAGE. THE EDGES OF THE FILL SHALL BE FEATHERED AND SMOOTHED SO THAT THE JOINT BETWEEN THE FILL AND THE ORIGINAL SURFACE IS INVISIBLE. PRACTICAL FIELD MEASUREMENT: 0.01 FOOT = TWO QUARTERS STACKED. NO STANDING WATER SHALL REMAIN AFTER 60 MINUTES ON A 70 DEGREE F (OR WARMER) DAY.

3.7 SEAL COAT

- A. Allow new asphalt pavement to cure 30 days before application of seal coat. See Project Specification Section 32 12 36: Seal Coat.

3.8 FIELD QUALITY CONTROL

- A. Thickness: Tolerances for asphalt pavement thickness shall be ¼ inch, plus or minus.
- B. All paving shall drain properly before being accepted. Upon completion, the pavement shall be true to grade and cross section. The asphalt substrate, shall not vary from the planned cross slope by more than +/- 0.1. When a 10 foot straightedge is laid on the finished surface of the asphalt, the surface shall not vary from the edge of the straightedge more than 1/8 inch, except at grade breaks. Where paving does not meet these tolerances, the paving material shall be repaired by a method determined by the Owner. Repairs shall not be made to pavement surface by feather-edging at the join lines. All expenses for pavement repair up shall be borne by the Contractor at NO cost to the Owner.
- C. Corrective Measures: It is the Contractor's responsibility to determine if the planarity, cross slopes, and general specifications have been met. If all of the conditions have been met the Contractor must notify the Owner in writing of the acceptance of the asphalt paving.

3.10 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.11 CLEAN UP

- A. Clean all debris and unused materials from the paving operation. Clean all surfaces that have been spattered or defaced as a result of the paving operation. Asphalt or asphalt stains which are noticeable upon surfaces of concrete, or materials which will be exposed to view, shall be promptly and completely removed. Cleaning shall be done in a manner that will not result in any discharge of contaminated materials into any catch basin. All expenses for clean up shall be borne by the Contractor at NO cost to the Owner.

END OF SECTION

SECTION 32 12 36

SEAL COATS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Surface sealer over new asphalt paved surfaces.

1.02 REFERENCES

- A. Conform to Section 203 and 302 of the Standard Specifications for Public Works Construction.
- B. Comply with International Slurry Surfacing Association (ISSA) performance guidelines.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product information and application procedures for bituminous surfacing.

1.04 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement: Standard Specifications Section 203-9, "SEALCOAT – ASPHALT BASED".
- B. Obtain materials from same source throughout.
- C. Schedule a pre-construction conference at jobsite in advance of beginning of Work. In existing areas to be seal coated and restriped, document existing striping to be duplicated before commencing seal coating work.
- D. Review and resolve conflicts involving requirements of specifications. Record discussions and furnish copies to all attendees.
- E. Beginning of Work means Contractor accepts all conditions.
- F. Agitate bulk materials during transport.

1.05 REGULATORY REQUIREMENTS

- A. Comply with local air quality management district regulations for emissions maximums.
- B. Maintain control of vehicular and pedestrian traffic during seal coating operations as required for other construction activities and in accordance with local traffic authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Seal Coat: The materials for sealcoat shall conform to Section 203-9 – “Sealcoat – Asphalt Based” of the Standard Specifications. Before incorporation in the Work, the Contractor shall submit a 2 Liter (2-quart) sample of undiluted seal coat at no cost to the Owner.

1. Seal Coat: Provide one of the following surface seals:

<u>Product Name</u>	<u>Manufacturer</u>
GuardTop	Vulcan Materials Company
Over Kote	Diversified Asphalt Product
Park Top	Western Colloid Products
Sure Seal	Asphalt Coating Engineering
MasterSeal	SealMaster Pavement Products & Equipment

- B. Crack Sealing: Crack sealant shall be CalSeal Modified Asphalt joint sealant as manufactured by Henry Inc, Crafco Polyflex Type 3 or equal.

PART 3 - EXECUTION

3.01 REPAIRING AND SEALCOATING OF SURFACES

- A. Preparation of Surfaces:
- Before placing the sealcoat, the pavement surface shall be cleaned by sweeping, flushing or other means necessary to removal all loose particles of paving, all dirt, and all other extraneous material. This shall include vegetation in pavement cracks and between pavement and curb/gutter. Prior to removal an approved herbicide, which leaves behind a visible blue marker dye, shall be sprayed where vegetation exists. Surface contaminates, grease or oil spots shall be cleaned to allow for proper adhesion.
 - Prior to applying sealcoat material, cracks wider than 1/8 inch shall be cleaned, treated with weed killer, and filled with an asphalt-based crack filler (large cracks may require several applications). For best quality, it is recommended that all broken asphalt be removed and patched with new asphalt. It is also suggested that extreme low spots be filled with new asphalt. New asphalt must cure 30 days before application of sealcoat.
 - Immediately before commencing the sealcoat operations, all surface metal utility covers (including survey monuments) shall be protected by thoroughly covering the surface with an appropriate adhesive and oiled or plastic paper. No adhesive material shall be permitted to cover, seal or fill the joint between the frame and cover of the structure. A vertical tab shall be placed on each

cover for locating after the seal application is complete. The tab shall extend at least 3" above the existing pavement surface. Covers are to be uncovered and cleaned of asphalt emulsion material by the end of the same work day. Inspector shall inspect surfaces before the installation of seal coat.

4. For best results, the asphalt, just prior to being sealed, should be sprayed with a mist of water in an amount that will leave the surface damp but with no puddles or visible water. This procedure is critical when ambient temperature is hot with bright sunlight or when the pavement is excessively aged or porous.
5. A prime or tack coat may be necessary on surfaces that have weathered excessively or are dusted. The primer should be diluted with three parts clean, potable water and one part SS-1h emulsion and shall be applied at the rate of 0.05 gallon per square yard.
6. Install barricades as required to divert traffic from operations. Install temporary "no parking" signs and similar notices.

B. Application:

1. Sealcoat may be mixed with water to obtain desired consistency for job requirements to a maximum of 20% of the total volume. Care should be taken not to over dilute. Material after dilution shall be mixed with a mechanical agitator to maintain consistency and ease of application. Note that as the pavement increases in roughness, the amount of dilution should be decreased.
2. Sealcoat shall only be applied when the atmospheric temperature is greater than 55 degrees F and if rain is not forecast for the period of 24 hours after application.
3. The sealcoat material shall be applied in two applications. Unless otherwise specified, the total quantity applied (before dilution) shall be 50 gallons per 1,000 square feet.
4. Sealcoat material shall be applied using a truck-mounted tank or wheeled container in continuous parallel lines and spread by means of brooms or rubber-faced squeegees either by hand or machine and in such a manner as to eliminate all ridges, lap marks, and air pockets.
5. Hand tools shall be available in order to remove spillage. Ridges or bumps in the finished surface will not be permitted. Sealcoat material shall be homogeneous prior to spreading, with no visible separation of solids and liquids.
6. When the first coat has completely dried to the touch, apply the second coat. While misting is not normally required before second coat, surface should be clean with no foreign materials on it.

C. Drying Time:

1. Sealcoat should be allowed to dry 24 – 48 hours before permitting traffic. When asphalt is cold or in shade, or air temperature is below 75 degrees F, based on general weather, humidity and temperature conditions, drying time may need to be extended.

3.02 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.
- B. Striping for parking or traffic flow should be done only after the sealcoat has thoroughly dried. It is recommended that a high quality water based Traffic Line Paint be used for best results.

3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. The CONTRACTOR shall furnish all materials for concrete in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other work as required to produce finished concrete, in accordance with the requirements of the Contract Documents.
- B. The following types of concrete shall be covered in this Section:
 - 1. Portland cement concrete pavement, cement walks, flatwork, curbs, gutters, retaining curbs, swales, trash pick-up areas, ramps, mowing strips, fence post footings, sliding gate concrete, catch basins, pipe bedding and encasements, transition structures, flagpoles and light standard bases and footings, splash blocks and equipment pads.
 - 2. Portland cement concrete paving shall be stable, firm and slip resistant and shall comply with CBC sections 11B-302 and 11B-403.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Comply with the reference specifications of the GENERAL REQUIREMENTS.
- B. The work provided herein shall conform to and be in accordance with the Contract Plans, General Conditions/Specifications and Special Provisions, as well as the Standard Specifications for Public Works Construction ("GREENBOOK"), 2024 Edition, adopted by the Southern California Chapter, American Public Works Association; herein referred to as the "Standard Specifications" and the 2022 California Building Code.
- C. Comply with the current provisions of the following Codes and Standards.
 - 1. Federal Specifications:
 - a. UU-B-790A (Int.Amd. 1) Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellant and Fire Resistant).
 - 2. Commercial Standards:
 - a. ACI 214 Recommended Practice for Evaluation of Strength Test Results of Concrete.
 - b. ACI 301 Specifications for Structural Concrete for Buildings.
 - c. ACI 315 Details and Detailing of Concrete Reinforcement.

- d. ACI 318-14 Building Code Requirements for Reinforced Concrete.
- e. ACI 347 Recommended Practice for Concrete Formwork.
- f. ACI 350 Recommended Practice for Sanitary Structure.
- g. ASTM C 31 Practices for Making and Curing Concrete Test Specimens in the Field.
- h. ASTM C 33 Specification for Concrete Aggregates.
- i. ASTM C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- j. ASTM C 40 Test Method for Organic Impurities in Fine Aggregates for Concrete.
- k. ASTM C 42 Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- l. ASTM C 78 Specification for Flexural Strength.
- m. ASTM C 88 Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate.
- n. ASTM C 94 Specification for Ready-Mixed Concrete.
- o. ASTM C 114 Method for Chemical Analysis of Hydraulic Cement.
- p. ASTM C 131 Test Method for Resistance to Degradation of Small-Sized Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- q. ASTM C 136 Method for Sieve Analysis of Fine and Coarse Aggregate.
- r. ASTM C 143 Test Method for Slump of Portland Cement Concrete.
- s. ASTM C 150 Specification for Portland Cement.
- t. ASTM C 156 Test Method for Water Retention by Concrete Curing Materials.
- u. ASTM C 157 Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete.
- v. ASTM C 172 Specification for Sampling Fresh Concrete.
- w. ASTM C 192 Method of Making and Curing Concrete Test Specimens in the Laboratory.

- x. ASTM C 260 Specification for Air-Entraining Admixtures for Concrete.
- y. ASTM C 289 Test Method for Potential Reactivity of Aggregates (Chemical Method).
- z. ASTM C 311 Method for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete.
- aa. ASTM C 494 Specification for Chemical Admixtures for Concrete.
- bb. ASTM C 618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
- cc. ASTM C 979 Specification for Pigments for Integrally Colored Concrete
- dd. ASTM D 1751 Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- ee. ASTM E 119 Method for Fire Tests of Building Construction and Materials.

1.03 CONTRACTOR SUBMITTALS

- A. Submittals shall be made in accordance with GENERAL REQUIREMENTS.
- B. The following submittals and specific information shall be provided.
 - 1. Mix Designs: Prior to beginning the WORK, the CONTRACTOR shall submit to the ENGINEER, for review, and approval, preliminary concrete mix designs for each class and type of concrete specified herein. The mix designs shall be designed by an independent testing laboratory acceptable to the ENGINEER. All costs related to such mix design shall be borne by the CONTRACTOR.
 - a. Each concrete mix submittal shall contain the following information:
 - 1) Slump on which the design is based.
 - 2) Total gallons of water per cubic yard.
 - 3) Brand, type, composition and quantity of cement.
 - 4) Brand type, composition and quantity of fly ash.
 - 5) Specific Gravity and gradation of each aggregate.
 - 6) Ratio of fine to total aggregate per cubic yard.
 - 7) Weight (surface dry) of each aggregate per cubic yard.

- 8) Brand, type, and ASTM designation, active chemical ingredients and quantity of each admixture.
 - 9) Copy of the Building and Safety Research Report Approval for each concrete admixture.
 - 10) Air content.
 - 11) Compressive strength based on 7 day and 28 day compression tests, including standard deviation calculations, corroborative data (if applicable), and required average comprehensive strength per ACI 318, Section 5.
 - 12) Time of initial set.
 - 13) Certification stamp and signature by a Civil or Structural engineer registered in state of California.
 - 14) Certificate of Compliance for Cement.
2. Certified Delivery Tickets: Where ready-mix concrete is used, the CONTRACTOR shall provide certified weighmaster delivery tickets at the time of delivery of each load of concrete. Each certificate shall show the public weighmaster's signature, and the total quantities, by weight of cement, sand, each class of aggregate, admixtures, and the amounts of water in the aggregate and added at the batching plant as well as the amount of water allowed to be added at the site for the specific design mix. Each certificate shall, in addition, state the mix number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to when the batch was dispatched, when it left the plant, when it arrived at the job, the time that unloading began, and the time that unloading was finished.
 3. When a water reducing admixture is to be used, the CONTRACTOR shall furnish mix designs for concrete both with and without the admixture.
 4. The CONTRACTOR shall furnish a Certificate of Compliance signed by the supplier identifying the type of fly ash and stating that the fly ash complies with ASTM C 618 and these Specifications, together with all supporting test data prior to the use of the fly ash the sample represents. The supporting data shall also contain test results confirming that the fly ash in combination with the cement and water to be used meets all strength requirements and is compatible with air-entraining agents and other admixtures.
 5. The CONTRACTOR shall submit to the ENGINEER for review the design mix for fly ash concrete together with the design mix for portland cement (non-fly ash) concrete as specified in this Section.

1.04 QUALITY ASSURANCE

- A. Testing for Portland Cement Concrete shall be sampled and tested in accordance with the ASTM and California Tests listed in the Standard Specifications for Public Works Construction, 2024 Edition, Section 201-1.7 Tests.
- B. Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards of concrete, or not less than once for each 2,000 square feet of surface area for slabs. Additional samples for seven-day compressive strength tests shall be taken for each class of concrete at the beginning of the concrete work or whenever the mix or aggregate is changed.
- C. The cost of all laboratory tests on cement, aggregates, and concrete, will be borne by the CONTRACTOR.
- D. Concrete for testing shall be supplied by the CONTRACTOR at no cost to the Owner, and the CONTRACTOR shall provide assistance and facilities to the INSPECTOR in obtaining samples, and disposal and cleanup of excess material.
- E. Curbs and gutters shall be staked by a Land Surveyor licensed to practice in the State of California.
- F. Job Mock-Up
 - 1. General
 - a. Make samples on-site; revise as required; obtain Architect's approval, 10 days prior to casting finished work.
 - b. Finished work to match approved samples.
 - c. Approved sample may be incorporated into the work. Retain samples until completion of all concrete work.
 - d. Include typical tooled joint control in sample.
 - 2. Broom Finished Concrete; Exterior Flatwork: Provide sample, 20 s.f. minimum area.
 - 3. "Sacked" Vertical Surface; Exterior Wall: Provide sample, 5 sf. minimum area.
- G. Construction Tolerances: The CONTRACTOR shall set and maintain concrete forms and perform finishing operations so as to ensure that the completed work is within the tolerances specified herein. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance is the specified permissible variation from lines, grades, or dimensions shown. Where tolerances are not stated in the specifications, permissible deviations will be in accordance with ACI 347.
- H. Construction tolerances shall not violate dimensions, grades, slopes required by CBC for accessibility requirements. Adjust work accordingly to comply with requirements.

