

Rio Mesa High School
Home Bleachers
Oxnard Union High School District

July 2020

Volume 1 of 1
Divisions 00 - 33
DSA 03 - 120515
Project No.: 612-12353-08

LITTLE
DIVERSIFIED ARCHITECTURAL CONSULTING

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**SECTION 00 01 01
PROJECT TITLE PAGE**

FOR

RIO MESA HIGH SCHOOL - HOME BLEACHERS

PROJECT NUMBER: 612.12353.08

DISTRICT

OXNARD UNION HIGH SCHOOL DISTRICT

309 S. K STREET, OXNARD CA 93030

805.385.2500

WWW.OXNARDUNION.ORG

PROJECT LOCATION

RIO MESA HIGH SCHOOL

545 CENTRAL AVENUE

OXNARD , CALIFORNIA 93036

PREPARED BY:

ARCHITECT

LITTLE DIVERSIFIED ARCHITECTURAL CONSULTING

1300 Dove Street, Suite 100, Newport Beach CA 92660

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NOTICE: This Project Manual, is an unpublished instrument of service of the authors.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

SECTION 00 01 02
PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

- A. Project Name: Rio Mesa High School - Home Bleachers, located at:
Project Number: 612.12353.08.
Rio Mesa High School.
545 Central Avenue.
Oxnard, California 93036.
- B. The Owner, hereinafter referred to as District: Oxnard Union High School District
Oxnard Union High School District
309 S. K Street, Oxnard CA 93030
www.oxnardunion.org
805.385.2500

1.02 NOTICE TO PROSPECTIVE BIDDERS

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

1.03 PROJECT DESCRIPTION

- A. Summary Project Description: Remove and replace existing athletic field and related site improvements.
- B. Contract Scope: Construction, demolition, and renovation.
- C. Contract Terms: Lump sum (fixed price, stipulated sum), with incentives.

1.04 PROJECT CONSULTANTS

- A. The Architect, hereinafter referred to as Architect: **Little Diversified Architectural Consulting**
1300 Dove Street, Suite 100, Newport Beach CA 92660
www.littleonline.com
949.698.1400

1.05 PROCUREMENT TIMETABLE

- A. Bids May Not Be Withdrawn Until: 30 days after due date.
- B. Contract Time: To be stated in bid documents.
- C. The District reserves the right to change the schedule or terminate the entire procurement process at any time.

1.06 PROCUREMENT DOCUMENTS

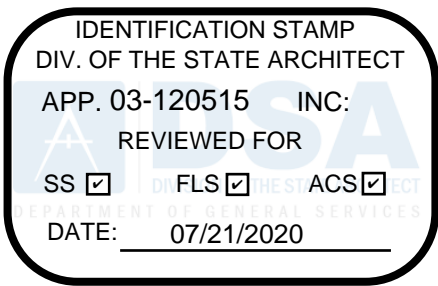
- A. Availability of Documents: Complete sets of procurement documents may be obtained:

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION



**SECTION 00 01 07
SEALS PAGE**

ARCHITECT

LITTLE DIVERSIFIED ARCHITECTURAL CONSULTING

1300 Dove Street, Suite 100, Newport Beach CA 92660

Architect of Record (AOR) Jay R. Tittle C-12955



STRUCTURAL ENGINEER

TAYLOR & SYFAN

553 S. Oak Knoll Avenue, Pasadena CA 91101

Structural Engineer of Record (SEOR) Brian T. Dean S-6087



ELECTRICAL ENGINEER

ENGINEOUS GROUP, INC.

751 N. Fair Oaks, Suite 201, Pasadena CA 91103

Electrical Engineer of Record (EEOR) Artin Oshian E-21460



CIVIL ENGINEER

LITTLE DIVERSIFIED ARCHITECTURAL CONSULTING

1300 Dove Street, Suite 100, Newport Beach CA 92660

Civil Engineer of Record (CEOR) Barsin B. Govargez C-81751



END OF SEALS PAGE

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SECTION 00 31 00
AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

- A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:
- B. Geotechnical Report: Entitled Engineering Geology and Geotechnical Engineering Report for Proposed Home Bleachers, Rio Mesa High School, 545 Central Avenue, Oxnard Area, Ventura County, California, Project No.: 303280-002, dated February 20, 2020.
 - 1. Original copy is available for inspection at District's offices during normal business hours.
 - 2. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect.
 - a. Soil and subsurface investigations conducted at site by an independent testing laboratory and report with log of borings prepared.
 - 3. Interpretation:
 - a. The District, Architect and Engineers disclaim all responsibility for the accuracy of information prepared by others.
 - 1) The District, Architect and Engineers disclaim all responsibility for the information to be completely representative of conditions and materials which may be encountered and as being adequate for the purposes of construction.
 - 2) Variations in kind, depth, quantity, and condition of soils may occur.
 - 3) The District, Architect and Engineers further disclaim responsibility for interpretation by Bidding Contractors and others of soil and subsurface investigation information, such as in projecting soil-bearing values, rock profiles, presence and scope of boulders and cobbles, soil stability and the presence, level and extent of underground water.
 - 4. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in Contract Documents.
 - 5. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Sum accruing to District.
 - a. If variances from Geotechnical Report are found, make written report to Construction Manager.
 - b. Claims for conditions found to be not as indicated in soil investigation data not permitted, unless otherwise indicated in District-Contractor Agreement.
 - 1) This applies only to conditions found after execution of the Agreement to be materially different from those reported and which are not customarily encountered in the geographic area.

1.02 BIDDER'S INVESTIGATIONS

- A. Bidder's Investigation: Bidder shall visit site and become familiar with site conditions.

1. Bidder may, at Bidder's own expense and prior to bidding, make soil surveys and investigations Bidder considers necessary.
 2. Bidder assumes risk that soil and underground conditions may be other than that indicated in soil investigation data.
- B. Procedures:
1. Obtain authorization from Construction Manager prior to start of borings or subsurface investigations.
 2. Immediately upon completion of Bidder's subsurface investigation, return site areas affected by investigations to condition existing prior to start of Bidder subsurface investigations as directed by Construction Manager.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

**SECTION 00 40 25
REQUEST FOR INFORMATION**

RFI NUMBER: _____ **DATE:** _____

PROJECT NAME: RIO MESA HIGH SCHOOL - HOME BLEACHERS **PROJECT NO.:** 612.12353.08

TO: LITTLE DIVERSIFIED ARCHITECTURAL CONSULTING
1300 Dove Street, Suite 100, Newport Beach CA 92660

Attention: _____

Contractor: _____

Address: _____

Request By: _____ Date: _____

BRIEF SUMMARY OF RFI: _____

Drawing No. _____ Detail No. _____

Specification Section _____ Title _____

Page _____ Paragraph _____

DETAILS OF THIS RFI: _____

Attachments: _____

RESPONSE WILL BE INCLUDED IN AN ADDENDUM

END OF RFI

SECTION 00 63 25
SUBSTITUTION REQUEST FORM (POST-AWARD)

SUBSTITUTION REQUEST NO. _____

DATE: _____

PROJECT NAME: RIO MESA HIGH SCHOOL - HOME BLEACHERS

PROJECT NUMBER: 612.12353.08

TO: LITTLE DIVERSIFIED ARCHITECTURAL CONSULTING
1300 Dove Street, Suite 100, 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 except under conditions beyond control of Contractor.

Specified Product: _____

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

Drawing No. _____ Detail No. _____

Proposed Substitution: _____

Manufacturer: _____ Tel: _____

A. Reason request for substitution is being submitted: _____

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

Explain _____

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

Explain _____

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

No__ Yes__ _____

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

- E. Does proposed substitution affect product cost, delivery time, or construction schedule?
 No ___ Yes ___ Explain _____
- F. Does proposed substitution comply with specified ICC Number, UL Rating, ASTM Numbers?
 No ___ Yes ___ Explain _____
- G. Does proposed substitution affect other trades and systems such as wiring, piping, ductwork, structure, etc.? No ___ Yes ___ (Explain which and how) _____

If yes, has impact on their work been included in price of proposed substitution? No ___ Yes ___.

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

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

No cost impact ___ Improve Schedule ___ Credit of \$ _____

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

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

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

Submitted by: _____
 (Type Name) Signature Date

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

Architect's Comments:

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

Reviewed by:

 Architect Date

 Construction Manager Date

 District Date

END OF SECTION

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Rio Mesa High School - Home Bleachers.
- B. District's Name: Oxnard Union High School District.
- C. Architect's Name: Little Diversified Architectural Consulting.
- D. The Project consists of the construction of new home bleachers and press box located at Rio Mesa High School.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Owner-Contractor Agreement.
- B. The Work: The Work is construction and related services for a , CBC, Occupancy Type Assembly Group A-5, Construction Type V-B, , totaling approximately 0 square feet.
 - 1. The Work includes new related site improvements; with patch and repair as required, and other features to the extent indicated on the Drawings.

1.03 CONTRACT DOCUMENTS

- A. Contract Requirements:
 - 1. Conditions of the Contract and other Contract documents have been included in the Project Manual, as indicated in the Table of Contents.
 - a. Such documents are not Specifications.
 - 2. Specifications are found in Divisions 01 through 33 of the Project Manual.
- B. Contract Drawings: The Drawings provided with and identified in the Project Manual are the Drawings referenced in the Agreement.
 - 1. The location, extent and configuration of the required construction and improvements are shown and noted on Drawings.
 - a. The Drawings are referenced in the Agreement.
 - b. An index of Drawings is included in the set of Drawings.
 - 2. Drawings are arranged into series according to design discipline. Such organization and all references to trades, subcontractor, specialty contractor or supplier shall not control the Contractor in dividing the Work among subcontractors or in establishing the extent of the Work to be performed by any trade.
 - 3. Where the terms "as shown", "as indicated", "as noted", "as detailed", "as scheduled", or terms of like meaning, are used in the Drawings or Specifications, it shall be understood that reference is being made to the Drawings referenced in the Agreement.
 - 4. Where reference to the word "plans" is made anywhere in Drawings, Specifications and related Contract Documents, it shall be understood to mean the Drawings referenced in the Agreement.