- I. The following construction tolerances are hereby established and apply to finished walls and slab unless otherwise shown:

Item	Tolerance
Variation of the constructed linear outline from the established position in plan.	In 10 feet: 1/8-inch; In 20 feet or more: 1/4-inch
Variation from the level or from the grades shown.	In 10 feet: 1/8-inch; In 20 feet or more: 1/4-inch
Variation from the plumb	In 10 feet: 1/8-inch; In 20 feet or more: 1/4-inch
Variation in the thickness of slabs and walls.	Minus 1/8-inch; Plus 1/4-inch
Variation in the locations and sizes of slabs and wall openings.	Plus or minus 1/8-inch

PART 2 - PRODUCTS

2.01 CONSTRUCTION MATERIALS

- A. Materials shall be delivered, stored, and handled so as to prevent damage by water or breakage. Only one brand of cement shall be used. Cement reclaimed from cleaning bags or leaking containers shall not be used. All cement shall be used in the sequence of receipt of shipments.
- B. All materials furnished for the work shall comply with the requirements of Sections 201, 203, and 204 of ACI 301, as applicable.
- C. Storage of materials shall conform to the requirements of Section 205 of ACI 301.
- D. Form Materials: Plywood, metal, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces. Conform to Section 303-5.2 of the Standard Specifications.
1. Use flexible or curved forms for curves of a 100-foot or less radius.
- E. Reinforcing Materials: As follows:
1. Steel Reinforcing Bars: ASTM A 615 deformed grade 60 billet steel, plain finish, unless otherwise specified on Construction Document. Fabrication, sampling and jobsite handling shall conform to the requirements in ASTM Designation: D 3963, except the 2 samples shall be 30 inches long.

2. Dowels:

- a. Dowel bars shall be plain round smooth conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 60 except that the two samples required in ASTM Designation: D 3963/D 3963M shall be 18 inches long. Dowel bars shall be free from burrs or other deformations detrimental to free movement of the bars in the concrete
- b. Dowel bars shall be lubricated with a bond breaker over the entire bar. A bond breaker application of petroleum paraffin based lubricant or white-pigmented curing compound shall be used to coat the dowel bars completely prior to placement. Oil and asphalt based bond breakers shall not be used. Paraffin based lubricant shall be Dayton Superior DSC BB-Coat or Valvoline Tectyl 506 or an approved equal. Paraffin based lubricant shall be factory applied. White pigmented curing compound shall conform to the requirements of ASTM Designation: C 309, Type 2, Class A, and shall contain 22 percent minimum nonvolatile vehicles consisting of at least 50 percent paraffin wax. Curing compound shall be applied in 2 separate applications, the last application not more than 8 hours prior to placement of the dowel bars. Each application of curing compound shall be applied at the approximate rate of one gallon per 15 square yards.

3. Epoxy for bonding tie bars and dowel bars to portland cement concrete shall be a two-component, epoxy-resin, conforming to the requirements of ASTM Designation: C 881, Type V, Grade 3 (Non-Sagging), Class B or C. The class used shall be dependent on the internal temperature of the hardened concrete at the time the epoxy is to be applied. Class B shall be used when the internal temperature is from 40 °F to 60 °F. Class C shall be used when the internal temperature is above 60 °F, but not higher than recommended by the manufacturer. A copy of the manufacturer's recommended installation procedure shall be provided to the Engineer at least 7 days prior to the start of work. Epoxy shall be applied in conformance with the manufacturer's recommendations.

- a. Simpson Set-3G Epoxy Adhesive (or approved equal) ICC-ES ESR-4057.

F. Concrete Materials: As follows:

1. Cement shall be standard brand portland cement conforming to ASTM C 150 for Type II. Portland cement shall contain not more than 0.60 percent alkalies. The term "alkalies" referred to herein is defined as the sum of the percentage of sodium oxide and 0.658 times the percentage of potassium oxide ($\text{Na}_2\text{O} + 0.658 \text{K}_2\text{O}$). These oxides shall be determined in accordance with ASTM C 114. A single brand of cement shall be used throughout the work, and prior to its use, the brand shall be acceptable to the ENGINEER. The cement shall be suitably protected from exposure to moisture until used. Cement that has become

lumpy shall not be used. Sacked cement shall be stored in such a manner so as to permit access for inspection and sampling. Certified mill test reports for each shipment of cement to be used shall be submitted to the INSPECTOR.

2. Concurrent with strength design criteria, concrete shall also be proportioned to provide the requisite durability to satisfy the exposure conditions imposed by either environment and/or service. Durability, in this context, refers to the ability of the concrete to resist deterioration from the environment or service in which it is placed. Concrete proportioned in accordance with ACI 318, chapter 4, Durability Requirements, will meet this criteria.
3. Combined Aggregate: 1" maximum coarse aggregate size conforming to Grading C of Standard Specifications Section 201-1.3.2(A). Aggregates shall be obtained from pits acceptable to the INSPECTOR, shall be non-reactive, and shall conform to ASTM C 33.
4. Water: Shall be potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts and other impurities. The water shall be considered potable, for the purposes of this Section only, if it meets the requirements of the local governmental agencies.
5. *"Pea gravel" mix is not acceptable*, unless specifically approved in writing by the Civil Engineer of Record prior to construction.

G. Admixtures:

1. The ENGINEER may require the use of admixtures or the CONTRACTOR may propose to use admixtures to control the set, effect water reduction, and increase workability. In either case, the addition of an admixture shall be at the CONTRACTOR's expense. The use and continued use of an admixture shall be approved by the ENGINEER. Admixtures specified herein, other than calcium chloride, shall conform to the requirements of ASTM C 494. The required quantity of cement shall be used in the mix regardless of whether or not an admixture is used. Admixtures shall contain no free chloride ions, be non-toxic after 30 days, and shall be compatible with and made by the same manufacturer as the air entraining admixture.
2. These admixtures shall not be used in greater doses than those recommended by the manufacturer or permitted by the ENGINEER. The permitted dosage of the admixture shall not exceed that which will result in an increase in the driving shrinkage of the concrete in excess of 20 percent when used in precast or prestressed concrete, or 10 percent when used in any other structural concrete. The strength of concrete containing the admixture in the amount of proposed shall, at the age of 48 hours and longer be not less than that of similar concrete without the admixture. The admixture shall not adversely affect the specified air content, unless permitted by the ENGINEER.

3. Set controlling admixture shall be either with or without water-reducing properties. Where the air temperature at the time of placement is expected to be consistently over 80 degrees F, a set retarding admixture such as [Sika Chemical Corporation's Plastiment], [Master Builder's Pozzoloth 300R], or equal shall be used. Where the air temperature at the time of placement is expected to be consistently under 40 degrees F, a set accelerating admixture such as [Sika Chemical Corporation's Plastocrete 161FL], [Master Builder's Pozzoloth 50C], or equal shall be used.
4. Low range water reducer shall conform to ASTM C 494, Type A. It shall be either a hydroxylated carboxylic acid type or a hydroxylated polymer type. The quantity of admixture used and the method of mixing shall be in accordance with the manufacturer's instructions and recommendations.
5. High range water reducer shall be sulfonated polymer conforming to ASTM C 494, Type F or G.
 - a. If the high range water reducing agent is added to the concrete at the batch plant, it shall be second generation type, [Daracem 100, as manufactured by W.R. Grace & Co.]; [Pozzoloth 430R, as manufactured by Masterbuilders]; or equal. High range water reducer shall be added to the concrete after all other ingredients have been mixed and initial slump has been verified.
 - b. If the high range water reducer is added to the concrete at the job site, it shall be used in conjunction with a low range water reducer and shall be [Pozzoloth 400N and Pozzoloth MBL82, as manufactured by Masterbuilders]; [WRDA 19 and WRDA 79, as manufactured by W.R. Grace & Co.]; or equal. Concrete shall have a slump of 3-inches \pm 1/2-inch prior to adding the high range water reducing admixture at the job site. The high range water reducing admixture shall be accurately measured and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested prior to each day's operation of the job site system.
6. Air-entraining agent meeting the requirements of ASTM C 260, shall be used. Sufficient air-entraining agent shall be used to provide a total air content of 3 to 4 percent; provided that, when the mean daily temperature in the vicinity of the worksite falls below 40 degrees F for more than one day, the total air content provided shall be 5 to 6 percent. The Owner reserves the right, at any time, to sample and test the air-entraining agent received on the job by the CONTRACTOR. The air-entraining agent shall be added to the batch in a portion of the mixing water. The solution shall be batched by means of a mechanical batcher capable of accurate measurement.
7. Calcium Chloride: Except as otherwise provided herein, calcium chloride will not be permitted to be used in concrete.

8. Fly ash/pozzolan shall conform to ASTM C 618 and the following supplementary requirements:
 - a. Class F fly ash
 - o Loss on ignition, maximum 4 percent
 - o SO₃ content, maximum 3 percent
 - o Moisture content, maximum 1 percent
 - b. Class F fly ash, as a percent by weight of total cementitious material, shall not exceed 15 percent.
 - c. When Sulfate Resistant or Special Exposure Concrete is specified, test results shall be submitted to the Engineer as specified in Section 2-5.3 of the Standard Specifications. The test result shall show that the fly ash to be used is effective in contributing to sulfate resistance in conformance with ASTM C618, Table 3 (optional physical requirements) as tested in accordance with ASTM C 1012. The data submitted shall be less than 6 months old.

H. Curing Materials:

1. Concrete curing compound shall conform to the requirements of ASTM C309 Type 1-D (clear or translucent with a fugitive dye), Class B (Resin Type Only), except the loss of water shall not exceed 0.15 kilograms per square meter in 24 hours nor 0.45 kilograms per square meter in 72 hours when tested in accordance with ASTM C 156. The CONTRACTOR shall provide, when requested by the ENGINEER, certified copies of vendor's test report showing compliance with ASTM C 309 and these specifications. The testing and the report shall be supplied without cost to the Agency. All compounds shall be furnished by the CONTRACTOR in sealed original containers labeled in accordance with ASTM C 309 and with the date of manufacture.
2. Polyethylene sheet for use as concrete curing blanket shall be white and conform to ASTM C 171. The loss of moisture when determined in accordance with the requirements of ASTM C 156 shall not exceed 0.055 grams per square centimeter of surface.
3. Polyethylene-coated burlap for use as concrete curing blanket shall conform to ASTM C 171. The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 grams per square centimeter of surface.

I. Expansion Joint Filler Material

1. Fiber expansion joint, W.R. Meadows, or approved equal, 3/8-inch thick material conforming to ASTM D 1751.

2. Silicone Joint Sealant: Premium-grade, high-performance, moisture-cured, single-component, polyurethane-based, non-sag elastomeric sealant. Meets Federal specification TT-S-00230C. Meets ASTM C-920, Type S, Class 25 or 35; Grade NS, Use T or NT, Shore A Hardness (21 day) 35-45. A Certificate of Compliance for the silicone sealant shall be furnished to the Engineer. The Certificate shall also be accompanied with a certified test report of the results of the required tests performed on the sealant material within the previous 12 months prior to proposed use. The Certificate and accompanying test report shall be provided for each lot of silicone joint sealant prior to use on the project.
 - a. Sika Corporation, Sikaflex 2C NS/CL or approved equal.
- J. Related Materials: As follows:
1. Damp-proofing agent shall be an asphalt emulsion, such as [Sonneborn Hydrocide 660], [Flintkote C-13-E Foundation Coating], or equal.
 2. Epoxy adhesives shall be the following products for the applications specified:
 - a. For bonding freshly-mixed, plastic concrete to hardened concrete, [Sikadur Hi-Mod Epoxy Adhesive, as manufactured by Sika Chemical Corporation]; [Concresive 1001-LPL, as manufactured by Adhesive Engineering Company]; or equal.
 - b. For bonding hardened concrete or masonry to steel, [Colma-Dur Gel], [Sikadur Hi-Mod Gel], or equal.
- K. Site Concrete Mix Design: At a minimum, site work concrete (flatwork and curbs) shall conform to the Standard Specifications for Public Works Construction, Section 201-1.1.2 mix class 560-C-3250.
1. Compressive Strength: minimum of 3,250 psi at 28 days compressive strength.
 2. Slump Limit: 4 inches at point of placement.
 3. Air Content: 4% +/- 1% percent.
- L. Slurry Mix Design:
1. Compressive Strength: 100 psi at min. 28 days compr. strength.
 2. Slump Limit: 5 inches at point of placement.
 3. Cement per cu yard (sacks): 1.0
 4. Aggregate Gradation: "E" per S.S.P.W.C. table 201-1.4.2.

PART 3 - EXECUTION

3.01 PREPARATION OF SURFACES FOR CONCRETING

- A. General: Earth surfaces shall be thoroughly wetted by sprinkling, prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.
- B. Subgrade Preparation:
 - 1. Refer to Concrete Pavement detail on sheet C3.00 of the construction documents.
- C. The subgrade preparation recommendations on C3.00 are based on the assumption that soils encountered during field exploration are representative of soils throughout the site. However, there can be unforeseen and unanticipated variations in soils between points of subsurface exploration. For this reason, the actual scarification or over-excavation depths will have to be determined on the basis of in-grading observations and testing performed by representatives of the project geotechnical consultant.
- D. A California Licensed Surveyor (LS) must provide grade stakes and elevations for the Geotechnical Engineer to verify that the over-excavation depths, shown on the construction drawings for concrete pavement structural sections, have been achieved prior to re-compaction.
- E. Joints in Concrete: Concrete surfaces upon or against which concrete is to be placed, where the placement of the old concrete has been stopped or interrupted so that, as determined by the ENGINEER, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be given a compacted, roughened surface for good bond. Except where the Drawings call for joint surfaces to be coated, the joint surfaces shall be cleaned of all laitance, loose or defective concrete, and foreign material. Such cleaning shall be accomplished by sandblasting followed by thorough washing. All pools of water shall be removed from the surface of construction joints before the new concrete is placed.
- F. Embedded Items: No concrete shall be placed until all formwork, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and ACCEPTED by the INSPECTOR at least 24 hours before placement of concrete. All surfaces of forms and embedded items that have become encrusted with dried grout from concrete previously placed shall be cleaned of all such grout before the surrounding or adjacent concrete is placed.
- G. All inserts or other embedded items shall conform to the requirements herein.
- H. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms where shown or by shop drawings and shall be acceptable to the INSPECTOR before any concrete is placed. Accuracy of placement is the responsibility of the CONTRACTOR.

- I. Where concrete is to be cast against old concrete, (greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by sand-blasting, exposing the aggregate. In concrete shear-walls, suspended slabs and roof slabs, the interface surface at construction joints shall be roughened to a full amplitude of one quarter inch. The hardened surface shall be cleaned of all latent foreign material and washed clean, prior to the application of an epoxy bonding agent.
- J. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the work. No concrete shall be deposited underwater nor shall the CONTRACTOR allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, will be subject to the review of the ENGINEER.
- K. Corrosion Protection: Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2-inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.
- L. Openings for pipes, inserts for pipe hangers and brackets, and the setting of anchors shall, where practicable, be provided for during the placing of concrete.
- M. Anchor bolts shall be accurately set, and shall be maintained in position by templates while being embedded in concrete.
- N. Cleaning: The surfaces of all metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

3.02 HANDLING, TRANSPORTING, AND PLACING

- A. General: Placing of concrete shall conform to the applicable requirements of ACI 301 and the requirements of this Section.
- B. The total elapsed time between the addition of water at the batch plant and the completion of the discharge of the P.C.C. from the mixer shall not exceed 90 minutes. All P.C.C. remaining in the mixer after said 90-minute time limit shall be rejected and removed from the project site.
- C. Non-Conforming Work or Materials: Concrete which upon or before placing is found not to conform to the requirements specified herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these Specifications, or which is of inferior quality, shall be removed and replaced by and at the expense of the CONTRACTOR.

- D. Whenever batch trucks or other paving equipment cause rutting of the subgrade or subbase in concrete placement areas, inspectors shall immediately stop construction. Construction shall not be allowed to resume until distorted subgrade or subbase is repaired. Contractors and inspectors should locate by proof rolling, any questionable unstable areas in advance to avoid distortion under equipment. Wet, unstable areas must be dried out or replaced before starting placement of asphalt. Locating wet or soft areas in advance can be accomplished by testing finished subgrade or subbase with a loaded truck. Construction of concrete pavement should not proceed unless testing gives a reasonable indication that distortions will not occur during construction of overlying pavement. When repair, aeration, and recompaction are required to correct damage from Contractor's operation, all necessary repair will be done at Contractor's expense. However, if the Engineer determines that additional depth of aeration and recompaction are needed, that should be paid by change order.
- E. All pull boxes, meter boxes, valve covers and manholes shall be adjusted to proposed finish grade prior to placement of the P.C.C.
- F. Dowel Placement:
1. Dowel bars shall be centered on the joint within a tolerance of ± 2 inches in the longitudinal direction directly over the contact joint or sawcut for the transverse weakened plane joints, as shown on the plans. Prior to placement of dowel bars, the Contractor shall submit to the Engineer a written procedure to identify the transverse weakened plane joint locations relative to the middle of the dowel bars and the procedure for consolidating concrete around the dowel bars.
 2. Dowel bars shall be placed at longitudinal joints as shown on the plans. Dowel bars shall be placed as shown on the plans by using mechanical insertion. When dowel bars are placed by mechanical insertion, the concrete over the dowel bars shall be reworked and refinished so that there is no evidence on the surface of the completed pavement that there has been any insertion performed. When drill and bonding of dowel bars is performed at contact joints, a grout retention ring shall be used.
- G. Concrete shall not be placed until the forms and reinforcement have been inspected, all preparations for the placement have been completed, and the preparations have been checked by the project inspector, all subject to the observation of the engineer or architect.
- H. Casting New Concrete Against Old: An approved epoxy adhesive bonding agent shall be applied to the old surfaces according to the manufacturer's written recommendations. This provision shall not apply to joints where waterstop is installed.
- I. Conveyor Belts and Chutes: All ends of chutes, hopper gates, and all other points of concrete discharge throughout the CONTRACTOR'S conveying, hoisting and placing system shall be so designed and arranged that concrete passing from them will not fall

separated into whatever receptacle immediately receives it. Conveyor belts, if used, shall be of a type acceptable to the INSPECTOR. Chutes longer than 50 feet will not be permitted. Minimum slopes of chutes shall be such that concrete of the specified consistency will readily flow in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a manner that none of the mortar adhering to the belt will be wasted. All conveyor belts and chutes shall be covered. Sufficient illumination shall be provided in the interior of all forms so that the concrete at the places of deposit is visible from the deck or runway.

- J. Placement in Slabs: Concrete placed in sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the pour. As the work progresses, the concrete shall be vibrated and carefully worked around the slab reinforcement, and the surface of the slab shall be screeded in an up-slope direction.
- K. Temperature of Concrete: The temperature of concrete when it is being placed shall be not more than 90 degrees F nor less than 40 degrees F in moderate weather, and not less than 50 degrees F in weather during which the mean daily temperature drops below 40 degrees F. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the specified minimum temperature. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F, the CONTRACTOR shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The CONTRACTOR shall be entitled to no additional compensation on account of the foregoing requirements.
- L. Cold Weather Placement: Earth foundations shall be free from frost or ice when concrete is placed upon or against them. Fly ash concrete shall not be placed when the air temperature falls below 50 degrees F.
- M. A transverse construction joint shall be constructed, including dowel bars, at the end of each day's work or where concrete placement is interrupted for more than 30 minutes, to coincide with the next contraction joint location. If sufficient concrete has not been mixed to form a slab to match the next contraction joint, when an interruption occurs, the excess concrete shall be removed and disposed of back to the last preceding joint. The cost of removing and disposing of excess concrete shall be at the Contractor's expense. Excess material shall become the property of the Contractor and shall be disposed of. A metal or wooden bulkhead (header) shall be used to form the joint. The bulkhead shall be designed to accommodate the installation of dowel bars.
- N. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. The finished surface shall be free from humps, sags, blemishes or other irregularities Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.

O. Broom Finish Type:

1. Surfaces Sloped Less than 6%: Provide a medium salt (medium broom) finish by drawing a soft bristle broom across concrete surface, perpendicular to line of traffic, to provide a uniform fine line texture.
2. Surfaces Sloped greater than 6%: Provide a slip resistant (heavy broom finish) by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

P. Joints:

1. Joints: Joints in concrete curb, gutter and flatwork shall be designated as expansion joints and control joints. Joints for concrete flatwork shall be provided in spacing noted on the architectural plans. Expansion joints for curbs / curb & gutter shall be placed at no greater than 15 feet on center or as indicated on construction drawings.
 - a. Expansion Joints: Provide premolded joint filler, material meeting Section 2.01-I herein.
 - 1) Extend expansion joint fillers full-width and depth of joint, and 1/4" below finished surface where joint filler is indicated. If no joint sealer is called for, place top of premolded joint filler flush with top of concrete or curb.
 - 2) Where silicone joint sealer is noted on the construction documents, the premolded joint filler strips shall be placed 1" below the surface of the concrete or curb, the full width of the expansion joint. The remainder of all joints shall be filled to within 1/4" below the surface of the concrete with the silicone joint sealant.
 - 3) Provide expansion joint filler strips, with elastomeric sealer, between p.c.c. walk and curb, p.c.c. walk and buildings, & p.c.c. walk and retaining walls and at locations noted on the construction documents. The depth of the filler strip shall be the depth of the p.c.c. walk plus 1 inch with the top set flush with the specified grade of the top of curb or walk.
 - b. Control Joints:
 - 1) Control joints in site work concrete shall comply with details on sheet C3.00.

- Q. Protection: In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control film. Apply

according to manufacturer's instructions after screeding and bull floating, but before floating.

3.03 TAMPING AND VIBRATING

- A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer which is being consolidated, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete during placement. Vibrators shall be high speed power vibrators (8000 to 10,000 rpm) of an immersion type in sufficient number and with (at least one) standby units as required.
- B. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type waterstops are placed horizontally, the concrete shall be worked under the waterstops by hand, making sure that all air and rock pockets have been eliminated. Concrete surrounding the waterstops shall be given additional vibration, over and above that used for adjacent concrete placement to assure complete embedment of the waterstops in the concrete.
- C. Concrete in walls shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly as specified. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the results herein specified within 15 minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall be kept from contact with the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.

3.04 CURING

- A. Comply with 2022 California Building Code, Title 24, Part 2, Volume 2, Section 1905A.11.
 - 1. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven (7) days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- B. Curing Methods: Perform curing of concrete by curing as herein specified.
 - 1. Provide moisture-curing by the following methods:
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Continuous water-fog spray.

- c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4 inch lap over adjacent absorptive covers.
 - 2. Provide curing and sealing compound to exposed exterior slabs, walks, and curbs, as follows:
 - a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Re-coat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - b. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid, floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Architect.
- C. Concrete slabs and paving shall be properly cured and protected against damage and defacement of nature during construction operations. If weather is hot or surface has dried out, spray surface with fine mist of water starting not later than two hours after final troweling. Surface of finish shall be kept continuously wet for at least ten days. Wetting is considered emergency work and shall be performed on weekends and holidays if necessary.
- D. The CONTRACTOR shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the CONTRACTOR'S expense. Exclude traffic from concrete paving for at least 7 days after placement.
- E. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

3.05 PUMPING OF CONCRETE

- A. General: If the pumped concrete does not produce satisfactory end results, the CONTRACTOR shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

- B. Pumping Equipment: The pumping equipment must have 2 cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the CONTRACTOR may have a standby pump on the site during pumping.
- C. The minimum diameter of the hose (conduits) shall be 4-inches.
- D. Pumping equipment and hoses (conduits) that are not functioning properly, shall be replaced.
- E. Aluminum conduits for conveying the concrete will not be permitted.
- F. Proportioning: Minimum compressive strength, cement content, and maximum size of aggregates shall be as specified herein.
- G. Gradation of coarse aggregates shall conform to ASTM C 33 and shall be as close to the middle range as possible.
- H. Gradation of fine aggregate shall conform to ASTM C 33, with 15 to 30 percent passing the number 50 screen and 5 to 10 percent passing the number 100 screen. The fineness modulus of sand used shall not be over 3.00.
- I. Water and slump requirements shall conform to the requirements of this Section.
- J. Cement and admixtures shall conform to the requirements of this Section.
- K. Field Control: Concrete samples for slump per ASTM C 143 and test cylinders per ASTM C 31 and C 39.

3.06 TREATMENT OF SURFACE DEFECTS

- A. As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the ENGINEER. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall have them repaired as specified herein. Concrete containing extensive voids, holes, honeycombing, or similar depression defects, shall be completely removed and replaced.
 - 1. All repairs and replacements herein specified shall be promptly executed by the CONTRACTOR at its own expense.
- B. Defective surfaces to be repaired shall be cut back from trueline a minimum depth of 1/2-inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of all laitance or soft material, and not less than 1/32-inch depth of the surface film from all hard portions, by means of an efficient sandblast. After cutting and sandblasting, the surface shall be wetted sufficiently in

advance of shooting with shotcrete or with cement mortar so that while the repair material is being applied, the surfaces under repair will remain moist, but not so wet as to overcome the suction upon which a good bond depends. The material used for repair purposes shall consist of a mixture of one sack of cement to 3 cubic feet of sand. For exposed walls, the cement shall contain such a proportion of Atlas white portland cement as is required to make the color of the patch match the color of the surrounding concrete.

- C. Holes left by tie-rod cones shall be reamed so as to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with non-shrink grout. Holes left by form-tying devices having a rectangular cross-section, and other imperfections having a depth greater than their least surface dimension, shall not be reamed but shall be repaired in an approved manner with non-shrink grout.
- D. All repairs shall be built up and shaped in such a manner that the completed work will conform to the requirements of this Section, as applicable, using approved methods which will not disturb the bond, cause sagging, or cause horizontal fractures. Surfaces of said repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.
- E. Prior to filling any structure with water, all cracks that may have developed shall be repaired to the satisfaction of the ENGINEER. This repair method shall be done on the water bearing face of members. Prior to backfilling, faces of members in contact with fill, which are not covered with a waterproofing membrane, shall also have cracks repaired as specified herein.
- F. The finished surface shall be free from humps, sags, blemishes or other irregularities.

3.07 FIELD QUALITY CONTROL

- A. Correction of Mix Design for Failed Concrete Tests: If the compressive cylinder strength test for in place PCC yields test results below the specified 28-day PCC compressive strength and the Engineer determines a corrective change is necessary, the Contractor shall, at its own expense, make corrective changes in the mix proportions. The Engineer shall approve the changes in the mix proportions or PCC placement procedures, before any additional PCC is placed on the job.
- B. Flood Tests: BEFORE ACCEPTANCE, ALL NEW CONCRETE SHALL BE WATER TESTED TO ENSURE PROPER DRAINAGE AS DIRECTED BY THE INSPECTOR. THE CONTRACTOR SHALL PROVIDE WATER FOR THIS PURPOSE. THE FLOODING SHALL BE DONE BY WATER TANK TRUCK. DEPRESSIONS WHERE THE WATER PONDS TO A DEPTH OF MORE THAN 0.01 FOOT SHALL BE FILLED OR THE SLOPE CORRECTED TO PROVIDE PROPER DRAINAGE. THE EDGES OF THE FILL SHALL BE FEATHERED AND SMOOTHED SO THAT THE JOINT BETWEEN THE FILL AND THE ORIGINAL SURFACE IS INVISIBLE. PRACTICAL FIELD MEASUREMENT: 0.01 FOOT = TWO QUARTERS STACKED. NO STANDING WATER SHALL REMAIN AFTER 60 MINUTES ON A 70 DEGREE F (OR WARMER) DAY.

3.08 CARE AND REPAIR OF CONCRETE

- A. General: The CONTRACTOR shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the CONTRACTOR'S expense.
- B. The contractor shall barricade and protect placed Portland Cement Concrete from all damage, marks, mars and/or graffiti. Any Portland Cement Concrete damaged, defaced, discolored or defective shall be replaced at the contractor's expense.

END OF SECTION

SECTION 32 17 13 PARKING BUMPERS

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. Precast concrete parking bumpers and anchorage.
- B. Reference Standards:
 - 1. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
 - 2. ASTM C150/C150M - Standard Specification for Portland Cement.
 - 3. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
 - 4. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete.