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

1.04 DESCRIPTION OF ALTERATIONS WORK

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

1.05 WORK BY OWNER

- A. Concurrent Work Under Separate Contracts:
 - 1. Work Under Separate Contracts: District will award separate contracts for products and installation for interior improvements and other work as may be indicated on Drawings as NIC (Not in Contract).
 - 2. Relationship to Work Under the Contract:
 - a. Work under the Contract shall include all provisions necessary to make such concurrent work under separate contracts complete in every respect and fully functional, including field finishing.
 - b. Provide necessary backing, supports, piping, conduit, conductors and other such provisions from point of service to point of connection, as shown on Drawings and specified herein.
 - 3. Related Contract Documents:
 - a. District will make available, in a timely manner, drawings and specifications of work under separate contracts for coordination and further description of that work.
 - b. Such drawings and other data required for the coordination of the work of separate contracts with the Work of this Contract may be included with the Contract Documents.
 - c. If so, they are provided for convenience only and are not to be considered Contract Documents produced by Architect or Architect's consultants.
 - 4. Permits, Notices and Fees:

- a. Permits, Notices and Fees: Notices required by and approvals required of authorities having jurisdiction for work under separate contracts and related fees will be solely the responsibility of District.
- B. Items noted NIC (Not in Contract) will be supplied and installed by District after Substantial Completion.
- C. District will supply the following for installation by Contractor:
 - 1. Owner-Furnished Products: District may furnish, for installation by Contractor, products which are identified on the Drawings and in the Specifications as OFCI (Owner-Furnished/Contractor-Installed).
 - 2. Relationship to Work Under the Contract:
 - a. Work under the Contract shall include all provisions necessary to fully incorporate such products into the Work, including, as necessary:
 - 1) Fasteners.
 - 2) Backing,.
 - 3) Supports.
 - 4) Piping.
 - 5) Conduit.
 - 6) Conductors.
 - 7) Other such provisions from point of service to point of connection.
 - 8) Field finishing, as shown on Drawings and specified herein.
 - b. See Section 01 30 00 - Administrative Requirements for additional requirements.

1.06 PERMITS, LICENSES AND FEES

- A. Permits:
 - 1. For Work included in the Contract, Contractor shall obtain all permits from authorities having jurisdiction and from serving utility companies and agencies.
 - 2. District will reimburse Contractor for amount charged for such permits, without mark-up.
 - 3. For Work performed under design/build basis, plancheck and permit fees shall be included in the Contract Sum.
- B. Licenses:
 - 1. Contractor shall obtain and pay all licenses associated with construction activities, such as business licenses, contractors' licenses and vehicle and equipment licenses.
 - 2. All costs for licenses shall be included in the Contract Sum.
- C. Assessments:
 - 1. District will pay all assessments and utility service connection fees. Costs of assessments shall not be included in the Contract Sum.
- D. Test and Inspection Fees:
 - 1. Contractor shall pay all fees charged by authorities having jurisdiction and from serving utility companies and agencies, for tests and inspections conducted by those authorities, companies and agencies.
 - 2. District will reimburse Contractor for actual amount of such fees, without mark-up.

3. Refer to Section 01 40 00 - Quality Requirements for additional information on tests and inspections and responsibility for payment of fees.

1.07 OWNER OCCUPANCY

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

1.08 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. Arrange use of site and premises to allow:
 1. District occupancy.
 2. Work by Others.
 3. Work by District.
 4. Use of site and premises by the public.
- C. Provide access to and from site as required by law and by District:
 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 2. Site Access:
 - a. Limit access to site to indicated routes and access points as indicated.
 - b. If routes and access points are not indicated, access shall be as approved by District.
 - c. Do not restrict access to adjacent properties and do not restrict access for those performing work under separate contracts for the District.
 3. Do not obstruct roadways, sidewalks, or other public ways without permit.
 4. Construction Limit:
 - a. Limit construction activities to areas indicated on Drawings as Project Area or, if not indicated, to areas within the parcel as described in the legal description on the Drawings.
 - b. Refer also to Section 01 50 00 - Temporary Construction Facilities and Controls for additional requirements.
- D. Existing building spaces may not be used for storage.
- E. Time Restrictions:
 1. Limit conduct of especially noisy, malodorous, and dusty exterior work to the hours of 8 AM to 6 PM.
- F. Utility Outages and Shutdown:
 1. Limit disruption of utility services to hours the site is unoccupied.

2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to District and authorities having jurisdiction.
3. Prevent accidental disruption of utility services to other facilities.

1.09 CONSTRUCTION WASTE MANAGEMENT

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

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

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

1.03 SCHEDULE OF VALUES

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

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

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

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

1.06 MODIFICATION PROCEDURES

- A. Construction Changes, General:
 - 1. The following describe administrative procedures to be followed in compliance with provisions of the Conditions of the Contract for Architect's Supplemental Instructions, Construction Change Directives, Construction Change Documents, and Contract Change Orders.
 - 2. The Architect will prepare and issue a Bulletin on which the Architect's Supplemental Instructions, a Construction Change Directive or a Request for Proposal will 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. 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. 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. CAC Section 4-215, 4-233(c), & 4-338(c).
 - a. The approved Construction Change Document shall be signed by:

- 1) Architect of Record.
 - 2) When applicable:
 - (a) Structural Engineer of Record.
 - (b) Mechanical Engineer of Record.
 - (c) Electrical Engineer of Record.
 - (d) Civil Engineer of Record.
 - (e) Delegated Professional Engineer.
 - 3) Division of the State Architect for final approval.
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.
- F. 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.
- G. 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.
- H. 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.
- I. 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.

- J. 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.
- K. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
 - 1. When agreement is reached on changes, if any, in the Contract Time and the Contract Sum, the Contractor shall prepare a Contract Change Order using a form as directed by the District, with supplementary documents as necessary to describe the change and the associated costs and schedule impacts.
 - 2. Construction Change Document approval is required from DSA prior to fabrication and installation.
 - 3. Submit Contract Change Orders to District through the Architect.
 - 4. Contractor shall prepare and submit five original sets of documents for each Change Order. District, Architect and Construction Manager shall sign the Change Order indicating acceptance and approval of the change.
 - a. Structural Engineer shall also sign the Change Order, when applicable.
 - 5. All Change Orders must be approved by DSA prior to fabrication and installation.
 - 6. Upon approval of the Change Order, Contractor shall promptly execute the change in the Work.
- L. 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.
- M. 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.
- N. 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 (Post-Award): Required form for substitution requests made after award of contract (During construction).
- D. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.
- E. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.
- F. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

1.03 DEFINITIONS

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Requests by Contractor to deviate from specified requirements for products, materials, equipment, and methods, or to provide products other than those specified, shall be considered requests for substitutions except under the following conditions:

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

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

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

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

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

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

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

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

- E. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.
 - 3. When acceptance will require revisions to Contract Documents.

3.04 CONTRACT DOCUMENT REVISIONS:

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

3.05 RESOLUTION

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

3.06 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive,

Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.07 CLOSEOUT ACTIVITIES

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

3.08 ATTACHMENTS

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

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 01 32 16 - Construction Progress Schedule: Form, content, and administration of schedules.
- B. Section 01 60 00 - Product Requirements: General product requirements.
- C. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- D. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.
- E. Technical Product Sections: Procedures for specific submittals specified in those Sections to be made at Contract closeout.

1.03 DEFINITIONS

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

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

1.04 PROJECT COORDINATOR

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

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

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

- E. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for District.

3.02 PRECONSTRUCTION MEETING

- A. District will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. District.
 - 2. Architect.
 - 3. Contractor.
 - 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.
 - 9. Scheduling activities of a Geotechnical Engineer.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, District, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

- A. Schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
 - 1. Contractor.
 - 2. District.
 - 3. Architect.
 - 4. Construction Manager.
 - 5. Contractor's superintendent.
 - 6. Major subcontractors.
 - 7. Inspector of Record.
 - 8. DSA Field Representative.
- C. Agenda:
 - 1. Distribute and discuss list of subcontractors and suppliers.

2. Project Communication Procedures: Review requirements and administrative requirements for written and oral communications.
 - a. Review requirements and administrative procedures Contractor may wish to institute for identification and reporting purposes.
3. Change Procedures: Review requirements and administrative procedures for Change Orders, Construction Change Directives, Architect's supplemental instructions and Contractor's Requests for Interpretation or Information.
4. Use of premises by District and Contractor.
 - a. Site access restrictions, if any, and requirements to avoid disruption of operations at adjoining facilities or operations.
 - b. Construction Facilities and Temporary Utilities: Designate storage and staging areas, construction office areas; review temporary utility provisions; present District's requirements for use of premises.
5. District's requirements.
6. Construction facilities and controls provided by District.
7. Temporary utilities provided by District.
8. Survey and building layout.
9. Security and housekeeping procedures.
10. Schedules.
 - a. Distribute and discuss initial construction schedule and critical work sequencing of major elements of Work;
 - b. Include coordination of District Furnished / Contractor Installed (OFCl) products;
11. Review requirements for Contractor's coordination of Work; review sequence and schedule for work being performed for District under separate contracts.
12. Submittals Administration: Review administrative procedures for shop drawings, product data and samples submittals and review of preliminary Submittals Schedule.
13. Materials and Equipment:
 - a. Review substitution requirements;
 - b. Review schedule for major equipment purchases and deliveries;
 - c. Review materials and equipment to be provided by District (OFCl products).
14. Application for payment procedures.
15. Procedures for testing.
 - a. Review tests and inspections to be performed by the following:
 - 1) Independent testing and inspection agency.
 - 2) Manufacturers and installers.
 - 3) Serving utilities and public agencies.
 - 4) Authorities having jurisdiction.
16. Procedures for maintaining record documents.
17. Requirements for start-up of equipment.
 - a. Operation and Maintenance Data:

- 1) Format and content of operation and maintenance manuals; instruction of District's personnel.
18. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, District, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-weekly intervals.
- B. Meeting Time and Location: As mutually agreed by District, Architect, and Contractor, at on-site location.
- C. Special Meetings: As necessary, Construction Manager may convene special meetings to discuss specific construction issues in detail and to plan specific activities.
1. See Section 01 70 00 - Execution and Closeout Requirements.
- D. Attendance Required:
1. Contractor.
 2. District.
 3. Architect.
 4. Construction Manager.
 5. Special consultants.
 6. Contractor's superintendent.
 7. Major subcontractors.
 8. Inspector of Record.
- E. Agenda:
1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of RFIs log and status of responses.
 7. Review of off-site fabrication and delivery schedules.
 8. Maintenance of progress schedule.
 9. Corrective measures to regain projected schedules.
 - a. Develop corrective measures and procedures, including but not necessarily limited to additional personnel loading to regain planned schedule.
 10. Planned progress during succeeding work period.
 11. Coordination of projected progress.
 12. Maintenance of quality and work standards.
 13. Effect of proposed changes on progress schedule and coordination.

14. Other business relating to work.
- F. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, District, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 32 16

- 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 Construction Manager's review.
- C. Reviews by Architect and Construction Manager will be to ascertain the general status of construction and shall not be interpreted to establish or approve the means, methods, techniques and sequences of construction.

3.06 DAILY CONSTRUCTION REPORTS

- A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.
- B. In addition to transmitting electronically a copy to District and Architect, submit two printed copies at weekly intervals.
 1. Submit in format acceptable to District.
 2. Submit using required form, a sample of which is appended to this section.
- C. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
 1. Date.
 2. High and low temperatures, and general weather conditions.
 3. List of subcontractors at Project site.
 4. List of separate contractors at Project site.
 5. Approximate count of personnel at Project site.
 - a. Include a breakdown for supervisors, laborers, journeymen, equipment operators, and helpers.
 6. Major equipment at Project site.
 7. Material deliveries.
 8. Safety, environmental, or industrial relations incidents.
 9. Meetings and significant decisions.
 10. Unusual events (submit a separate special report).
 11. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
 12. Meter readings and similar recordings.
 13. Emergency procedures.
 14. Directives and requests of Authority(s) Having Jurisdiction (AHJ).

15. Change Orders received and implemented.
16. Testing and/or inspections performed.
17. List of verbal instruction given by District and/or Architect.
18. Signature of Contractor's authorized representative.

3.07 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.
- C. Photography Type: Digital; electronic files.
- D. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.
- E. In addition to periodic, recurring views, take photographs of each of the following events:
 1. Completion of site clearing.
 2. Excavations in progress.
 3. Foundations in progress and upon completion.
 4. Structural framing in progress and upon completion.
 5. Enclosure of building, upon completion.
 6. Final completion, minimum of ten (10) photos.
- F. Take photographs as evidence of existing project conditions as follows:
 1. Interior views: each elevation, floor and ceilings prior to demolition.
 2. Exterior views: each elevation, roof and areas adjacent to construction limits.
- G. Views:
 1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
 2. Consult with Architect for instructions on views required.
 3. Provide factual presentation.
 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
 5. Point of View Sketch: Provide sketch identifying point of view of each photograph.
- H. Digital Photographs: 24 bit color, minimum resolution of 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. 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 specified in Section - 01 32 16 - Construction Progress Schedule.

- a. Submit initial Submittals Schedule within 14 days of date of Notice of Award of construction.
 - b. After review and return by Architect, resubmit Submittals Schedule within 10 days and thereafter submit updated Submittals Schedules at each Construction Progress Meeting.
 - c. Submit one copy each to Owner and Architect.
2. Coordinate with Contractor's construction schedule and schedule of values.
 3. Format schedule to allow tracking of status of submittals throughout duration of construction.
 - a. Prepare schedules in Gantt format using software at Contractor's option, providing clear indication of sequencing and scheduling of Work, for determination of "critical path" of construction progress.
 - 1) Submittals shall be connected to the related construction element by a graphically indicated critical path on the same page.
 - 2) Present schedules using opaque reproductions on substantial paper, with sheet size a multiple of 8-1/2 by 11 inches and large enough to clearly read characters.
 4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
 5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.
 - b. Allow time for shipping and distribution to involved parties. Minimum 1 day, including those sent by electronic transmission.
 6. Posting: Post one copy of most recent Submittals Schedule in Contractor's field office, readily available to District, District Representative, and Architect. Update bi-weekly with project schedule.
 7. Archive: Preserve a minimum of two copies of all superseded schedules, with one copy available at field office for review by District or Architect.

3.10 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) 09 21 16-1 - First submittal for Section 09 21 16 - Gypsum Board Assemblies.
 - 2) 09 21 16-2 - Second submittal for Section 09 21 16 - Gypsum Board Assemblies.
 - b. Use same number for resubmittals as original submittal, followed by a letter indicating sequential resubmittal. For example:
 - 1) 09 21 16-2A - Resubmission of second submittal for Section 09 21 16 - Gypsum Board Assemblies.
 - 2) 09 21 16-2B - Second resubmission of second submittal for Section 09 21 16 - Gypsum Board Assemblies.
6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 - b. Field measurements have been determined and verified.
 - c. Conformance with requirements of Contract Drawings and Specifications is confirmed.
 - d. Catalog numbers and similar data are correct.
 - e. Work being performed by various subcontractors and trades is coordinated.
 - f. Field construction criteria have been verified, including confirmation that information submitted has been coordinated with the work being performed by others for District and actual site conditions.

- g. All deviations from requirements of Drawings and Specifications have been identified and noted.
 - 7. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
 - a. Send submittals in electronic format via email to Architect.
 - b. Upload submittals in electronic form to Electronic Document Submittal Service website.
 - 8. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, District, or another affected party, allow an additional 7 days.
 - 9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 - a. Changes in the Work shall not be authorized by submittals review actions.
 - b. No review action, implicit or explicit, shall be interpreted to authorized changes in the Work.
 - c. Changes shall only be authorized by separate written Contract Change Order or Construction Change Directive, in accordance with the Conditions of the Contract and Section 01 20 00 - Price and Payment Procedures.
 - 10. Provide space for Contractor and Architect review stamps.
 - 11. When revised for resubmission, identify all changes made since previous submission.
 - 12. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 - 13. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 - 14. Submittals not requested will be recognized, but will be returned without comment,
- B. Product Data Procedures:
- 1. Submit only information required by individual specification sections.
 - 2. Collect required information into a single submittal.
 - 3. Submit concurrently with related shop drawing submittal.
 - 4. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
- 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 - 2. Do not reproduce Contract Documents to create shop drawings.
 - 3. 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.
 - 4. Coordination: Show all field dimensions and relationships to adjacent or critical features of Work.

5. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
1. Transmit related items together as single package.
 2. Samples will be reviewed for aesthetic, color, or finish selection.
 3. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
 4. Color Selection Samples: Architect will review and select colors for Project only after all colors are received, so that colors may be properly coordinated.
 5. Copies: Submit actual samples. Photographic or printed reproductions will not be accepted.
 6. Review of Field Samples: Review by Architect of field samples will be made for the following example products, as applicable, if not otherwise required and if requested by Contractor.
 - a. Concrete wall finishes and detailing (edges, corners and reveals).
 - b. Concrete paving colors and textures.
 - c. Gypsum board textures and finishes.
 - d. Field-applied paint colors and finishes.

3.15 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", or language with same legal meaning.
 - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 - 1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
 - 2) Non-responsive resubmittals may be rejected.
 2. Not Authorizing fabrication, delivery, and installation:
 - a. "Revise and Resubmit".
 - 1) Resubmit revised item, with review notations acknowledged and incorporated.

- 2) Non-responsive resubmittals may be rejected.
 - b. "Rejected".
 - 1) Submit item complying with requirements of Contract Documents.
- E. Architect's and consultants' actions on items submitted for information:
 - 1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 - 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

**SECTION 01 30 00.01
REQUEST FOR INTERPRETATION**

RFI NUMBER: _____

DATE: _____

PROJECT NAME: RIO MESA HIGH SCHOOL - HOME BLEACHERS

PROJECT NO.: 612.12353.08

TO: LITTLE DIVERSIFIED ARCHITECTURAL CONSULTING

. 1300 Dove Street, Suite 100, Newport Beach CA 92660

Attention: _____

Contractor: _____

Address: _____

BRIEF SUMMARY OF RFI: _____

Drawing No. _____ Detail No. _____

Specification Section _____ Title _____

. Page _____ Paragraph _____

DETAILS OF THIS RFI: _____

SUGGESTED SOLUTION: _____

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

. Organization: _____

RESPONSE: _____

Attachments: _____

Response By: _____ Date: _____

Organization: _____

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

END OF RFI

SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Responsibilities of individual Multi-Prime Contractors to coordinate with the Construction Manager's Master Project Schedule.
- B. Preliminary schedule.
- C. Construction progress schedule, with network analysis diagrams and reports.
- D. Summary schedule.
- E. Weekly/Short term (Look Ahead) Schedule.