1.3 SUBMITTALS

- A. See Section 01 33 00: Submittal Procedures.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Parking Bumpers - Precast concrete, conforming to the following:
 - 1. Nominal Size: 7 inches high, 12 inches wide, 6 feet long. Manufactured by Granite precast or approved equal.
 - 2. Cement: ASTM C150/C150M, Portland Type I - Normal; white color.
 - 3. Concrete Materials: ASTM C330/C330M aggregate, water, and sand.
 - 4. Reinforcing Steel: ASTM A615/A615M, deformed steel bars; unfinished, strength and size commensurate with precast unit design.
 - 5. Air Entrainment Admixture: ASTM C260/C260M.
 - 6. Concrete Mix: Minimum 4000 psi compressive strength after 28 days, air entrained to 5 to 7 percent.
 - 7. Use rigid molds, constructed to maintain precast units, uniform in shape, size and finish. Maintain consistent quality during manufacture.
 - 8. Embed reinforcing steel, and drill or sleeve for two dowels.

9. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
10. Minor patching in plant is acceptable, providing appearance of units is not impaired.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install units without damage to shape or finish. Replace or repair damaged units.
- B. Install units in alignment with adjacent work.

END OF SECTION 32 17 13

SECTION 32 17 23 PAVEMENT MARKINGS

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. Parking lot markings, including parking bays, arrows, International Symbol of Accessibility (ISA), and curb markings.
- B. Related Section:
 - 1. Section 32 12 16: Asphalt Paving.
 - 2. Section 32 12 36: Seal Coats.
- C. Reference Standards:
 - 1. CBC Chapter 11B - California Building Code - Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
 - 2. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

1.3 DEFINITIONS

- A. Pavement Stripe: Includes traffic control, materials, and all appurtenances not otherwise specified.
- B. Pavement Markings: Includes traffic control, setup, materials, and all appurtenances not otherwise specified in the bid schedule.

1.4 SUBMITTALS

- A. See Special Provisions for Submittal Requirements.

1.5 QUALITY ASSURANCE

- A. Accessible Parking:
 - 1. Accessible parking spaces serving a particular building or facility shall be located on the shortest accessible route to an entrance complying with CBC Section 11B-208.3.1.
 - 2. Accessible parking spaces serving more than one accessible entrance shall be

- dispersed and located on the shortest accessible route to the accessible entrances.
3. Accessible parking spaces in a parking facility not serving a particular building or facility shall be located on the shortest accessible route to an accessible pedestrian entrance of the parking facility. See CBC Section 11B-208.3.1.
 4. Minimum number of required accessible parking spaces shall be provided in accordance with CBC Table 11B-208.2 for each parking facility provided on a site.
 5. For every six, or fraction of six, accessible parking spaces, at least one shall be an accessible van parking space. See CBC Section 11B-208.2.4.
 6. Accessible parking spaces and access aisles shall comply with CBC Section 11B-502 and shall be dimensioned to the centerline of the marked lines as follows:
 - a. Parking spaces and access aisles shall be marked according to CBC Figures 11B-502.2, 11B-502.3, and 11B-502.3.3. Their surfaces shall comply with CBC Section 11B-302 and shall be at the same level with slopes not steeper than 1:48 in any direction. See CBC Section 11B-502.4:
 - b. Parking spaces shall be 9 feet x 18 feet minimum, and van parking spaces shall be 12 feet by 18 feet minimum with an adjacent access aisle of 5 feet by 19 feet minimum. Access aisles shall be placed on either side of the parking spaces except be located on the passenger side for van parking spaces. Van parking spaces shall be permitted to be 9 feet by 19 feet minimum where the access aisle is 8 feet by 18 feet minimum.
 - c. Access aisles shall be marked by a blue painted borderline around their perimeters. The area within the blue borderlines shall be marked with hatched lines a maximum of 36 inches on center in a color contrasting with that of the aisle surface, preferably blue or white. Access aisle markings may extend beyond the minimum required length. See CBC Section 11B-502.3.3.
 - d. Access aisles (accessible parking spaces as well – similar application) shall not overlap the vehicular way. See CBC Section 11B-502.3.4.
 - e. A vertical clearance of 8 feet 2 inches minimum shall be provided for accessible parking spaces, access aisles, and vehicular routes serving them. See CBC Section 11B-502.5.
 7. At least one passenger loading zone shall be provided in every continuous 100 linear feet of loading zone space, or fraction thereof, complying with CBC Sections 11B-209 and 11B-503 as follows:
 - a. Vehicle pull-up spaces shall be 8 feet by 20 feet minimum.
 - b. Access aisles shall be 5 feet wide minimum x full length of vehicle pull-up spaces. They shall be at the same level with each other and with slopes not steeper than 1:48 in any direction. Access aisle shall adjoin an accessible route and shall not overlap the vehicular way.
 - c. Access aisles for passenger drop-off and loading zone shall be marked with a painted borderline around their perimeters. The area within the borderlines shall be marked with hatched lines a maximum of 36 inches on center in a color contrasting with that of the aisle surface: Blue interior hatch lines are preferred for concrete surfaces and white interior hatch lines are preferred for asphalt surfaces. Where white hatch lines are used, hatch lines shall be interrupted at 12 inches high “No Parking” text so that legibility is maintained.

- d. A vertical clearance of 9 feet 6 inches minimum shall be provide for vehicle pull-up spaces, access aisles, and a vehicular route serving them connecting a vehicular entrance and a vehicular exit. See CBC Section 11B-503.5.

1.6 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.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Traffic Paint:
 - 1. Type: Water base, roadway traffic lane marking type; colors as selected.
 - 2. Acceptable Manufacturers:
 - a. Dunn-Edwards, Vin-L-Stripe No. W-801, vinyl-epoxy as a standard of quality.
 - b. J. E. Bauer latex base Formula No. 1030A9 White, No. 1056A9 Yellow, No. 1865A9 Blue, No. 1118A9 Green, and No. 1854A9 Red.
 - c. Sinclair No. 160 Vinyl Traffic Line Paint, waterbase.
 - d. Ennis Traffic Safety Solutions, product 6000 white & 6006 blue.
 - e. Or equal
- B. Line and Zone Marking Paint - MPI (APL) No. 97 Latex Traffic Marking Paint; white:
 - 1. Roadway Markings: As required by authorities having jurisdiction.
 - 2. International Symbol of Accessibility (ISA): White figure on a Blue background.
- C. Striping: Thermoplastic Stripe, In accordance with State of California, Department of Transportation (CALTRANS), Standard Specifications, Section 84.
- D. Pavement Markings: Thermoplastic Markings, In accordance with State of California, Department of Transportation (CALTRANS), Standard Specifications, Section 84.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

3.2 EXAMINATION

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

3.3 JOB CONDITIONS

- A. Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.
- B. Sequencing, Scheduling: Coordinate with paving work. Verify that paint type is compatible with asphalt paving surfaces sealcoats.
- C. Protection: Do not apply pavement markings for seven days after application of asphalt surface seal coat. After application, protect from traffic until thoroughly dry.

3.4 PREPARATION

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Clean surfaces thoroughly prior to installation:
 - 1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
- D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.
- E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

3.5 INSTALLATION

- A. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.
- B. Apply markings in locations determined by measurement from survey control

points; preserve control points until after markings have been accepted.

- C. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends:
 - 1. Apply paint in one coat only.
 - 2. Wet Film Thickness: 0.015 inch, minimum.
 - 3. Width Tolerance: Plus or minus 1/8 inch.
- D. Parking Lots - Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings:
 - 1. Mark the International Symbol of Accessibility (ISA) at indicated parking spaces.
 - 2. Hand application by pneumatic spray is acceptable.

3.6 DRYING, PROTECTION, AND REPLACEMENT

- A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.
- B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.
- C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.
- D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.
- E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.
- F. Replace removed markings at no additional cost to District.

END OF SECTION 32 17 23

SECTION 32 17 26 TACTILE WARNING SURFACE

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. Cast-In-Place Pressed Concrete Tiles and Cast-In Place replaceable plastic tactile and detectable warning tiles for pedestrian walking surfaces meeting State of California 11B requirements.
- B. Related Sections:
 - 1. Section 32 13 13: Concrete Paving.
 - 2. Section 32 17 23: Pavement Markings.
- C. Reference Standards:
 - 1. 49 CFR 37 - Transportation Services for Individuals with Disabilities (ADA); current edition.
 - 2. AASHTO LRFD - Bridge Design Specifications, Customary U.S. Units (Current Edition).
 - 3. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
 - 4. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 5. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - 6. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
 - 7. ASTM C501 - Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.
 - 8. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
 - 9. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
 - 10. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
 - 11. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
 - 12. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - 13. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 14. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for

Exposure of Nonmetallic Materials.

15. ATBCB PROWAG - Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way.
16. FED-STD-595C - Colors Used in Government Procurement (Fan Deck).
17. Accessibility Requirements:
 - a. Americans with Disabilities Act of 1990, as amended:
 - 1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design.
 - b. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA):
 - 2) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.

1.3 SUBMITTALS

- A. See Section 01 33 00: Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, standard details, details specific to this project; written installation and maintenance instructions.
- C. Samples: Submit two (2) samples of tactile warning surfacing, 12 x 12 inches minimum, in pattern and color specified.
- D. Shop Drawings.
- E. Installer Qualifications: Submit evidence that installer meets specified requirements and is certified by manufacturer.
- F. Warranty: Submit manufacturer warranty; complete forms in District's name and register with manufacturer.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years documented experience.
- B. Accessibility Requirements:
 1. Detectable warning surfaces shall comply with CBC Section 11B-705.1.
 2. Detectable warning surfaces shall be yellow and approximate FS 33538 of SAE AMS-STD-595A. Detectable warning surfaces at other locations shall contrast with that of adjacent walking surfaces. The material used to provide visual contrast shall be an integral part of the surface. See CBC Section 11B- 705.1.1.3.
 3. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound- on-cane contact. Such constraint shall not be required for detectable warning surfaces at curb ramps, islands, or cut-through medians. See CBC Section 11B-705.1.1.4.

1.5 WARRANTY

- A. See Section 01 77 00: Closeout Submittals.
- B. Plastic Tiles - Provide manufacturer's standard five (5) year warranty against manufacturing defects, breakage or deformation. Warranty shall also indicate compliance with architectural standards as published in the current edition of the California Building Standards Code, and also include durability criteria which indicate that the shape, color fastness, confirmation, sound-on-cane acoustic quality, resilience, and attachment will not degrade significantly for specified years after initial installation:
 - 1. As used in this bulletin, "not degrade significantly" means that the product maintains at least 90 percent of its approved design characteristics, as determined by the enforcing agency.
- C. Installer's Warranty: 1 year.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Tactile Warning Surfacing shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy plastic wrappings to protect tile from concrete residue during installation and tile type shall be identified by part number.
- B. Tactile Warning Surfacing shall be delivered to location at building site for storage prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Plastic Tactile and Detectable Warning Surface Tiles:
 - 1. **Armorcast Products Company**; armorcastprod.com (Basis of Design).
 - 2. Access Tile, a brand of Access Products, Inc: www.accesstile.com.
 - 3. ADA Solutions, Inc: www.adatile.com/#sle.
 - 4. Armor-Tile, a brand of Engineered Plastics, Inc: www.armortiletransit.com.
 - 5. Or approved equal.
 - 6. Substitutions: See Section 01 25 00: Substitution Procedures and Form.

2.2 DETECTABLE WARNING DEVICES

- A. Plastic Tactile and Detectable Warning Tiles - ADA Standards compliant, glass fiber and carbon fiber reinforced, exterior grade, matte finish polyester sheet with truncated dome pattern, solid color throughout, internal reinforcing of sheet and of truncated domes; with factory applied removable protective sheeting:
 - 1. Material Properties:

- a. Water Absorption: 0.07 percent, maximum, when tested in accordance with ASTM D570.
- b. Slip Resistance: 0.50 minimum dry static coefficient of friction, when tested in accordance with ASTM D2047 or 1.18 dry, 1.05 wet when tested in accordance with ASTM D2047.
- c. Compressive Strength: 25,000 pounds per square inch, minimum, when tested in accordance with ASTM D695.
- d. Tensile Strength: 10,000 pounds per square inch, minimum, when tested in accordance with ASTM D638.
- e. Flexural Strength: 25,000 pounds per square inch minimum, when tested in accordance with ASTM D790.
- f. Chemical Stain Resistance: No reaction to 1 percent hydrochloric acid, motor oil, calcium chloride, gum, soap solution, bleach, or antifreeze, when tested in accordance with ASTM D543.
- g. Abrasion Resistance: 300, minimum, when tested in accordance with ASTM C501.
- h. Flame Spread Index: 25, maximum, when tested in accordance with ASTM E84.
- i. Accelerated Weathering: Delta-E of less than 5.0 at 2,000 hours exposure, when tested in accordance with ASTM G155.
- j. Loading: No damage when tested according to AASHTO LRFD test method HS20.
- k. Salt and Spray Performance: No deterioration or other defect after 200 hours of exposure, when tested in accordance with ASTM B117.
2. Installation Method: Cast in place replaceable.
3. Shape: Rectangular.
4. Color: FED-STD-595C, Table IV, Federal Yellow No. 33538, or alternate color meeting CBC 11B-705.1.1.2 and CBC 11B-705.1.1.3.
5. Truncated Dome Dimensions:
 - a. Height: 0.2 inch (5.1mm).
 - b. Base Diameter: 0.9-inch (22.9mm) minimum to .92-inch (23.4mm) maximum.
 - c. Top Diameter: 0.45-inch (11.4mm) minimum to .47-inch (11.9mm) maximum.
 - d. Pattern: Wide Inline (Square) Pattern, 2.35 inches on center each way.
6. Tile Dimensions: As specified on Drawings.
7. Products:
 - a. Armorcast; Wet Set; armorcastprod.com.
 - b. Access Tile, a brand of Access Products, Inc; Cast in Place Replaceable Tactile Warning Tile: www.accesstile.com.
 - c. ADA Solutions, Inc; Cast in Place Replaceable (Wet-Set): www.adatile.com/#sle.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

- A. Maintain minimum temperature of 40 degrees F in spaces to receive Tactile Warning Surfacing for at least 24 hours prior to installation, during installation, and for not less than 24 hours after installation.

3.2 EXAMINATION

- A. When installation location is near site boundary or property line, verify required location using property survey.
- B. Verify that work area is ready to receive work:
- C. If existing conditions are not as required to properly complete the work of this section, notify Architect.
- D. Do not proceed with installation until deficiencies in existing conditions have been corrected.
- E. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.3 INSTALLATION, GENERAL

- A. Install in accordance with manufacturer's written instructions:
 - 1. Do not install damaged, warped, bowed, dented, abraded, or otherwise defective units.
- B. The physical characteristics of the concrete shall be consistent with the contract specifications while maintaining a slump range of four (4) to seven (7) inches to permit solid placement of the Tactile Warning Surfacing.
- C. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. The tile shall be placed true and square to the curb edge in accordance with the drawings. Tiles shall be tamped into fresh concrete to ensure the field level of the tile is flush to adjacent concrete surface.
- D. The elevation and slope of the tile shall be set consistent with the contract drawings to permit water drainage and eliminate ponding.
- E. Field Adjustment:
 - 1. Locate relative to curb line in compliance with CBC Chapter 11B, Section 705.
 - 2. Orient so dome pattern is aligned with the direction of ramp.
 - 3. Align truncated dome pattern between adjacent units.
- F. Install units fully seated to substrate, square to straight edges and flat to required slope.