1.02 RELATED SECTIONS

- A. Section 01 10 00 - Summary: Work sequence.
- B. Section 01 30 00 - Administrative Requirements: Submittal Schedule.

1.03 REFERENCE STANDARDS

- A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.
- B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2015.

1.04 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule.
- B. Submit two copies to Construction Manager and one copy to Architect.
- C. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- D. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- E. Within 10 days after joint review, submit complete schedule.
- F. Submit updated schedule with each Application for Payment.
 - 1. Revise schedule also upon issuance of Change Orders and Construction Change Directives which substantially affect construction sequence or schedule.
- G. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.
- H. Submit under transmittal letter form specified in Section 01 30 00 - Administrative Requirements.

1.05 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one year's minimum experience in scheduling construction work of a complexity comparable

to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

- B. Contractor's Administrative Personnel: Three years minimum experience in using and monitoring CPM schedules on comparable projects.
- C. Reviews by Architect and Construction Manager: Reviews by Architect and Construction Manager will be to ascertain the general status of construction and shall not be interpreted to establish or approve the means, methods, techniques and sequences of construction.
- D. Contractor's Review: All schedules shall be reviewed and approved by Contractor prior to submission for Architect's and Construction Manager's review.
- E. Changes and Deviations: Identify all deviations from requirements of Drawings and Specifications.
 - 1. Changes in the Work shall not be authorized by submittals review actions.
 - 2. No review action, implicit or explicit, shall be interpreted to authorized changes in the Work.
 - 3. Changes shall only be authorized by separate written Change Order or Field Change Directive, in accordance with the Conditions of the Contract.

1.06 SCHEDULE FORMAT

- A. Format: Prepare schedules in format at Contractor's option, either bar chart, PERT or GANTT format, providing clear indication of sequencing and scheduling of Work, for determination of "critical path" of construction progress.
 - 1. Prepare schedules in MS Project or Primavera.
 - 2. Provide clear indication of sequencing and scheduling of work for determination of "critical path" of construction progress.
 - 3. Present schedule in both electronic and reproducible paper formats with sheet size large enough to clearly read the characters.
- B. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- C. Diagram Sheet Size: Maximum 22 x 17 inches.
- D. Sheet Size: Multiples of 8-1/2 x 11 inches.
- E. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

- A. Prepare preliminary schedule in the form of a horizontal bar chart.
- B. Prescheduling Conference:
 - 1. Construction Manager will conduct a conference within fifteen (15) work days after the Notice of Intent to Award to comply with requirements in Section 01 30 00 - Administrative Requirements.

- a. Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 - 1) Review software limitations and content and format for reports.
 - 2) Verify availability of qualified personnel needed to develop and update schedule.
 - 3) Discuss constraints, including phasing work stages area separations interim milestones and partial District occupancy.
 - 4) Review delivery dates for District-furnished products.
 - 5) Review schedule for work of District's separate contracts.
 - 6) Review submittal requirements and procedures.
 - 7) Review time required for review of submittals and resubmittals.
 - 8) Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 9) Review District's IT requirements for installation of their Work.
 - 10) Review time required for Project closeout and District startup procedures, including commissioning activities for MEP, Security Electronics Equipment.
 - 11) Review and finalize list of construction activities to be included in schedule.
 - 12) Review procedures for updating schedule.
- C. At the meeting, the Construction Manager will review scheduling requirements. These include schedule preparation, reporting requirements, labor and equipment loading, updates, revisions, and schedule delay analysis.
 - 1. The Contractor will present schedule methodology, planned sequence of operations, resource loading methodology, and proposed activity coding structure.
- D. Coding structure:
 - 1. Submit proposed coding structure, identifying the code fields and the associated code values it intends to use in the project schedule.
 - 2. A minimum, include code fields for Project Segment or Phase, Area of Work, Type of Work, Submittal/Procurement/Construction and Responsibility/Subcontractor.
 - a. Refer to NETWORK DETAILS AND GRAPHICAL OUTPUT for listing of activity categories to be included in the schedule.

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of separate stages and other logically grouped activities.
 - 1. Identify Work of separate buildings, phases, units or other logically grouped activities to facilitate review of Application for Payment with completed Work.
- D. Provide sub-schedules for each stage of Work identified in Section 01 10 00 - Summary.
- E. Provide sub-schedules to define critical portions of the entire schedule.
- F. Include conferences and meetings in schedule.
- G. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

- H. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
1. Format: Prepare Submittals Schedule in a format comparable to Construction Progress Schedule, specified in Article above.
 2. Content: List all items specified to be submitted, indicating submittal number (see instructions specified in Section 01 30 00 - Administrative Requirements, submittal type (i.e., product data, shop drawings, sample, quality control report, maintenance and operating data, etcetera), scheduled date submittal is to be made and date review should be complete in order to maintain construction on schedule.
 3. The Contractor shall submit to the Architect a schedule of the shop drawings that lists their required submission and approval dates.
 - a. Allow minimum one (1) week for the Architect to review the submittals. Some submittals may require a longer review period. See Section 01 30 00 - Administrative Requirements.
 - b. Allow for the possibility that the consultant team will request revisions and resubmittal following the initial submittal.
 - c. The schedule shall encompass the entire construction period and will be revised by the Contractor and reviewed by the project team at each project meeting.
 4. Changes and Deviations: Identify all deviations from requirements of Drawings and Specifications.
 - a. Changes in the Work shall not be authorized by submittals review actions.
 - b. No review action, implicit or explicit, shall be interpreted to authorized changes in the Work.
 - c. Changes shall only be authorized by separate written Change Order or Construction Change Directive, in accordance with the Conditions of the Contract and Section 01 20 00 - Price and Payment Procedures.
 5. Administration: Review of Submittals Schedules by Architect, Construction Manager, and District will be to ascertain the general status of submittals review and shall not be interpreted to establish or approve the means, methods, techniques and sequences of construction.
 - a. Submit one copy each to Construction Manager and Architect.
 - b. Submit initial Submittals Schedule within 14 days of construction start date established in Notice to Proceed.
 - c. After review, resubmit Submittals Schedule within 10 days and thereafter submit updated Submittals Schedules at each Construction Progress Meeting.
- I. Indicate delivery dates for owner-furnished products.
- J. Coordinate content with schedule of values specified in Section 01 20 00 - Price and Payment Procedures.
1. Include Submittals Schedule.
- K. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

3.04 NETWORK ANALYSIS

- A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.
- B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.
- C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
 - 1. Preceding and following event numbers.
 - 2. Activity description.
 - 3. Estimated duration of activity, in maximum 15 day intervals.
 - 4. Project Milestones; include "Project Start" and "End Project" Milestones.
 - a. Schedule starts no earlier than the Project Duration (Day 1) will start on the Notice To Proceed (NTP) date.
 - 5. Earliest start date.
 - 6. Earliest finish date.
 - 7. Actual start date.
 - a. "Project Start" Milestone to have no predecessors and "End Project" Milestone has no successors.
 - b. "Project Start": Constrained by a "Mandatory Start" Milestone.
 - c. "End Project": Constrained by a "Mandatory Finish" Milestone.
 - d. No other activities on the schedule may have constraints, unless reviewed and approved by Construction Manager and Architect.
 - 8. Actual finish date.
 - 9. Latest start date.
 - 10. Latest finish date.
 - 11. Total and free float; float time shall accrue to District and to District's benefit.
 - a. Contractor does not own the float.
 - b. "Float time" refers to the time between earliest finish date and the latest finish date of each activity shown on the Construction Schedule.
 - c. Any float time indicated in the Construction Schedules required by this Section are to be held jointly by the District and Contractor.
 - d. Any delay (including District caused) encountered is to be subtracted from the available days ahead of progress against the Construction Schedule.
 - 1) District may claim float days equal to the delay until such float days are exhausted.

- 2) No compensation of any type will be due the Contractor until the delay extends the overall project substantial completion date.
- e. Weather (Rain) day requirements are as specified in the "Construction Services Agreement."
- 12. Monetary value of activity, keyed to Schedule of Values.
- 13. Percentage of activity completed.
- 14. Responsibility.
- D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.
- E. Required Reports: List activities in sorts or groups:
 - 1. By preceding work item or event number from lowest to highest.
 - 2. By amount of float, then in order of early start.

3.05 CREW SCHEDULES

- A. Separate and concurrent with the Baseline Schedule, submit a schedule histogram depicting crew loading for Contractor's own labor forces and those of each subcontractor. Submit this crew schedule electronically.
- B. Provide the breakdown of a typical crew, by trade, for resource loading quantification.

3.06 WEATHER DAYS ALLOWANCE- AS ANTICIPATED BY THE CONTRACTOR

- A. Based on historical weather in the local area, the Baseline Schedule shall include all non-work days on which the Contractor anticipates Work will not be performed due to adverse weather days that are anticipated to occur within the work day calendar and impact critical activities.
- B. The Contractor shall not receive any additional compensation for unavoidable delays due to inclement or unsuitable weather, and no time extension to complete any Contractual Completion Events as defined in General Conditions, will be considered due to inclement or unsuitable weather or conditions resulting there from.

3.07 REVIEW AND EVALUATION OF SCHEDULE

- A. Review all schedules reviewed and approved by Contractor prior to submission for review by Architect and District.
- B. Participate in joint review and evaluation of schedule with Construction Manager and Architect at each submittal.
- C. Evaluate project status to determine work behind schedule and work ahead of schedule.
- D. After review, revise as necessary as result of review, and resubmit within 10 days.
- E. Review by Architect and District will be to ascertain the general status of construction and shall not be interpreted to establish or approve the means, methods, techniques and sequences of construction.

3.08 SUMMARY SCHEDULE

- A. Provide Summary Schedule, upon request, which consolidates groups of activities associated with Major Items of Work shown on Baseline Schedule.

1. Summary Schedule is intended to give an overall indication of the project schedule without a large amount of detail.
 2. This schedule shall include the current status of each of the contract Milestones listed in the Agreement, and any significant activities that are critical to the completion of the Milestone work at the required time.
- B. Include in the Summary Schedule a separate Gantt Chart depicting only the critical path of the project at the time of the update.
- C. Updated and submitted monthly and with each Schedule Update or Schedule Revision.

3.09 WEEKLY (SHORT TERM LOOK-AHEAD) SCHEDULE

- A. Submit to Construction Manager, twenty four (24) hours prior to each weekly progress meeting, a short term look ahead schedule showing the activities completed during the previous week and the schedule of activities for the following 4 weeks.
- B. Using the same computer software as the progress schedule, use the Activity ID's, Descriptions, and logic of the current progress schedule when producing a Weekly Schedule in CPM schedule or a bar chart format.
1. In the event that the Weekly Schedule no longer conforms to the current schedule, Contractor may be required to revise either or both schedule(s).
- C. The activity designations used in the Weekly Schedule must be consistent with those used in the Baseline Schedule and the monthly Schedule Updates.
- D. Contractor and Construction Manager must agree on the format of the Weekly Schedule.
- E. Weekly Schedule should indicate locations of work, critical activities, early start and early finish dates, actual start and actual finish dates, progress, and remaining durations for each activity in the three-week schedule.

3.10 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.
- G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

3.11 ADJUSTMENT OF CONTRACT TIMES

- A. Subject to the terms of General Conditions, contract time will be adjusted only for causes specified as generally described below.
1. Non-excusable delay:

- a. Includes actions or inactions of the Contractor, or events for which the Contractor has assumed contractual responsibility that would independently delay the completion of the Work beyond the current Contract completion date.
 - 1) This also includes actions or inactions of subcontractors, suppliers, or material manufacturers at any tier.
 - b. No time extensions will be granted for non-excusable delays.
2. Excusable delay:
- a. Events which are unforeseeable, outside the control of, and without the fault or negligence of either the District or the Contractor (or any party for whom either is responsible), which would independently delay the completion of the Work beyond the current Contract completion date.
 - b. The Contractor is entitled to a time extension only.
 - c. No other damages will be approved.
3. Compensable delay:
- a. Actions or inactions of the District, or events for which the District has assumed contractual responsibility, which would independently delay the completion of the Work beyond the current Contract completion date.
 - b. The Contractor is entitled to a time extension and delay damages.
4. Concurrent delay:
- a. Any combination of the above three (3) types of delay occurring on the same calendar date, or cases where the combination consists of two (2) or more instances of the same type of delay occurring on the same calendar date.
 - 1) Exception to concurrent delay:
 - (a) When one cause of delay is District-caused or caused by an event which is beyond the control and without the fault or negligence of either the District or the Contractor and the other Contractor-caused, the Contractor is entitled only to a time extension and no delay damages.
- B. If the Contractor believes that the District has impacted its work, such that the project completion date will be delayed, the Contractor must submit proof demonstrating the delay to the critical path.
- 1. Proof, in the form of a Time Impact Analysis, may entitle the Contractor to an adjustment of Contract Time.
- C. Notify Construction Manager of a potential request for Contract Time adjustment within five (5) days of the start of the impact.
- D. The Contractor shall prepare and submit along with any Change Order Request (COR), response to Request for Proposal/Quote (RFP/RFQ), Differing Site Condition (DSC) notification or Request for Additional Compensation (RAC) a Time Impact Analysis (TIA) which includes both a written narrative and a schedule diagram depicting how the changed work may affect the progress of work and other schedule activities.
- 1. The schedule diagram shall show how the Contractor proposes to incorporate the changed work in the schedule, and how it impacts the current updated schedule and critical path.
 - 2. The TIA shall not be resource constrained, or leveled using resource limits.

3. Failure to include a TIA with the COR, Proposal, Quote, DSC or RAC shall constitute a waiver of the right to later claim any adjustment in time based upon changed or unforeseen Work.
- E. Time Impact Analysis (TIA):
1. Use the accepted schedule update that is current relative to the time frame of the delay event (change order, third party delay, or other District-caused delay). Represent the delay event in the schedule by:
 - a. Inserting new activities associated with the delay event into the schedule.
 - b. Revising activity logic.
 - c. Revising activity durations.
 2. If the project schedule's critical path and milestone date(s) are impacted as a result of adding this delay event to the schedule, a time extension equal to the magnitude of the impact without resource constraints may be warranted.
 3. The Time Impact Analysis submittal must include the following information:
 - a. A fragment of the portion of the schedule affected by the delay event.
 - b. A narrative explanation of the delay issue and how it impacted the schedule.
 - c. A digital file containing the schedule file used to perform the Time Impact Analysis.
- F. When a delay to the project as a whole can be avoided by revising preferential sequencing or logic, and the Contractor chooses not to implement the revisions, the Contractor will be entitled to a time extension and no compensation for extended overhead.
- G. Indicate clearly that the Contractor has used, in full, all project float available for the work involved in the request, including any float that may exist between the Contractor's planned completion date and the Contract completion date.
1. Utilize the latest version of the Schedule Update accepted at the time of the alleged delay, and all other relevant information, to determine the adjustment of the Contract Time.
- H. Adjustment of the Contract Times will be granted only when the Contract Float has been fully utilized and only when the revised date of completion of the Work has been pushed beyond the Contract completion date.
1. Adjustment of the Contract Times will be made only for the number of days that the planned completion of the work has been extended.
- I. Actual delays in activities which do not affect the critical path work or which do not move the Contractor's planned completion date beyond the Contract completion date will not be the basis for an adjustment to the Contract Time.
- J. Submit request as specified with Contract Documents.
1. In cases where the Contractor does not submit a request for Contract Time adjustment for a specific change order, delay, or Contractor request within the specified period of time, then it is mutually agreed that the particular change order, delay, or Contractor request has no time impact on the Contract completion date and no time extension is required.

- K. The Construction Manager will, within five (5) working days after receipt of a Contract Time adjustment, request any supporting evidence, review the facts, and advise the Contractor in writing.
1. Include the new Progress Schedule data, if accepted by the District, in the next monthly Schedule Update.
 2. When the District has not yet made a final determination as to the adjustment of the Contract Time, and the parties are unable to agree as to the amount of the adjustment to be reflected in the Progress Schedule, reflect that amount of time adjustment in the Progress Schedule as the Construction Manager may accept as appropriate for such interim purpose.
 - a. It is understood and agreed that any such interim acceptance by the Construction Manager shall not be binding.
 - b. Interim acceptance shall be made only for the purpose of continuing to schedule the Work
 - c. Interim acceptance shall remain until such time as a final determination as to any adjustment of the Contract Time acceptable to the Construction Manager has been made.
 - d. Revise the Progress Schedule prepared thereafter in accordance with the final decision.

3.12 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Construction Manager, Architect, District, and other concerned parties.
- B. Posting: Post one copy, minimum, of most recent Construction and Submittals Schedules in the Contractor's jobsite office, readily available to Construction Manager and Architect.
- C. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
- D. Archive: Preserve a minimum of two copies of all superseded schedules, with a minimum of one copy available at job office for review by Construction Manager or Architect.

3.13 FINAL SCHEDULE SUBMITTAL

- A. The final Schedule Update becomes the As-Built Schedule.
 1. The As-Built Schedule reflects the exact manner in which the project was constructed by reflecting actual logic, start and completion dates for all activities accomplished on the project.
 2. Contractor's Project Manager and Scheduler sign and certify the As-Built Schedule as being an accurate record of the way the project was actually constructed.
- B. Retainage will not be released until final Schedule Update is provided.

END OF SECTION

SECTION 01 35 50
REQUESTS FOR ELECTRONIC FILES

PART 1 - GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED SECTIONS

- A. Section 01 30 00 - Administrative Requirements: Shop Drawings, Product Data and Samples.
- B. Section 01 70 00 - Execution and Closeout Requirements.
- C. Divisions 31 through 33 - Site Work.

1.03 REQUIREMENTS

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

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

PART 3 - EXECUTION

3.01 ELECTRONIC FILE TRANSFER PROCEDURE

- A. Submit a check in the amount of \$250.00 along with a list of the requested sheet numbers and an acknowledged copy of this waiver to the office of the Architect, Little Diversified Architectural Consulting, 1300 Dove Street, Suite 100, Newport Beach CA 92660.
- B. In order to expedite the transfer, upon receipt of a PDF copy of this acknowledgement, the requested CAD/Revit/BIM files will be sent in the form of a compact disc, DVD, or thumb drive to the recipient, as requested, by UPS, similar delivery service, or other method of electronic transfer after payment is received.
- C. It is expressly understood that any transfer is done as a courtesy and can be revoked at any time by the Architect.