3.4 CLEANING PLASTIC UNITS

- A. Remove protective plastic sheeting within 24 hours of installation.

- B. Remove excess sealant or adhesive from joints and edges.
- C. Clean four days prior to date of scheduled inspection.

3.5 PROTECTION

- A. Protect installed units from traffic, subsequent construction operations or other imposed loads until concrete is fully cured.
- B. Touch-up, repair or replace damaged products prior to Date of Substantial Completion.

END OF SECTION 32 17 26

SECTION 32 84 13 IRRIGATION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Potable water irrigation system.
 - a. Related Requirements:
 - 2. Division 22 - Plumbing.
 - 3. Division 26 - Electrical.
 - 4. Section 32 93 00 - Plants

1.02 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Materials List: Provide manufacturer's name and description of items to be furnished.
- C. Product Data: Provide catalog cuts, technical data, and manufacturer's specifications.
- D. Shop Drawings: Provide Shop Drawings indicating proposed system layout, locations of controllers, valves, backflow devices, flow sensors, master valves, quick couplers, heads and point of connections. Include details for sleeves, yard boxes, backflow devices, and controller installations.
- E. Provide proof of purchase for energy saving devices to the Owner. Owner will receive rebates as part of energy savings program.
- F. Record Documents: See Section 01 78 39 - Project Record Documents for submittal requirements.
 - 1. Before Contract Completion, provide project record documents as follows:
 - a. Indicate the location of each numbered sprinkler controlled valves and quick coupling valves with legible dimensions from two permanent points of reference such as building corners or sidewalks.
 - 2. Closeout Submittals-As Built:
 - a. Submit three copies of as-built including complete list of materials, manufacturer's name, and product installation literatures.
 - b. Record drawings: Submit dimensioned drawings and details, before Contract Completion.
 - c. Record Drawings shall contain the following:
 - 1) As-Built shall be computer generated (C.A.D.).
 - 2) Print shall show the locations of the numbered remote control valves, manual control valves, locations and size of supply and lateral lines, location and type of sprinkler heads, quick coupling valves, gate valves, backflow devices, point of connections, controllers and other related equipment.

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- 3) Dimensions shall be legible from two permanent points of reference such as buildings and sidewalks.
- 4) Drawings: 24-inch by 36-inch minimum size.
- d. Proof of Backflow Registration:
 - 1) Contractor to provide proof of registration with the jurisdictional authority.
 - 2) Backflow test results shall be acceptable to the jurisdictional authority.
3. Operation and Maintenance Manuals:
 - a. Provide complete operating and maintenance instruction manuals for equipment.
 - b. Provide in writing as part of the Water Management Program the controller settings for water under Best Management Practices No. 5 Handbook for all seasons. This service shall be performed by a certified water auditor and paid by the Contractor. This report shall identify designed controller setting for water discharge and actual installed discharged tested. The audit report shall also include the status of items indicated in paragraph 1.07.C based on final inspection and testing.

1.03 REFERENCES

- A. ASME B36.10 - Welded and Seamless Wrought Steel Pipe.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM D1784 - Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
- D. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- E. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- F. American National Standards Institute (ANSI):
 1. ANSI B125.1 - Welded And Seamless Steel Pipe.
 2. ANSI B125.2 - Black/Hot-Dipped Zinc Coated Welded/Seamless Pipe.
- G. Federal Specifications:
 1. FS WW-P-460 - Pipe Fittings: Brass Or Bronze.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements:
 1. Comply with local, municipal and state laws, rules, and regulations governing or relating to this Work. Wiring shall conform to California Electrical Code.
- B. Best Management Practices: Conform to "Handbook Five: A Guide for Implementing Large Scale Irrigation Projects" as required by The California Water Conservation in Landscaping Act (Assembly Bill 325).
 1. AB 325 California Calculation of Estimated Applied Water Use (EWU).
 2. AB 325 California Calculation of Maximum Applied Water Allowance (MAWA).

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- C. Conform to California Code of Regulations, Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance.
- D. Manufacturers Instructions: The manufacturer's instructions and detailed drawings shall be followed where the manufacturers of products and/or materials furnish installation details not indicated in the Drawings and Specifications.
- E. Qualifications: Work shall be performed by skilled workers with a minimum of five years experience in work of similar scope and complexity.
- F. Designs and materials used shall conform to the Efficient Landscape Ordinance, MWELo water efficiency use requirements.

1.05 PRODUCT HANDLING

- A. Do not damage materials during handling, loading, unloading, and storage of pipe and fittings. Store materials under cover, protect from direct sunlight. Transport materials in a manner to avoid undue stress on piping and other materials.
- B. Do not install damaged materials or products into the Work.

1.06 PROJECT CONDITIONS

- A. Before excavation, contact the "Underground Service Alert of Southern California" (USASC) for information on buried utilities and pipelines.

1.07 TESTING AND INSPECTION

- A. Notify the Project Inspector 24 hours in advance of the pressure side piping inspection.
 - 1. Pressure Side Piping: After welded joints have cured for at least 24 hours, lines flushed and outlets are capped, the system shall be tested under normal street water pressure for a minimum of 4 hours. Joints shall remain exposed for inspection during the pressure test. Center loading of piping with small loads of sand backfill to prevent arching or slipping under pressure is permitted.
 - 2. Correct defective Work and repeat tests until the entire system is tested watertight.
- B. Submit a request for a final inspection 48 hours in advance. Perform a coverage test to determine if the coverage of water to turf and planting areas is complete and adequate as required.
- C. Final Inspection: The following items shall be considered part of the final inspection:
 - 1. Specified products and materials.
 - 2. Irrigation coverage test, providing 100% head to head coverage.
 - 3. Soils compacted in trenches and around sprinkler heads, level with existing grades.
 - 4. Controller and cabinet installation.
 - 5. Sprinkler control valves and boxes.
 - 6. Backflow devices, pressure regulators, pumps.
 - 7. Automatic sensors.
 - 8. Final site review shall include operating each system in its entirety in the presence of the Landscape Architect or Project Inspector.
 - 9. Provide any required adjustments and correct defective Work as required.

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1.08 MAINTENANCE

- A. Extra Materials, Tools and Accessories:
 - 1. Spare Sprinkler Heads: Furnish twelve spare sprinkler heads, with inserts for each type, size and series installed.
 - 2. Keys and Wrenches:
 - a. Keys: Furnish two tagged pin tumbler type keys.
 - b. Wrenches: Furnish two sets for each type of sprinkler head or nozzle.
 - c. Coupler: Furnish a minimum of one quick coupler key (quill) and an additional key for every three quick-coupler valves installed.
- B. Training:
 - 1. Before substantial completion provide at least 4 hours of training, by an authorized representative of the controller manufacturer, for each type of irrigation controller installed.
 - 2. Instruct designated Owner personnel on operation and programming of the irrigation controller and hand held controller, demonstrating program features.
 - 3. Review "As-Built" plans with Owner's personnel and explain the following features: master valve, flow sensor, rain sensors, pump, backflow devices and locations of critical valves.
 - 4. Provide an attendance sheet to the Owner listing personnel trained.

1.09 WARRANTY

- A. Provide a five year manufacturer's warranty for controller units.
- B. Provide a one year warranty for materials, fabrication, and installation, including restoration of planted or paved areas due to settlement of trenches.

PART 2 - PRODUCTS

2.01 IRRIGATION SYSTEM

- A. Systems shall be automatic with electrically operated control valves.
- B. Provide 100 percent head to head triangulated coverage or other required 100 percent configuration.
- C. Point of connection (POC) for irrigation systems:
 - 1. Provide a single POC on a designated irrigation meter, with flow monitoring, unless otherwise indicated on the Drawings.
- D. Athletic Fields: Install remote valves grouped along the perimeter of the field.
- E. No PVC piping of any kind will be permitted for above grade pressure lines.
- F. Install isolation valves in order to avoid a total system shutdown for maintenance and repairs. Include valves to isolate loop system and major branch lines.
- G. Irrigation System shall incorporate the following requirements:

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1. The flow velocity shall not exceed five feet per second for pressure/lateral lines based on industry standard friction pressure loss values.
2. Pressure line pipe size shall be sufficient to support a minimum of two control valves operating at the same time, one valve opening while another is closing.
3. G.P.M. demand and sprinkler head coverage shall follow the manufacturer's requirements.
4. Remote valves shall be sized no smaller than the piping it serves unless piping is increased in size to reduce friction loss. Remote valves shall then be sized no less than one pipe size smaller than the piping it serves.
5. Minimum pipe size shall be ¾ inch.

2.02 MATERIALS

- A. Provide only new materials, of brands and types noted on Drawings and in the Specifications.
- B. Plastic Pipe and Fittings:
 1. Plastic Pipe: Schedule 40, extruded from 100 percent Virgin Polyvinyl Chloride (PVC) Compound, meeting requirements of Class 12454-B of ASTM D1784.
 - a. Plastic pipe shall be continuously and permanently marked with the following information: Manufacturer's name, nominal pipe size, Schedule or Class, SDR (Standard Dimension Ratio, or pressure rating in psi) National Sanitation Foundation (NSF).
 2. Plastic fittings: Schedule 40 molded from PVC Type I Compound, conforming to the requirements of specification ASTM D2466.
 - a. Plastic Nipples: PVC schedule 80 conforming to ASTM D2467.
 - b. PVC Male Threaded Nipples: Schedule 80 only.
 3. PVC primer and solvent for chemical weld of pipe and fittings shall be as recommended by pipe manufacturer. Containers for solvent and primer shall be clearly marked with manufacturer's data. Solvent and primer shall not be more than one year old. Blue or red hot glue is not permitted.
 - a. IPS Weld On P-70 primer.
 - b. IPS Weld On 2711 (gray) cement.
- C. Pipe and Fittings:
 1. Steel Pipe and Steel Fittings: (where occurs at existing schools only): Pipe and fittings shall be ASA Schedule 40 galvanized mild steel screwed pipe and beaded galvanized malleable iron screwed fittings, including couplings. Thread on pipe and fittings shall be taper type, complying with ANSI Specification B125.1, B125.2 and ASTM A53/A53M. Above grade fittings shall comply with ASME B36.10 and ASTM A53/A53M.
 - a. Unions 2 inch and smaller shall be ground joint pattern.
 - b. Unions larger than 2 inch shall be flanged unions.
 - c. Steel pipe or fittings shall not be installed below grade.
 - d. Connection between steel pipe and copper pipe or tube shall be provided with a 6 inch brass nipple.

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2. Connection between any female threaded fitting and plastic pipe shall be bridged with a Schedule 80 PVC nipple.
 3. Brass Pipe: Seamless, 85 percent red brass, iron pipe sized, threaded.
 4. Brass Fittings: Brass fittings shall be 250 psi rated, threaded FS WW-P-460.
 5. Copper pipe, fittings:
 - a. Pipe: Type L rigid.
 - b. Fittings: Wrought copper, solder joint type.
- D. Valves: (PVC Valves are not permitted):
1. Gate valves on pipe 2 1/2-inch and larger shall be AWWA Specification, Class "D" standard flanged, or a combination of outlets as required, iron body, brass trimmed, non-rising stem. Gate valves 2-inch or smaller shall be bronze, non-rising stem, threaded:
 - a. Watts 406-NRS-RW, or equal.
 2. Gate valves 2 inch or smaller shall be bronze, non-rising stem, threaded:
 - a. Nibco T113, Milwaukee 105, or Hammond 1B 645.
 3. Quick coupler valves shall be brass, 1 inch, with lock top and resilient cap.
 - a. Hunter Quick Coupler HQ-LRC with HK-44 Key, Champion QCV-100VL, Buckner QB 44LRC10, Toro 100-SLVLC, or equal.
 - b. Quills shall be the same manufacturer as quick coupler valve, cast bronze, machine shank, stainless steel or bronze lugs.
 4. Coupler keys (quills) shall be from the same manufacturer as quick coupler valve; cast bronze with stainless steel or bronze lugs.
 5. Pressure Relief Valves shall be set at a 150 psi. Bronze body with internal brass parts, stainless steel springs, and 3/4 inch IPS, angle type, with purge lever:
 - a. Wilkins P220, Watts 31, or equal.
 6. Check Valves:
 - a. Swing Type: Check Valves shall be 200 lbs. WOG: bronze screwed with replaceable neoprene disc. Shall have a straight through pattern with closing member set on angle. Of size and type indicated on the Drawings. Disc shall close tight to prevent low head drainage:
 - 1) Watts Series WCV-2, Nibco T-413, or equal.
 - b. Pop-up Type: Check valves shall be PVC body, neoprene disc, stainless steel spring and integral components, straight through pattern, screwed. Valve to be adjustable in field from 5 feet to 40 feet head to prevent low head drainage. Size and type indicated on Drawings.
 7. Electric remote control valves shall be 24 volt normally closed solenoid actuated valve, capable of operating on 14 gage UF wire; either bronze or brass, globe or angle pattern, and diaphragm actuated:
 - a. Hunter IBV-FS, or equal.
 8. Manual sprinkler control valves are not allowed.
 9. Master Control Valves:

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- a. Shall be a normally open solenoid actuated valve. Valve shall have a NPT inlet and outlet, and shall be capable of working pressures up to 150 psi. Superior 3100, Rainbird, Hunter IBV-FS, or equal.
 - b. Shall meet requirements for Automatic Valves, except for those indicated on article "a" above.
 - c. Shall be installed with separate power and common wires.
- E. Sprinkler Heads:
 - 1. In lawn areas, provide 4-inch plastic pop-up sprinkler heads with built in check and adjustable nozzles with diameter of coverage as indicated on drawings.
 - a. Toro 570Z-4P-PRX-COM, Rainbird 1804-SAM-PRS, Hunter, or equal.
 - 2. In planters and shrub areas, provide 6 inch plastic pop-up sprinkler heads with built in check and adjustable nozzles with diameter of coverage as indicated on drawings:
 - a. Toro 570Z-6P-PRX-COM, Rainbird 1806-SAM-PRS, Hunter PROS-06-PRS30, or equal.
 - 3. Tree area sprinklers shall be pressure compensating flood bubbles surrounded by a perforated sleeve and gravel:
 - a. Rainbird 1400 Series, ToroHunter RZWS-18-50, or equal.
 - 4. In groundcover and similar areas, provide 12 inch plastic pop-up sprinkler heads with built in check and adjustable nozzles with diameter of coverage as indicated:
 - a. Toro-570Z-12P-PRX-COM, Rainbird 1812 SAM, Hunter PROS-12-PRS30, or equal.
 - 5. Large turf-area sprinkler heads shall be gear driven rotary heads with removable strainer, and make, type and performance as indicated on Drawings. Heads shall be permanently marked with manufacturer's name and shall be equipped with soft rubber covers. Shall have a built-in check valve.
 - a. Large Turf: Hunter I-40 SS, Toro Super 640 Series SS, Rainbird 7005 SS, or equal.
 - b. Small Turf: Hunter I-20 SS, Toro Super 700 Commercial SS, or equal.
 - c. On Slopes Only: Hunter PGP, Toro Super 700 Series, or equal.
 - 6. Install on triple swing assemblies: King Bros. Industries, TSA-0500-SS, Hunter SJ-505, or equal, through SJ 712 or swing joints assembled with PVC schedule 80 nipples and Marlex 90 degree "L".
- F. Tracer Wires: A No. 14, Green, Type TW plastic-coated copper tracer wire shall be installed with non-metallic irrigation main lines.
- G. Control Wires to Control Valves: Control wires to electrically operated solenoid valves shall be direct burial type UF#14 AWG copper, 3/64 inch thick PVC coating. UL approved for Class 2 wiring for 24 volts, 60 cycle AC, use UL recognized waterproof connectors to connect control wires to solenoids.
 - 1. Use UL recognized waterproof connectors to connect control wires to solenoids.
 - a. Spears Drysplice DS400 or Equal.
- H. Valve Boxes:
 - 1. Rectangular valve boxes shall be green plastic 12-inch wide, 18 inch long, and 12-inch deep (outside dimensions) or larger as may be required to provide specified clearances.