Agreement is on next page

HOLD HARMLESS AGREEMENT

ARCHITECT'S PROJECT: RIO MESA HIGH SCHOOL - HOME BLEACHERS

ARCHITECT'S PROJECT NUMBER: 612.12353.08

We, _____, understand that we may be receiving electronic media containing design information, not necessarily intended for construction. We agree to hold Little Diversified Architectural Consulting 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.

Acknowledged by:

Signature of Company Officer Print or Type Name Date

Company Name

Street Address City, State, Zip Code

E-mail Address

END OF SECTION

SECTION 01 35 53
SECURITY PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: use of premises and occupancy.
- B. Section 01 50 00 - Temporary Facilities and Controls: Temporary lighting.

1.03 SECURITY PROGRAM

- A. Protect Work, existing premises and District's operations from theft, vandalism, and unauthorized entry.
- B. Initiate program in coordination with District's existing security system at project mobilization.
- C. Maintain program throughout construction period until District acceptance precludes the need for Contractor security.

1.04 ENTRY CONTROL

- A. Restrict entrance of persons and vehicles into Project site and existing facilities.
- B. Allow entrance only to authorized persons with proper identification.
- C. Maintain log of workers and visitors, make available to District on request.
- D. District will control entrance of persons and vehicles related to District's operations.
- E. Contractor shall control entrance of persons and vehicles related to District's operations.
- F. Coordinate access of District's personnel to site in coordination with District's security forces.

1.05 PERSONNEL IDENTIFICATION

- A. Shall be worn by Contractor's superintendent and all sub contractors
- B. Provide identification badge to each person authorized to enter premises.
- C. Badge To Include: Personal photograph, name, assigned number, expiration date and employer.
- D. Maintain a list of accredited persons, submit copy to District on request.
- E. Special badges shall be issued to construction personnel when term of construction exceeds six months.
- F. Require return of badges at expiration of their employment on the Work.

1.06 RESTRICTIONS

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

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

1.03 REFERENCE STANDARDS

- A. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2018.

1.04 DEFINITIONS

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

1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

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

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

1.06 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Base design on performance and/or design criteria indicated in individual specification sections.
- C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
 1. Structural Design of Formwork: As described in Section 03 10 00 - Concrete Forming and Accessories.
 2. Concrete Mix Design: As described in Section 03 30 00 - Cast-in-Place Concrete. No specific designer qualifications are required.

1.07 SUBMITTALS

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

3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
 4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- E. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for District's information.
- F. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- G. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the District's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- H. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for District.
1. Submit report in duplicate within 30 days of observation to Architect for information.
 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
- I. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for District.

1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or District.

1.08 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Qualification Statement: Provide documentation showing testing laboratory is approved by Division of the State Architect.
4. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in California.

C. Contractor's Quality Control (CQC) Plan:

1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
 - a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.
 - 1) Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.
 - b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
 - 1) Management and control of documents and records relating to quality.
 - 2) Communications.
 - 3) Coordination procedures.
 - 4) Resource management.
 - 5) Process control.
 - 6) Inspection and testing procedures and scheduling.
 - 7) Control of noncomplying work.
 - 8) Tracking deficiencies from identification, through acceptable corrective action, and verification.
 - 9) Control of testing and measuring equipment.
 - 10) Project materials certification.
 - 11) Managerial continuity and flexibility.
 - c. District will not make a separate payment for providing and maintaining a Quality Control Plan. Include associated costs in Bid price.

- d. Acceptance of the plan is required prior to start of construction activities not including mobilization work. District's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. District reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.
- D. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.

1.09 REFERENCES AND STANDARDS - SEE SECTION 01 42 19

1.10 REGULATORY REQUIREMENTS FOR TESTING AND INSPECTION

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

1.11 TESTING AND INSPECTION AGENCIES AND SERVICES

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTRACTOR'S QUALITY ASSURANCE

- A. Quality Requirements: Work shall be accomplished in accordance with quality requirements of the Drawings and Specifications, including, by reference, all Codes, laws, rules, regulations and standards. When no quality basis is prescribed, the quality shall be in accordance with the best accepted practices of the construction industry for the locale of the Project, for projects of this type.
- B. Quality Control Personnel: Contractor shall employ and assign knowledgeable and skilled personnel as necessary to perform quality control functions to ensure that the Work is provided as required.

3.02 CONTROL OF INSTALLATION

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

3. Provide access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated.
4. Provide all information and assistance as required, including that by and from subcontractors, installers, fabricators, materials suppliers and manufacturers, for verification of quality by District, or Architect.
5. Contract modifications, if any, resulting from such verification activities shall be governed by applicable provisions in the General Conditions.

3.03 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.

3.04 TESTING AND INSPECTION

- A. See individual specification sections for testing required.
- B. Testing Agency Duties:
 1. Test samples of mixes submitted by Contractor.
 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 3. Perform specified sampling and testing of products in accordance with specified standards.
 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 6. Perform additional tests and inspections required by Architect.
 7. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the Work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 3. Provide incidental labor and facilities:

- a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 6. Arrange with District's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 7. Inspections and Tests by Authorities Having Jurisdiction:
 - a. Contractor shall cause all tests and inspections to be made for Work under this Contract, as required by Building Departments, Department of Public Works, Fire Department, Health Department and similar agencies having jurisdiction.
 - b. Excepted as specifically noted, scheduling, conducting and paying for such inspections shall be solely the Contractor's responsibility.
 8. Inspections and Tests by Serving Utilities:
 - a. Contractor shall cause all tests and inspections required by serving utilities to be made for Work under this Contract.
 - b. Scheduling, conducting and paying for such inspections shall be solely the Contractor's responsibility.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
 - F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

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

3.06 FIELD QUALITY CONTROL SUBMITTALS

- A. Administration: Make all submittals to the Architect, unless otherwise directed.

B. Submittal Identification: Identify each submittal by Specification Section number followed by a number indicating sequential submittal for that Section. Coordinate submittal numbers with submittals specified in Section 01 30 00 - Administrative Requirements.

1. Resubmittals shall use same number as original submittal, followed by a letter indicating sequential resubmittal.

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

C. Project Identification: Title each submittal with Project name, submittal date and Architect's Project number.

D. Copies: Provide PDF copies electronically transmitted or submit 6 copies, minimum, of reports of quality control reports on dry-process xerographic copies only.

E. Contractor's Review:

1. Submittals shall be made in accordance with requirements specified herein and in individual Sections.
2. Indicate clearly on each submittal the specified or referenced values for each quality control activity and the values obtained.
3. Note clearly and sign each submittal certifying that reported quality control activity "Conforms" or "Does Not Conform".

F. Changes and Deviations:

1. Identify all deviations from requirements of Drawings and Specifications.
2. Changes in the Work shall not be authorized by submittals review actions.
3. No review action, implicit or explicit, shall be interpreted to authorized changes in the Work.
4. Changes shall only be authorized by separate written Change Order or Construction Change Directive, in accordance with the General Conditions and 01 20 00 - Price and Payment Procedures.

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

H. Unsolicited Submittals: Unsolicited submittals will be returned unreviewed.

3.07 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.

3.08 DEFECT ASSESSMENT

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

END OF SECTION

SECTION 01 41 00
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 AUTHORITY AND PRECEDENCE OF CODES, ORDINANCES AND STANDARDS

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

4. Part 6, Title 24 CCR - 2019 California Energy Code.
5. Part 9, Title 24 CCR - 2019 California Fire Code (CFC).
 - a. Based on ICC (IFC) - International Fire Code; 2018.
6. Part 11, Title 24 CCR - 2019 California Green Building Standards Code (CALGreen).
7. Part 12, Title 24 CCR - 2019 California Referenced Standards Code.

1.02 SUMMARY OF REFERENCE STANDARDS

- A. Regulatory requirements applicable to this project are the following:
- B. California Referenced Standards Code, 2016: Chapter 12-7-4 Fire Resistive Standards, for fire rated doors.
- C. National Fire Protection Association (NFPA): (Partial List of Applicable Standards)
 1. Reference CBC for applicable NFPA Standards - 2019 CBC (SFM) Chapter 35.
 2. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - a. Use 2016 as indicated in 2019 CBC Ch.35 Referenced Standards.
 3. NFPA 72 - National Fire Alarm and Signaling Code (CA Amended); 2016 is current; use 2016 as amended in 2016 CBC Ch.35 Referenced Standards.
 4. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2019.
- D. ICC 300 - Standard for Bleachers, Folding and Telescoping Seating, and Grandstands; 2017.
- E. 28 CFR 35 - Nondiscrimination on the Basis of Disability in State and Local Government Services; Final Rule; Department of Justice; current edition.
- F. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice; current edition.
- G. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- H. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- I. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.

1.03 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 42 19
REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements relating to referenced standards.

1.02 QUALITY ASSURANCE

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

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

2.01 INTERPRETATION OF REGULATIONS

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

PART 3 UNITED STATES GOVERNMENT AND RELATED AGENCIES DOCUMENTS

3.01 CFR -- CODE OF FEDERAL REGULATIONS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.
- C. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- D. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice; current edition.
- E. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.

- F. 29 CFR 1910, Subpart D - Walking-Working Surfaces, 1910.21-1910.30; current edition.
- G. 29 CFR 1910.23 - Ladders; current edition.
- H. 29 CFR 1910.38 - Emergency action plans; current edition.
- I. 29 CFR 1910.132-138 - Personal Protective Equipment; current edition.
- J. 29 CFR 1910.134 - Respiratory protection; current edition.
- K. 29 CFR 1926.62 - Lead; current edition.
- L. 29 CFR 1926.1101 - Asbestos; Current Edition.
- M. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- N. 39 CFR 111 - U.S. Postal Service Standard 4C; Current Edition.
- O. AHRI 340/360 - Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500 MM (12- to 60-in.) Diameter; 2013.
- P. 40 CFR 60 - Standards of Performance for New Stationary Sources; Current Edition.
- Q. 40 CFR 273 - Standards For Universal Waste Management; current edition.
- R. 40 CFR 280 - Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks; current edition.
- S. 40 CFR 761 - Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, And Use Prohibitions; current edition.
- T. 47 CFR 15 - Radio Frequency Devices; current edition.
- U. 47 CFR 68 - Connection of Terminal Equipment to the Telephone Network; Current Edition .
- V. 49 CFR 37 - Transportation Services for Individuals with Disabilities (ADA); current edition.
- W. 49 CFR 178 - Specifications for Packaging; current edition.
- X. 49 CFR 192.285 - Plastic Pipe: Qualifying Persons to Make Joints; current edition.

3.02 CPSC -- CONSUMER PRODUCTS SAFETY COMMISSION

- A. CPSC Pub. No. 325 - Public Playground Safety Handbook; 2010.

3.03 EPA -- ENVIRONMENTAL PROTECTION AGENCY

- A. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.
- B. EPA 600/4-90/010 - Compendium of Methods for the Determination of Air Pollutants in Indoor Air; 1990.
- C. EPA 600-4-790-20 - Methods for Chemical Analysis of Water and Wastes; 1983.
- D. EPA 625/1-86/021 - Design Manual: Municipal Wastewater Disinfection; 1986.
- E. EPA 625/R-96/010b - Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air; 1999.
- F. EPA 712-C-02-190 - Health Effects Test Guidelines OPPTS 870.1100 Acute Oral Toxicity; 1996.

3.04 FDA -- FOOD AND DRUG ADMINISTRATION

- A. FDA Food Code - Chapter 6 - Physical Facilities; Current Edition.

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

- A. FEMA (MAPS) - FEMA Map Service Center; Current Edition.
- B. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.
- C. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.
- D. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.
- E. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

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

- A. FED-STD-595C - Colors Used in Government Procurement (Fan Deck); 2008 (Chg Notice 1).
- B. FS L-F-001641 - Floor Covering Translucent or Transparent Vinyl Surface with Backing; 1971, and Amendment 2, 1982.
- C. FS L-S-125 - Screening, Insect, Nonmetallic; 1972b, with Notice (1987).
- D. FS RR-P-1352 - Partitions, Toilet, Complete; Revision C, 1989.
- E. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant; 1994e.
- F. FS RR-W-365 - Wire Fabric (Insect Screening); 1980, Rev. A (Amended 1986).
- G. FS SS-T-312 - Tile, Floor: Asphalt, Rubber, Vinyl, and Vinyl Composition; Revision B, 1974, and Amendment 1, 1979.
- H. FS TT-B-1325 - Beads (Glass Spheres); Retro-Reflective; 2007d (Validated 2017).
- I. FS TT-P-115 - Paint, Traffic (Highway, White and Yellow); Revision F, 1984.
- J. FS TT-P-1952 - Paint, Traffic Black, and Airfield Marking, Waterborne; 2015f.
- K. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).
- L. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2017h.
- M. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); 2017g.
- N. STATE STD 01.01 - Certification Standard Forced Entry and Ballistic Resistance of Structural Systems; Physical Security Division, Office of Physical Security Programs, Bureau of Diplomatic Security, United States Department of State; 1993.
- O. UFC 4-010-01 - DoD Minimum Antiterrorism Standards for Buildings; 2018.
- P. USPS Handbook AS-503 - Standard Design Criteria; United States Postal Service; 2010.

3.07 GSA -- U.S. GENERAL SERVICES ADMINISTRATION

- A. GSA PBS-P100 - Facilities Standards for the Public Buildings Service; General Services Administration; 2017.

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

- A. NIJ 0108.01 - Standard for Ballistic Resistant Protective Materials; 1985.

3.09 PS -- PRODUCT STANDARDS

- A. PS 1 - Structural Plywood; 2009.

- B. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- C. PS 20 - American Softwood Lumber Standard; 2020.

3.10 USDA -- UNITED STATES DEPARTMENT OF AGRICULTURE

- A. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 2013.

3.11 USGS -- UNITED STATES GEOLOGICAL SURVEY

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

END OF SECTION

SECTION 01 45 33
CODE-REQUIRED SPECIAL INSPECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Document 00 31 00 - Available Project Information: Soil investigation data.
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- C. Section 01 40 00 - Quality Requirements.
- D. Section 01 42 19 - Reference Standards.
- E. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 DEFINITIONS

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

1.04 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).
 - 1. Use 2014 as indicated in 2019 CBC Ch. 35 Referenced Standards.

- B. AISC 341 - Seismic Provisions for Structural Steel Buildings; 2016 (Revised 2018).
 - 1. Use 2016 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- C. AISC 360 - Specification for Structural Steel Buildings; 2016.
 - 1. Use 2016 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
 - 1. Use 2010 with Supplements No. 1, as indicated in 2019 CBC Ch. 35 Referenced Standards.
- E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018.
 - 1. Use 20115ae1 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- F. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.
 - 1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- G. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.
- H. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2019a.
 - 1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- I. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2017.
 - 1. Use 2014a as indicated in 2019 CBC Ch. 35 Referenced Standards.
- J. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).
- K. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012, with Editorial Revision (2015).
 - 1. Use 2012e1 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- L. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2019.
- M. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2018.
- N. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2015.
- O. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
 - 1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- P. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
 - 1. Use 2017 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- Q. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2016.
 - 1. Use 2016 as indicated in 2019 CBC Ch. 35 Referenced Standards.

- R. SDI (QA/QC) - Standard for Quality Control and Quality Assurance for Installation of Steel Deck; 2017.
 - 1. Use 2017 as indicated in 2019 CBC Ch. 35 Referenced Standards.

1.05 SUBMITTALS

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

1. District	1
2. Architect	2
3. Structural Engineer	1
4. Contractor	1
5. District's Inspector	1
6. Division of the State Architect	1
7. Construction Manager	1
- G. Each and every test or inspection report shall bear the File Number and Application Number assigned to this project by the DSA.
- H. DSA Form 291: From the engineering manager of the laboratory of record.

- I. Special Inspection Reports: After each special inspection, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one each to the distribution list.
 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of Special Inspector.
 - d. Date and time of special inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of special inspection.
 - h. Date of special inspection.
 - i. Results of special inspection.
 - j. Compliance with Contract Documents.
 2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.
- J. Fabricator Special Inspection Reports: After each special inspection of fabricated items at the Fabricator's facility, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one each to the distribution list.
 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of Special Inspector.
 - d. Date and time of special inspection.
 - e. Identification of fabricated item and specification section.
 - f. Location in the Project.
 - g. Results of special inspection.
 - h. Verification of fabrication and quality control procedures.
 - i. Compliance with Contract Documents.
 - j. Compliance with referenced standard(s).
- K. Test Reports: After each test or inspection, promptly submit at least two copies of report; one to Architect and one each to the distribution list.
 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test or inspection.
 - h. Date of test or inspection.

- i. Results of test or inspection.
 - j. Compliance with Contract Documents.
 - k. Test reports shall be signed by a Civil Engineer licensed in the State of California.
2. Test reports shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory.
- a. Samples taken but not tested shall also be reported.
 - b. Records of special sampling operations as required shall also be reported.
 - c. Reports shall show that the material or materials were sampled and tested in accordance with the requirements of the CBC, and with the approved specifications.
 - d. They shall also state definitely whether or not the material or materials tested comply with requirements.
 - e. Test reports shall be issued within 14 days of finding being known, to all parties listed above.
3. At the completion of the project, Testing Laboratory shall certify in writing and on all required DSA forms, that all work specified or required to be tested and inspected conforms to drawings, specifications and applicable building codes.
4. Verification of Test Reports:
- a. The Testing Laboratory of record shall submit to the Division of the State Architect (DSA) a verified report covering all tests which are required to be made by that agency during the progress of the project.
 - 1) Such report shall be furnished each time that work on the project is suspended, covering the tests up to that time, and at the completion of the project.
 - 2) Specific testing requirements as listed on the Structural Test and Inspections (T&I) Form DSA-103 for this project. These tests may include the following forms:
 - (a) DSA-201: Soils Compaction.
 - (b) DSA-202: Sieve Analysis.
 - (c) DSA-203: Tension/Bend.
 - (d) DSA-204: Compression.
 - (e) DSA-205: Concrete Masonry Unit.
 - (f) DSA-206: Anchor Load.
 - (g) DSA-207: Masonry Core Shear/Compression.
 - (h) DSA-208: High-Strength Bolt.
 - (i) DSA-209: Fireproofing Density Form.
 - (j) DSA-210: Ultrasonic (NDT).
 - (k) DSA-250: Special Inspection(s).
 - (l) DSA-291: Laboratory Verified Report.
 - (m) DSA-292: Special Inspection(s) Verified Report(s).
 - (n) DSA-293: Geotechnical Verified Report.
 - (o) DSA-403: Energy Compliance Checklist.
 - 3) Other Division of the State Architect (DSA) Certification Documents (Reports) as may be required.