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- a. NDS #314BCB or Equal.
- 2. Round valve boxes shall be green, 7-inch diameter by 10-inch high with locking cover.
 - a. NDS #312BCB or Equal.
- 3. Covers on valve boxes shall be vandal resistant, locking, and marked "Water". Tops of boxes shall be set flush with finished turf grade or 2-inch above grade in shrubbery or groundcover areas.
 - a. The cover shall be identified with 3-inch high stenciled letters "RCV (with Station No.) GV for Gate Valve, or QC for Quick Coupler.
 - b. Dura Boxes are not allowed.

PART 3 - EXECUTION

4.01 CONNECTIONS TO SUPPLY

- A. Source of water supply shall be as indicated on the Drawings.
- B. Connection to piping shall be provided with proper fittings:
 - 1. When connecting to point of connection (POC) above grade pipes shall be copper with required fittings unless otherwise indicated.
 - 2. POC from above to below grade transition shall be copper pipe to a depth of 18 inches from top of pipe.
 - 3. No steel pipe or fitting shall be installed below grade.
 - 4. When connecting plastic pipe to copper below grade, provide a schedule 80 PVC nipple.
 - 5. Exposed copper or brass material above grade shall be painted green in color.
 - 6. Connect steel and copper pipe or tube with a 6-inch brass nipple.

4.02 PIPE INSTALLATION

- A. Excavate trenches deep enough to provide earth coverage of 12 inches for non-pressure lines and 24 inches for pressure lines, from finished grades to top of pipe. Bottom of trenches shall be free of rocks, clods and other sharp-edged objects. Below grade piping shall be installed on a firm sand bed for its entire length.

4.03 PLASTIC PIPE AND FITTINGS SHALL BE SOLVENT WELDED. PVC PIPE ENDS SHALL BE CUT NINETY (90) DEGREES AND CLEANED OF CUTTING BURRS PRIOR TO CEMENTING. USE APPROVED REAMING TOOL. PIPE ENDS SHALL BE WIPED CLEAN WITH A RAG AND LIGHTLY WETTED WITH PVC PRIMER. CEMENT SHALL BE APPLIED WITH A LIGHT COAT ON THE INSIDE OF THE FITTING AND A HEAVIER COAT ON THE OUTSIDE OF THE PIPE. PIPE SHALL BE INSERTED INTO THE FITTING AND GIVEN A QUARTER TURN TO SEAT THE CEMENT. EXCESS CEMENT SHALL BE WIPED FROM THE OUTSIDE OF THE PIPE. THE PIPE WILL BE TESTED AS INDICATED IN PARAGRAPH 1.07.

- A. Cure welded joints at least 15 minutes before moving or handling, and at least 24 hours before applying pressure to system, unless otherwise recommended by joint solvent manufacturer.

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- B. Irrigation piping installed under a driveway or sidewalk shall be sleeved. The sleeves shall be two pipe sizes larger than the pressure piping.
- C. Piping through cement and asphalt pavement shall be L type copper with ¼ inch of foam wrap or other required material around the pipe to allow for expansion.
- D. Holes cored through walls shall be two pipe sizes larger to allow for foam wrap around pipe.
- E. PVC pipes shall not be installed above grade unless reviewed by the Architect.
- F. Lettering shall be face up on below grade PVC piping. Pipe serving tree areas shall be located not more than 30 inch from center of tree area.

4.04 IRRIGATION HEAD INSTALLATION

- A. Install sprinkler heads with 100 percent triangulated head to head coverage or other required 100 percent head to head coverage method where indicated.
- B. To insure proper coverage spray heads and rotary heads shall be installed on separate control valves.
- C. Install heads and or change heads, nozzles, or orifices as may be required to provide coverage.
- D. Branch lines, swing joints or sprinkler risers shall not be sized smaller than the sprinkler heads inlet they serve.
- E. Rotary Heads:
 - 1. Prior to installing heads, thoroughly flush main and lateral lines with full line pressure. Repeat whenever system is opened up for repairs or replacements. Start flushing operation at highest point of delivery and proceed to lowest.
 - 2. Risers to rotary heads shall be installed plumb and secured in position with thoroughly compacted sand.
 - 3. In new turf fields, rotary heads shall be temporarily set 3 inch minimum above grade and then lowered into permanent position as required.
 - 4. Rotary heads in turf areas shall be provided with rubber tops.
 - 5. Part circle rotor heads shall be adjusted to minimize spray water onto adjacent track or paving surfaces.
 - 6. Adjust spray nozzles to minimize overspray and so entire system will be evenly balanced as required.
 - 7. Install rotary heads on factory assembled triple-swing joints or triple-swing joints assembled with PVC Schedule 80 nipples and Marlex 90 degree elbows.
 - 8. Unless overspray or run off flows into the landscaping then overhead irrigation is not permitted within 24 inches of non-permeable surfaces.
- F. Pop-up Head Installation:
 - 1. Pop-up head shall be installed flush with finished grade and 24 inch from edge of walks, and 9 inches from buildings to parking areas.
 - 2. Install pop-up heads on factory assembled triple-swing joints or triple-swing joints assembled with PVC Schedule 80 nipples and Marlex 90 degree elbows.

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4.05 VALVE BOX INSTALLATION

- A. Automatic control valves shall be enclosed in valve boxes of HDPE or polyolefin fibrous material, with locking lids.
- B. Valve boxes shall be of sufficient size to provide no less than 1-1/2 inch of clearance on all sides of equipment installed within. The bottom section shall be slotted so as to extend below the pipe. Extensions shall be added as required to meet grade requirements.
- C. Valve boxes installed in concrete or asphalt shall be set one inch below pipe and extensions shall be added as required to meet grade requirements. A homogeneous finished material shall surround valve boxes 4 inches below finished grade and match existing grade conditions.
- D. Valve boxes shall be installed level to finish grade except in ground cover areas which shall extend 2 inches above finish grade.
- E. Bottom of valve boxes shall be set level on 4 full size corner bricks on 2 inches of gravel bed.
- F. Pea gravel shall be filled up to the bottom of the manual and remote valve and at least 4 inches of gravel inside of the valve box.

4.06 QUICK COUPLER VALVES AND ASSEMBLIES

- A. Quick couplers shall be one inch brass with one or two piece bodies and locking brass tops with rubber cover.
 - 1. For typical Baseball infield application behind Pitcher's mound, use quick coupler installed in 8-inch round, bolted, yard box.
 - 2. For football fields, install quick coupler up against cement curb surrounding the football field, and as indicated on the drawings.
 - 3. For athletic fields, install at the perimeter of the field, and as indicated on the drawings.
 - 4. In other applications, install next to walkways.
 - 5. Top of quick coupler assembly shall be installed within 2 inches from bottom of cover.
 - 6. Quick Coupler supply piping shall originate from a Point of Connection upstream of the Master Valve.

4.07 HOSE BIBS

- A. Hose bibs are prohibited.
- B. Where hose bib connections are needed provide a quick coupler valve..

4.08 VALVES

- A. Isolation and Shut-Off Valves:
 - 1. Pressure piping system shall be furnished with valves at points indicated on Drawings or specified.
 - 2. Valves shall be installed with neat appearance and groupings, so parts are easily accessible. Valves near walks, curbs etcetera, to be set-in 12 inches and parallel to the adjacent surface. Remote control valves shall be installed in ground cover or shrub areas wherever possible.
 - 3. Valves shall be full size of line in which they are installed unless otherwise indicated.
- B. Remote Control Valves:

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1. Remote control valves shall be low wattage (24 volts,) and shall be capable of operating properly on no larger than #14 gage UF wire.
2. Remote control valves shall be adjustable to control flow of water through valve adjustments and shall be accessible through valve boxes installed above each valve. Valves shall be highest quality of manufacturer.
3. Remote control valves shall be installed and adjusted so that sprinkler heads operate at pressure recommended by head manufacturer. Remote control valves shall be adjusted so that sprinkler heads to planting areas from each individual valve system applies a uniform distribution of water.
4. Remote control valves on any line shall be installed 3-inch minimum, 8-inch maximum below finish grade to top of flow control stem.
5. Remote control valves shall be installed with schedule 80 PVC nipples on each side of the valve.
6. Valves for lawn and shrub areas shall be installed within the perimeter of the area it serves. The location shall be accessible within 12 inches from curb or sidewalk and installed in a location to avoid wetting the person operating the valve manually.
7. Remote control valves for athletic fields shall be installed in one of the following specified locations:
 - a. Control valves shall be installed in groups of three or more. They shall be installed on the perimeter of the athletic field in valve boxes.
 - b. Control valves above ground shall be grouped together and installed on the perimeter outside of the athletic field, on a copper manifold and enclosed in a secure fenced enclosure.

4.09 CONTROLLER, CLOCK AND ENCLOSURE

- A. Refer to plan.

4.10 CONTROL WIRE

- A. Mainline control wires shall be taped together at five foot intervals with black electrical tape, then laid parallel to pressure line with 18 inches minimum cover to finish grade.
- B. Control wiring located under paved areas shall be encased in Schedule 40 PVC pipe and shall extend a minimum of 12 inches beyond pavement.
- C. Wires shall be color coded, white for common ground wire, red or black for valve control wires.
- D. Wire splicing shall only be performed in controller cabinet and at remote control valve boxes. Splices shall be made with a mechanical connector equal to Spears Dry Splice Wire Connectors and encased in epoxy resin to provide a permanent watertight connection.
- E. Stubbed out control wires shall terminate in concrete yard boxes.
- F. Wire passing under future or existing paving or structures shall be encased in Schedule 40 PVC pipe extending at least 12 inches beyond edges of the paving or structure.

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4.11 COVERAGE TEST

- A. When sprinkler system has been completed, perform a coverage test to determine if coverage of water to turf and planting areas is complete and adequate.
- B. Make adjustments, add heads, change heads, nozzles or orifices as may be required to provide complete coverage and provide layout indicated on Drawings.

4.12 PRESSURE TEST

- A. After welded joints have cured at least 24 hours and before sprinkler heads are installed, flush out lines and cap outlets. Test system under normal street water pressure, in presence of the Project Inspector.
- B. Joints shall remain exposed for examination during pressure test. Center load pipe with small amount of sand to prevent arching or slipping under pressure. Use normal street water pressure for test. Maintain pressure on plastic pipe for not less than four hours.
- C. Replace or repair system, including joints that fail during pressure test. Repeat pressure testing until entire system passes the test period without leaks.

4.13 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

4.14 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site. Hard surfaces shall be washed clean. Daily clean up shall be required on areas used for circulation, parking, or other use.

END OF SECTION

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**SECTION 32 92 00
TURF AND GRASSES**

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes the furnishing and installation of materials for lawns and grasses. Products shall be as follows or as directed by the OWNER. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 01 25 00- Substitution Procedures.
 - 3. Section 31 22 00 - Grading.
 - 4. Section 32 13 13 – Concrete Paving
 - 5. Section 32 84 13 - Irrigation System
 - 6. Section 32 93 00 – Plants.
- C. Section Includes:
 - 1. Sodding.
 - 2. Turf Renovation.
 - 3. Erosion-control material.
- D. Definitions:
 - 1. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
 - 2. Finish Grade: Elevation of finished surface of planting soil.
 - 3. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
 - 4. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
 - 5. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and

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mice), unwanted plants (weeds), fungi, bacteria, and viruses.

6. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
7. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
8. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.
9. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.02 SUBMITTALS

- A. Comply with provisions of Section 01 3300.
- B. Product data: For each type of product indicated.
- C. Certification of each seed mixture for turfgrass sod as directed.
- D. Product Certificates: For soil amendments and fertilizers, from manufacturer.
- E. USGA Sand based Rootzone import material with additives. Provide product data sheets, pre-mix source and location, plus a one gallon physical sample review.
- F. Sod: Furnish certificate by grower for type, and trueness to name of grass variety or strain. Where or seed issued, provide quality to be delivered.

1.03 QUALITY ASSURANCE

- A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
- B. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory.
 1. The soil-testing laboratory shall oversee soil sampling.
 2. Report suitability of tested soil for turf growth.
 - a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.

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1.04 DELIVERY, STORAGE AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. Sod: Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.
- C. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.05 MAINTENANCE SERVICE

- A. See Specification Section 32 0190 for lawns & grasses Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Begin maintenance immediately after each area is planted and continue until acceptable turf is established.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Turfgrass Sod:
 - 1. Turfgrass Sod: Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects. Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
 - 2. Turfgrass species (warm-season grass): Hybrid Bermudagrass (*Cynodon dactylon*).
 - 3. Turf Grass species (cool season grass): Tall Fescue (*Festuca arundinacea*), Improved varieties, as specified on plans.
- B. Elementary School/Primary Center:
 - 1. General Sod Areas are to be sod or roll sod: Tall Fescues.
 - 2. Multi Purpose field:
 - a. Sod or Roll Sod: Hybrid Bermuda.
- C. Middle Schools/High Schools:
 - 1. General Sod Areas:
 - a. Sod or Roll Sod: Tall Fescues.

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2. Baseball/Softball (enclosed):
 - a. Infield: Sod or Roll Sod: Hybrid Bermuda.
 - b. Outfield: Big Roll Sod: Hybrid Bermuda.
 3. Football/Soccer Field:
 - a. Big Roll Sod: Hybrid Bermuda.
 4. Multi-Purpose Fields:
 - a. Big Roll Sod: Hybrid Bermuda.
- D. For USGA Sand Based Rootzone (if specified).
1. Root zone for sand based athletic turf and materials.
 2. Pre-manufactured Sport Sand by Gail Materials, or Equal.
 3. USGA Sand Growing Medium: Refer to detail on approved plans for depth.
 - a. Sand shall meet the following gradation:

Sieve	Percent Retained
#10	<3%
#18	20-30%
#35 & #60	>50% combined
#100	<20%
#270	<5%
PAN	0-5% Combined

- b. CU coefficient between 2.5 - 5.0.
4. Amendments:
 - a. Blend peat moss at the rate of 10% by volume. Final organic content shall be 0.4 - 0.8% by weight.
 - b. Reed Sedge Peat Moss 10% by volume of mix.
 - c. Lassenite Pozzolan porous ceramic soil amendment 5% 8X20 per cubic yard.
 - d. Fertilizer 6-20-20 mix 15 lbs. per cubic yard.
 - e. Gypsum, mix 50 lbs. per cubic yard.
 - f. Mycorrhizal fungi - MycoApply® All Purpose granular material mix 1.5 pounds per 1,000 sq.ft.
 - g. AxisDE® diatomaceous earth 10% by volume of mix.

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5. Chemistry:
 - a. Salinity: Saturation extract conductivity (ECe) shall be less than 3.0 dS, @ 25 degree C.
 - b. Sodium: Sodium absorption ratio (SAR) shall be less than 6.0.
 - c. Boron: Saturation extract concentration shall be less than 1.0 ppm.
 - d. Reaction pH of saturation paste shall be 5.5 to 7.8 without height lime content.
 6. Location:
 - a. Use in designated field areas.
 - b. Depth shall be per details.
 7. Available through Gail Materials, Corona.
- E. Inorganic Soil Amendments:
1. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - a. Class T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve, or Class O, with a minimum of 95 percent passing through No. 8 (2.36-mm) sieve and a minimum of 55 percent passing through No. 60 (0.25-mm) sieve.
 - b. Provide lime in form of ground dolomitic limestone.
 2. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve
 3. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
 4. Aluminum Sulfate: Commercial grade, unadulterated.
 5. Perlite: Horticultural perlite, soil amendment grade.
 6. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.
 7. Sand: Clean, washed, natural or manufactured, and free of toxic materials.
- F. Organic Soil Amendments:
1. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) or 3/4-inch (19-mm) or 1/2-inch (12.5-mm), as directed, sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

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- a. Organic Matter Content: 50 to 60 percent of dry weight.
 2. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
 - a. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15 lb/cu. ft. (2.4 kg/cu. m) of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25 lb/cu. ft. (4 kg/cu. m) of loose sawdust or ground bark.
 3. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.
- G. Fertilizers:
1. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.
 2. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
 3. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - a. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - b. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
 4. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - a. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

Or:

 - b. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- H. Planting Soils:
1. Planting Soil: ASTM D5268 topsoil, with pH range of 5.5 to 7 Imported topsoil or manufactured topsoil from off-site source. Verify suitability of soil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant

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growth. Mix soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:

- a. Ratio of Loose Compost to Topsoil by Volume: 1:3.
- b. Ratio of Loose Wood Derivatives to Topsoil by Volume: as directed by the OWNER.
- c. Weight of Iron Sulfate per 1000 Sq. Ft.: as directed by the OWNER.
- d. Weight of Agricultural Gypsum per 1000 Sq. Ft.: as directed by the OWNER.
- e. Volume of Sand per 1000 Sq. Ft.: as directed by the OWNER.
- f. Weight of Bonemeal per 1000 Sq. Ft.: as directed by the OWNER.
- g. Weight of Superphosphate per 1000 Sq. Ft.: as directed by the OWNER.
- h. Weight of Commercial Fertilizer per 1000 Sq. Ft.: as directed by the OWNER.
- i. Weight of Slow-Release Fertilizer per 1000 Sq. Ft.: as directed by the OWNER.

I. Mulches:

1. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - a. Organic Matter Content: 50 to 60 percent of dry weight.

J. Erosion Control Materials:

1. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
2. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.
3. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, 4-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.

PART 3 – EXECUTION

3.02 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations. Protect grade stakes set by others until directed to remove them.

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- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil- bearing water runoff or airborne dust to adjacent properties and walkways.

3.02 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than ¾" inch in any dimension, and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off OWNER's property.
 - 1. Apply superphosphate fertilizer directly to subgrade before loosening.
 - 2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 - 3. Spread planting soil to a depth of 6 inches, but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet
 - a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.
 - b. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
 - 1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
 - 2. Loosen surface soil to a depth of at least 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 6 inches of soil. Till soil to a homogeneous mixture of fine texture.
 - a. Apply superphosphate fertilizer directly to surface soil before loosening.
 - 3. Remove stones larger than 3/4 inch in any dimension and sticks, roots, trash, and other extraneous matter.

Legally dispose of waste material, including grass, vegetation, and turf, off OWNER's property.
- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

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- F. Before planting, obtain the OWNER's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- G. For USGA Rootzone for Sand Based Turf (if specified):
 - 1. The thoroughly mixed root zone material shall be placed on the areas designated for Athletic turf and firmed to a uniform depth of 6 inches (300mm) minimum or as detailed. Mix shall be moist when spread to discourage migration into the subgrade and to assist forming.
 - 2. See Planting Plans for turf locations.
 - 3. Finish grade shall be rolled with a water drum 1,000 lbs max.
 - 4. Finish grade of the rootzone sand shall be 1/8" over 10'-0".
 - 5. Installed product shall be saturated to 100% bearing capacity to ensure no void spaces exist and the material has been properly installed. Irregularities shall be top dressed and skimmed as necessary to provide an even surface free from depressions or varying firmness. Compact per geotechnical recommendations 85% relative compaction 5% above optimum moisture content minimum.
 - 6. ARCHITECT shall review and approve the Finished Surface prior to laying sod.
 - 7. Reserve additional USGA sand based rootzone material for top dressing the installed sod.

3.03 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
- B. Fill cells of erosion-control mat with planting soil and compact before planting.
- C. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- D. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.04 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across angle of slopes exceeding 1:3.

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2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- C. Sod or Roll Sod: type, thickness, and areas of installation shall be in accordance with Drawings and Specifications.
- D. Remove roll sod netting prior to installation.
- E. Lightly irrigate within two hours after installing sod and before rolling. Roll seams and joints until sod is well bonded to sub-grade.
- F. Water area thoroughly to penetrate sub-grade at least 8 inches. Repeat watering as necessary to keep sod moist until rooted in sub-grade. Protect sod areas against foot traffic until sod is well established. Replace damaged areas with new sod.
- G. Sand leveling shall occur post sod installation. Topically apply USGA sand growing medium to fill low spots and proof roll the sod for a uniform surface. Finish grade shall not deviate more than 1/8" in 10'-0". Lawn mower wheels shall not pump or yield atop the surface after installation. A maximum of 1/4" of sand can be applied.

3.05 TURF RENOVATION

- A. Renovate existing turf damaged by CONTRACTOR's operations, such as storage of materials or equipment and movement of vehicles, or due to lack of maintenance during construction activities.
 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 2. Install new planting soil as required.
 3. Rake, drag, float and roll seed bed as often as necessary to produce a true, uniform, and smooth seed bed. Remove debris, stones, etcetera.
- B. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- C. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from CONTRACTOR 's operation and replace with new planting soil.
- D. Mow, dethatch, core aerate, and rake existing turf.
- E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off OWNER's property.
- G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- H. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 6 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
- I. Apply seed and protect with mulch as required for new turf.

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- J. Water seed bed thoroughly until a moisture penetration of 8 inches is achieved.
- K. Seed mixture shall be sown at following rates:
 - 1. Common Bermuda: 4 pounds per 1000 square feet or as recommended by manufacturer.
- L. Seeding by hand, "Cyclone" type seeder, or pushed seeder shall be done in two passes at right angles to each other using 50 percent of specified rate for each pass. After seeding, apply a top dressing of wood residuals at rate of 3/4 cubic yards per 1,000 square feet.
- M. Large sod areas shall be seeded by using "Brillion" type seeder. Areas inaccessible to seeder shall be handed seeded and seed raked lightly into top 1/4 inch of seed bed.
- N. Irrigate immediately after completion and irrigation as frequently as necessary to assure complete germination of seed without creating run-off.
- O. Areas that do not germinate satisfactorily shall be reseeded at proper intervals until an overall acceptable stand of grass is produced. Good turf coverage will be required before final acceptance of work.
- P. Protect new sod from damage by erosion, trespass or any source. Safeguards and temporary fencing shall be erected where necessary, and precautions taken to prevent excessive runoff.
- Q. Hydro-Seeding (Supplement of Sod Area):
 - 1. Mix slurry of seeds and fertilizer to produce a homogeneous slurry mixture in designated proportions. Discharge system shall apply slurry at a continuous and uniform rate.
 - 2. Immediately after application, irrigate seeded areas thoroughly. Application pattern shall conform to irrigation system so that watering can be accomplished in a timely sequence.
 - 3. Program watering so that repeated watering at short application times can be made to prevent excessive runoff and to prevent erosion.
 - 4. Prior to planting, hydro-seeding shall be done. Abutting ground cover beds shall be neatly trimmed to forms and lines shown on drawing.
 - 5. Areas that do not germinate satisfactorily shall be reseeded at 14-day intervals until an overall acceptable stand of vegetation is achieved.
- R. Hydroseed slurry: Proportions to be as follows:

	Manufacturers
Seed mix (see paragraph 2.01)	Recommendation
Wood Cellulose fiber (dyed green)	2000 pounds per acre
M-Binder Soil Stabilizer	100 pounds per acre

Triple Super Phosphate	250 pounds per acre
Water and Dye	As needed

3.06 TURF MAINTENANCE

- A. See Specification Section 32 0190- Operation and Maintenance of Planting for Turf and Lawn Care.
- B. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

3.07 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by ARCHITECT:
 - 1. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even- colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities
- B. Use specified materials to re-establish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.08 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION

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**SECTION 32 93 00
PLANTS**

PART 1 – GENERAL

1.01 SUMMARY

- A. Provide labor, material, equipment, and appliances necessary to provide trees, plants, and ground cover as indicated on Drawings, specified, and as required for a complete installation.

1.02 RELATED REQUIREMENTS

- A. Section 32 84 23 – Irrigation System

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils (Withdrawn 2016).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Submit complete lists of landscape materials and equipment to be used, including manufacturers name and address, specific trade names, catalog numbers complete with illustrations and descriptive literature and clearly mark or underline proposed items; list sources of landscape topsoil.
- C. Material List: Plant materials list.
- D. Certification: In addition to other required certification, furnish a certificate with each delivery of bulk material, including topsoil, planter mix soil, bark mulch, stating its source, quantity, type of material furnished and that such item or material conforms to requirements of this section.
- E. Sample: Submit topsoil Sample and soil amendments with analysis.
- F. Fertilizer analysis: Provide labels of each fertilizer used and quantities used at each applications recommended in Soil Analysis Report.
- G. Soil Test: After completing soil rough grading, have soil tested for fertility and agricultural suitability. Soil shall be tested from minimum of (1-2) locations per acre of planted area. Record locations where samples were taken. A copy of soil test results shall be submitted to District and Architect before landscape work begins. Pay cost of soil test.
- H. Sod: Furnish certificate by grower for type, and trueness to name of grass variety or strain. Where or seed issued, provide quality to be delivered.

1.05 QUALITY ASSURANCE

- A. Workers: Furnish skilled workers thoroughly trained and experienced in required crafts and familiar with specified requirements for proper performance of Work of this section.

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- B. Codes and Regulations: Materials, fabrication, and installation in this section shall comply with applicable State Codes and Regulations. Deliver permits and testing certifications to Project Inspector.
- C. Quality and Size: Comply with current edition of "Horticultural Standards" for number one nursery stock as adopted by "American Association of Nurserymen".
- D. Plants:
 - 1. True to name, with name of plants in accordance with standards of practice of "American Association of Nurserymen."
 - 2. Botanical names take precedence over common names.

1.06 GENERAL REQUIREMENTS

- A. Project Inspector will verify that irrigation systems are operating before starting Work of this section.
- B. Inspection: Notify Architect at least 72 hours in advance to schedule following inspections:
 - a. Plant material at time of delivery to Project site.
 - b. Finish grades prior to sodding or seeding areas.
 - c. Landscape construction items prior to start of maintenance of plant establishment period.
 - d. Final inspection.
- C. Existing Utilities and Plant Materials:
 - 1. Protect utilities and plant materials from damage.
 - a. Perform modifications only as permitted by Architect, in accordance with applicable provisions noted or specified on Drawings, or in other sections of these Specifications.
 - 2. Replace damaged plant material with like type and size material. Architect shall determine cost of irreplaceable plant material according to "square inch" method as described by Council of Tree and Landscape Appraisers' "Manual for Plant Appraisers" handbook, Current Edition, and "Guide for Establishing Values of Trees and Other Plants".
- D. Verification of Dimensions and Quantities:
 - 1. Verify scaled dimensions and quantities before starting landscaping Work.
 - 2. Promptly notify Architect of any discrepancies between Drawings, Specifications or actual Project site conditions.
- E. Pest Management Method and Products:
 - 1. Contractor shall ensure that plants provided are clean, healthy, free of physical damage, and show no symptoms of abiotic injury. Plants must also be free of diseases, arthropod pests, and any other type of plant pests. Before applying pesticides to plants on District property, the following criteria must be met:
 - a. Individuals who apply pesticides on behalf of contractor's company must have a Qualified Applicator License in appropriate category of pest control issued by California Department of Pesticide Regulation and registered to conduct pest control for hire as a business by Los Angeles County Agricultural Commissioner's Office.

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- b. Products used must be listed on District's OEHS approved product list.
- c. Length of time from date of use of a pesticide products until beneficial occupancy by Owner may not be less than five half lives of products used.
- d. Contact District's Pest Management Department at (213) 743-1102 prior to any pesticide application to verify items above.
- e. Complete written records of pesticide applications made by a contractor and or their representative on District property, must be provided to District's Pest Management Department within 10 days of applications.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Plants shall be protected in transit and after delivery to Project site.
- B. Plant materials damaged in planting operations shall be replaced.

1.08 WARRANTY

- A. Shrubs and groundcover shall be growth and health guaranteed by installer for a period of 90 days after completion of maintenance period. Trees shall be installer guaranteed to live and grow in upright position for a period of one year after completion of maintenance period.
- B. Within 15 days after notification by Owner, remove and replace failed plantings. Replacement plantings shall be guaranteed as specified for original plantings.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Topsoil: Designated as imported topsoil as specified herein. Soil test will determine suitability of topsoil before installation. Transport topsoil from source to its final position unless stockpiling is specified. Test in compliance with Section 31 23 23 - Fill.
 - 1. Imported Soil:
 - a. Shall be from a source outside Project site and in compliance with this section.
 - b. Architect may make such inspections and perform such tests as deemed necessary to determine material meets all requirements.
 - c. At least 30 days before scheduled installation, submit proposed source of topsoil and a sample to Architect. Submit a written request for review, accompanied by a written report stating that proposed source complies with these specifications by a testing laboratory registered by State of California for agricultural soil evaluation.
 - d. Comply with recommendations of soils testing laboratory and provide any soil amendments necessary to achieve proper nutrient levels to support healthy plant growth.
 - e. Imported topsoil shall be of a uniform composition and structure, fertile and friable sandy loam soil, and be free of roots, decay, subsoil, clods and stones larger than ¼ inch in greatest dimension, pockets of coarse sand, noxious weeds, sticks, brush and other litter and not be infested with nematodes or other undesirable insects and plant disease organisms. Imported topsoil shall meet following additional requirements:

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- 1) Gradation Limits: Sand – 50 to 80 percent, clay – 20 percent maximum, and silt – 30 percent maximum. Sand, clay and silt gradation limits shall be as defined in ASTM D422.
 - 2) Agricultural Suitability and Fertility: Topsoil shall be fertile and friable garden soil suitable for sustaining and promoting growth of specified plants.
 - 3) Electrical conductivity less than 2.0 milliohms/centimeter or DS/m.
 - 4) Boron content maximum of 1.0 part per million.
- B. Fertilizers and Conditioning Materials: Comply with applicable requirements of State of California Agricultural Code:
1. General:
 - a. Fertilizing materials shall be packaged, first grade, commercial quality products identified as to source, type of material, weight and manufacturer's guaranteed analysis.
 - b. Fertilizing material shall not contain toxic ingredients and fillers in quantities harmful to animal, human or plant life.
 - c. Submit a certificate of compliance stating material substantially meets Specifications in accordance with provisions of Article 1.03B.
 2. Materials:
 - a. Bone Meal: Commercial raw bone meal shall be finely ground, steamed dry material with a minimum analysis of 2.5 percent nitrogen and 22 percent phosphoric acid.
 - b. Gypsum: Hydrated calcium sulfate produce containing 23 percent calcium and 18 percent sulfur with a guarantee analysis of 84 percent calcium sulfate.
 - c. Soil Sulfur: Guarantee analysis of 99 percent sulfur.
 - d. Superphosphates: First grade finely ground phosphate rock used for agricultural purpose, containing minimum 18 percent phosphoric acid by volume.
 - e. Commercial Fertilizer: Pellets or granular product having a chemical analysis of 14-14-14, with a minimum of 68 percent of nitrogen from slow release nitrogen unless otherwise specified in Soil Analysis Report: it should be a free flowing material delivered in unopened bags, do not install material which becomes caked or otherwise damaged.
 - f. Nitrogen Fortified Wood Product: Derived from redwood, fir or cedar sawdust or from bark of fir or pine treated with a non-toxic agent to quickly absorb water and comply with following requirements:

1) Gradation:

Sieve Size	Percent Passing
¼-inch	95 percent minimum
#8	80 percent minimum
#35	30 percent minimum

2) Nitrogen Content:

Nitrogen Content	Percent Dry Weight
Redwood	0.4 to 0.6 percent

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Nitrogen Content	Percent Dry Weight
Fir	0.56 to 0.84 percent
Cedar	0.56 to 0.84 percent
Fir Bark	0.8 to 1.2 percent
Pine Bark	0.8 to 1.2 percent

- 3) Salinity: Maximum saturation extract conductivity 2.5 milliohms/centimeter at 25 degrees Celsius.
 - 4) Absorption: When one teaspoon of water is applied to 4 cubic inches of air-dried products, material shall become completely damp in a period of less than 2 minutes. Kellogg KRA, Sequoia Redwood/Cedar Blend or White Fir, Long Beach Soil Preparation, Bandini #101 Redwood Soil Builder or nitrogenized wood amendment.
- g. Organic Fertilizer: Treated, relatively dry friable organic compost derived from sewage sludge processed for agricultural use; containing at least 1 percent nitrogen by dry weight, 2 percent phosphoric acid and comply substantially with gradation noted in sub-section 2.1, B6. Milorganic, Kellogg's Nitrohumus, or equal.
 - h. Fertilizer Tablets shall be tightly compressed, long lasting, slow release tablets derived from urea, methylene ureas, calcium phosphate, potassium sulfate, calcium sulfate, magnesium oxide, sodium borate, copper sulfate, iron sulfate, manganese sulfate, and zinc oxide. N-P-K shall be 20-10-5. Tablet size shall be 21 grams. Rate and application shall be per these specifications and Contract Drawings.
- C. Prepared Backfill mix:
1. To be based upon recommendations from soils test performed by a certified laboratory.
 2. Mix (for bidding purposes):
 - a. Seventy percent by volume clean excavated topsoil/import soil.
 - b. Thirty percent by volume nitrogen stabilizer wood residual.
 - c. One pound per cubic yard gypsum.
 - d. Two pounds fertilizer per cubic yard (14-14-14 with a minimum 68 percent of nitrogen from slow release nitrogen. Additional secondary and micronutrients preferred).
- D. Plants (General): Plant names indicated or listed on Drawings shall conform with Sunset, Western Garden Book, latest edition.
1. Type and Size: Plant materials shall be listed on Drawings.
 2. Plants shall be true name, and one of each bundle or lot shall be tagged with Botanical/Common name and size of each plant in accordance with standards of practice recommended by American Association of Nurseryman
 3. Tag one plant of each variety for identifying purposes.
 - a. Plantings shall be inspected before installation.
 4. Substitutions: When plants of a specified kind or size are not available, substitution may be requested in accordance with Section 01 60 00 - Product Requirements.

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5. Plants shall have a growth habit normal to species in accordance with USA Standards for Nursery Stock, latest editions; shall be sound, healthy, vigorous, and free from insect pests, plant disease, sun scalds, fresh bark abrasions, excessive abrasions or other objectionable disfigurements. Tree trunks shall have normal well developed branch systems and vigorous and fibrous root systems, not root bound and shall be free of kinked or girdling roots.
 6. Plantings specified for adverse conditions shall be Project site acclimated before planting. Purchase from local nurseries or store on Site for a period of 10 weeks for autumn planting and six weeks for spring planting.
- E. Plant Material:
1. Grass Seed: First quality from a new crop seed.
 2. Use non-hulled seed except during months of May through September. During remaining months provide hulled seed.
- F. General Materials:
1. Pipe: Galvanized steel, standard weight (schedule 40) complying with ASTM A53/A53M.
 2. Nails, fasteners, etc.: Galvanized and commercial quality materials.
 3. Fabricated metal items: Steel conforming to ASTM A36/A36M.
 4. Concrete items: Standard 2000 psi concrete.
- G. Concrete headers: 6-inch by 8-inch size, complete with pre-molded expansion joint material 10 ft. apart or as indicated on Drawings.
- H. Pest Management Methods and Products: Refer to General Requirements of this section for details pertaining to Contractor applying pesticides.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine areas and conditions under which Work of this Section will be performed. Correct detrimental conditions before commencing Work of this section.

3.02 GRADING AND SOIL PREPARATION

- A. Initial Rough Grading: Specified in Division 31 - Earthwork.
- B. Earthwork and Topsoil Placement: Shall include excavation and backfilling for irrigation system and preparation for spreading, densification, cultivation, and raking of topsoil, including fertilization and conditioning.
- C. Preliminary Grading: Scarify existing soil to a depth of 6 inches before backfilling with topsoil. During preliminary grading operation, remove stones over ¾ inch.
- D. In Previously Paved Areas: Remove top 6 inches of existing soil and legally dispose of off Project site. Replace with approved imported topsoil to indicated finish grade.
- E. Topsoil Preparation and Conditioning:
1. Type and Thickness: Topsoil shall have a minimum depth of 6 inches above subgrade or as indicated on Drawings, whichever is greater.

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2. Before installing topsoil, subgrade shall be cleared of weeds, rock $\frac{3}{4}$ inch and larger and other extraneous materials from designated planting areas to a depth of 6 inches. The tools acceptable for this cleaning process are a Rock Picker by Harley Enterprise, Track Screener by Cherrington, Screen USA Inc. or other tools or machines designed for the purpose. The finished planting bed preparation is subject to the approval of the Owner's representative. OAR shall coordinate with the Owner's Landscape Office for a site visit and approval prior to plant/lawn installation.
 - a. Do not process topsoil when it is so wet or dry as to cause excessive compaction or forming of hard clods or dust.
 3. Existing soil can be used as topsoil only if it meets the General Requirements of this section.
- F. Fertilizing and Conditioning: Provide planting areas to finish grades, including mounds, before installation of specified fertilizer or soil conditioning materials.
1. Mechanically install following amount of fertilizer or soil conditioning materials at a uniform rate per 1,000 square feet of planting area:
 - a. Three cubic yards of nitrogen fortified wood compost.
 - b. Two cubic yards of organic fertilizer.
 - c. One hundred pounds. of gypsum.
 - d. Thirty pounds of commercial fertilizer.
 2. Quantities of required materials for planting areas shall be at Project site. Furnish Project Inspector with delivery tickets before installation to verify source, kind, and quantities delivered.
 3. After installation of fertilizer and soil conditioning materials, uniformly cultivate materials into upper 6 inches of soil with suitable equipment operated in at least two directions at approximate at right angles. Process soil until friable.
- G. Finish Grading:
1. Provide a finish grade, smooth, uniform, and free of abrupt grade changes and depressions to insure proper surface drainage.
 2. Finish grades adjacent to paving curbs or headers shall be 1 inch lower in sod areas and 2 inches lower in shrub or ground cover areas.
 3. Irrigate soil after installation of fertilizer and soil conditioning materials. Allow soil to settle. Provide a stable surface. After soil has dried out to a workable condition, re-grade, rake, and smooth to required grades and contours. Finished surfaces to be left clean and suitable for planting.
 4. Areas to be planted shall be graded and floated to provide complete surface drainage; water holding depressions and pockets shall be eliminated. Undulations and unsightly variations in grade which will not permit the use of normal mowing equipment without scalping or missing shall be removed so that proper use of mowing equipment can be performed.
 5. Areas to be planted shall also be finished graded to meet any walks, paths or other adjoining surfaces so that, after compaction, no water pockets or ridges remain.

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- 6. Areas where sod will interface with other modes of planting at catch basins and paved areas shall be finish shaped so as to counter sink the sod one inch such that once sod is placed, it shall be at grade with adjacent planting bed.
- H. Contour mounds: Construct with imported topsoil and specified soil amendments. Install and shape mounds to minimize settlement or erosion and to provide adequate footing for placement of boulders. Referenced dimensions of mound contours refer to height above finish grade.
- I. Trenching: After completion of soil conditioning or finish grading operations, backfill upper portion of trench so specified topsoil thickness in trench is restored.
- J. Weeding: Once site has been cleared, grubbed and rough graded, landscape areas shall be maintained free of vegetation growth until start of irrigation and planting phase of work.

3.03 HEADER INSTALLATION

- A. Install at locations and grades shown on Drawings, before planting.

3.04 PLANTING

- A. General: Planting materials shall be inspected before planting, including those tagged at nursery.
 - 1. Perform planting with material, equipment and according to procedures favorable to optimum growth of plant. Do not plant during windy conditions.
 - 2. Except as noted for specimen planting in sub-section 3.04D, commence planting operations immediately following completion of irrigation system.
- B. Protection and Storage:
 - 1. Maintain plantings delivered to Project site in a healthy condition.
 - 2. Do not allow plantings to dry out.
 - 3. Separate bare root stock and "heal in" in moist earth or other suitable material.
 - 4. Cover root ball of bailed or burlap wrapped plantings with moist sawdust, wood chips, or other permitted materials.
- C. Layout and Plant Locations:
 - 1. Plant locations indicated on Drawings are approximate.
 - 2. Plants may be re-spotted before planting as required by Architect.
 - 3. Provide a detailed layout of plants and landscape elements in planting areas and obtain review of Architect before actual planting operations.
- D. Backfill Planting Mix: Consists of 70 percent specified topsoil, and 30 percent nitrogen fortified sawdust mulch plus the amendments indicated in soil analysis report.

3.05 MAINTENANCE AND PLANT ESTABLISHMENT

- A. Required: Maintain areas on a continuous basis as they are completed during progress of Work and during establishment period. Maintenance shall include continuous operations of watering, weeding, trimming, rodent control, reseeding, planting replacement irrespective of cause or any other operations necessary to assure normal plant growth.
- B. Keep planting areas free of debris and weeds. Cultivate at intervals not to exceed 10 days.

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- C. Pruning: Required pruning of plants at start of plant establishment period shall be as required by Architect.
- D. Plant Establishment Inspection:
 - 1. Request an inspection to begin plant establishment period after plantings and related Work has been completed in accordance with Contract Documents.
 - 2. Upon successful completion of inspection, effective commencement date of plant establishment period shall begin.
 - 3. Plant establishment period for shrubs and ground cover, shall be 90 calendar days and for trees shall be one year or as otherwise indicated in Contract Documents.
 - 4. Architect may recommend extension of plant establishment period if planting areas are improperly maintained, appreciable plant replacement is required, or other defective Work.
- E. Damage:
 - 1. Immediately replace failed or damaged plantings.
 - 2. Provide replacement plantings of same type and size to match adjacent plantings. Furnish plantings and fertilizer as specified. New plantings shall be subject to a 30 day establishment period.
 - 3. Damage to planting areas shall be repaired immediately. Depressions caused by vehicles or foot traffic shall be filled with topsoil and leveled.
- F. Final Inspection:
 - 1. Upon completion of plant establishment period, Architect will perform a final inspection.
 - 2. If plant establishment period is completed before Substantial Completion, planting areas shall be maintained until Final Completion.

3.06 PESTICIDE APPLICATION

- A. Contractor must comply with specifications outlined in General Requirements of this section.

3.07 PROTECTION

- A. Unless noted otherwise, protect Work of this section until Final Inspection.

3.08 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

END OF SECTION

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