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

1.06 SPECIAL INSPECTION AGENCY

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

1.07 TESTING AND INSPECTION AGENCIES

- A. District is to employ services of an independent inspection and testing agency to perform observation, testing and sampling associated with special inspections including those not required by the building code. CAC
 - 1. Project Inspector and testing lab are employed by the District and approved by:
 - a. A/E of Record.
 - b. Structural Engineer (when applicable).
 - c. DSA.
- B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.08 QUALITY ASSURANCE

- A. Special Inspection Agency Qualifications:

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

1.09 INSPECTION BY THE DISTRICT

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

1.10 DISTRICT'S INSPECTOR

- A. An Inspector (IOR) employed by the District and approved by Architect, Structural Engineer and DSA in accordance with the requirements of the California Building Code will be assigned to the work.
 1. IOR duties are specifically defined in CCR Title 24 Part 1, Sec. 4-211 and 4-219.
- B. The District's Inspector shall at all times have access for the purpose of inspection to all parts of the work and to the shops where the work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.
- C. The work of construction in all stages of progress shall be subject to the personal continuous observation of the District's Inspector.

1. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the work and the character of the materials.
2. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this Contract.
3. Inspector of Record is required to work a normal 40 hour week on this project only. Any overtime required will be at the expense of the Contractor and sub-contractor requiring the inspection.

1.11 PAYMENTS

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

- A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.

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

3.02 SPECIAL INSPECTIONS FOR STEEL CONSTRUCTION (CHAPTER 17A AND 22A)

- A. Structural Steel: Comply with quality assurance inspection requirements of CBC.
- B. Cold-Formed Steel Deck: Comply with quality assurance inspection requirements of SDI (QA/QC).
- C. Erection Inspection: Testing Laboratory will visually inspect bolted and field welded connections, perform such additional tests and inspections of field work as are required by the Architect and prepare test reports for the Architect's review.
- D. Welding:
1. Testing Laboratory will review welding procedure specifications as prepared by the fabricator.
 2. Structural Steel:
 - a. Inspect welding per CBC [].
 - b. Complete and Partial Joint Penetration Groove Welds: Verify compliance with AWS D1.1/D1.1M and AWS D1.8/D1.8M; continuous.
 3. Reinforcing Steel: Verify items listed below comply with AWS D1.4/D1.4M and ACI 318, Section 26.6.
 - a. Provide continuous inspection of welding of reinforcing steel per CBC 1705A.3.1; Table 1705A.3, Item 2; 1903A.8.
- E. Corrections:
1. Correct deficiencies in structural steel work which inspections and test reports indicate to be not in compliance with the specified requirements.
 2. Perform additional tests required to reconfirm noncompliance of the original work and to show compliance of corrected work. Costs for all additional tests will be paid for by the District and backcharged to the Contractor.

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

- A. Inspection:
1. Job Site Inspection: CBC 1705A.3, 1705A.3.5 (Conc. Preplacement), 1705A.3.6 (Placing Record), and 1910A.
 2. Batch Plant or Weighmaster Inspection: CBC 1705A.3.3.
- B. Reinforcing Steel, Including: Verify compliance with approved contract documents and ACI 318, Sections 20.2, 25.2 through 256.6, and 26.6.
1. Reinforcing Bars: CBC 1901A.6; 1910A.2.

2. Tests:
 - a. Tests shall be performed before the delivery of steel to Project site. Steel not meeting specifications shall not be shipped to the Project.
 - b. Testing procedure shall conform to ASTM A615/A615M or .
 - c. Sample at the place of distribution, before shipment:
 - 1) Make one tensile test and one bending test from samples out of 10 tons, or fraction thereof, of each size and kind of reinforcing steel, where taken from bundles as delivered from the mill and properly identified as to heat number.
 - 2) Mill analysis shall accompany report.
 - 3) Where identification number cannot be ascertained, or where random samples are taken, make one series of tests from each 2-1/2 tons, or fraction thereof, of each size and kind of reinforcing steel.
 - 4) Tests on unidentified reinforcing steel will be paid by the District and backcharged to the Contractor.
 - 5) Samples shall include not fewer than 2 pieces, each 18 inches long, of each size and kind of reinforcing steel.
 - d. District's Inspector will inspect all reinforcement for concrete work for size, dimensions, locations and proper placement.
- C. Reinforcing Bar Welding: Verify compliance with AWS D1.4/D1.4M and ACI 318, 26.6.4; continuous.
 1. Verify weldability of reinforcing bars other than those complying with ASTM A706/A706M; periodic.
 2. Inspect single-pass fillet welds, maximum 5/16 inch; periodic.
 3. Inspect all other welds; continuous.
 4. Reinforcing Bar Welding Inspection: CBC 1705A.3.1; Table 1705A.3, Item 2; 1903A.8.
- D. Anchors Cast in Concrete: Verify compliance with ACI 318, 17.8.2; periodic.
- E. Bolts Installed in Concrete: Where allowable loads have been increased or where strength design is used, verify compliance with approved Contract Documents and ICC-ES AC308 approved report prior to and during placement of concrete; continuous.
 1. Comply with CBC Section 1910A.5; Table 1705A.3, items 4a & 4b, ASCE 7, Section 13.4, and DSA Bulletin 14-02, 2/20/14.
- F. Anchors Post-Installed in Hardened Concrete: Verify compliance with ACI 318.
 1. Adhesive Anchors: Verify horizontally or upwardly-inclined orientation installations resisting sustained tension loads - Section 17.8.2.4; continuous.
 2. Other Mechanical and Adhesive Anchors: Verify as per Chapter 17.8.2; periodic.
- G. Design Mix: Verify plastic concrete complies with the design mix in approved contract documents and with ACI 318, Chapter 19A, 26.4.3, 26.4.4; periodic.
 1. Portland Cement Tests: CBC 1705A.3.2, 1910A.1.
 2. Concrete Aggregates: CBC 1705A.3.2, 1903A.5.
 3. Batch Plant Inspection: CBC 1705A.3.3.
 4. Waiver of Continuous Batch Plant Inspection and Tests: CBC 1705A.3.3.1.

5. Admixtures: CBC 1910A.1.
 6. Proportions of Concrete: CBC 1904A (Durability) and 1905A (Modifications to ACI 318).
- H. Concrete Sampling Concurrent with Strength Test Sampling: Each time fresh concrete is sampled for strength tests, verify compliance with ASTM C172/C172M, ASTM C31/C31M and ACI 318, Chapter 26.5, 26.12, and record the following, continuous:
1. Slump.
 2. Air content.
 3. Temperature of concrete.
 4. Strength Tests of Concrete: CBC 1905A.1.16; Table 1705A.3 Item 6; ACI 318-14 Sec. 26.12.
- I. Concrete Placement: Verify application techniques comply with approved Contract Documents and ACI 318, Chapter 26.5; continuous.
- J. Specified Curing Temperature and Techniques: Verify compliance with ACI 318, Chapter 26.5.3-26.5.5; continuous.
- K. Concrete Strength in Situ: Verify concrete strength complies with approved Contract Documents, CBC Table 1705A.3, and modified ACI 318, Chapter 26.12.2,1(a).
- L. Formwork Shape, Location and Dimensions: Verify compliance with approved Contract Documents and ACI 318, Chapter 26.11.1.2(b); continuous.
- M. Welding of Reinforcing Bars: Conduct special inspections and verify Special Inspector's qualifications in accordance with requirements of AWS D1.4/D1.4M.
- N. District Inspector (IOR) will do the following:
1. Inspect placing of reinforcing steel and concrete at Project.
 2. Obtain weighmaster's certificate and identify mix before accepting each load.
 3. Keep daily record of concrete placement, identifying each truck load, time of receipt, and location of concrete in structure.
 4. Keep record until completion of Project and make available for inspection by DSA Field Engineer or representative.
 5. See also subparagraph on Waiver of Continuous Batch Plant Inspection above.
 6. During progress of work, take an additional number of test cylinders as directed by Architect. Conform to CBC 1905A.1.16 (modified ACI 318). Test cylinders need not be made for concrete used in exterior flatwork.
 - a. ACI 318 Section 26.12.2.1 shall be replaced and the Contractor shall comply with the following:
 - 1) Samples for strength test of each class of concrete placed each day shall not be taken less than once for each 50 cubic yards (38.3m³) of concrete, or not less than once for each 2,000 square feet (186 m²) of surface area of for slabs or walls.
 - 2) Additional samples for seven day compressive strength tests shall be taken for each class of concrete at the beginning of the concrete work or whenever the mix or aggregate is changed.

7. One set of cylinders shall consist of 4 samples all taken from same batch, one to be tested at age of 7 days and two at 28 days.
8. Make and store cylinders according to ASTM C31/C31M.
9. Deliver cylinders to laboratory or store cylinders in a suitable protected environment for pick up by laboratory personnel.
10. Make slump test of wet concrete according to test for slump of portland cement concrete, ASTM C143/C143M, at least at the same frequency that the cylinders are taken.

3.04 SPECIAL INSPECTIONS FOR SOILS

- A. Materials and Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
 1. Design bearing capacity of material below shallow foundations; periodic.
 2. Design depth of excavations and suitability of material at bottom of excavations; periodic.
 3. Materials, densities, lift thicknesses; placement and compaction of backfill: continuous.
 4. Subgrade, prior to placement of compacted fill verify proper preparation; periodic.
- B. Testing: Classify and test excavated material; periodic.
- C. Excavations, Foundations and Retaining Walls (Chapters 17A, 18A, and 33):
 1. Earth Compaction: CBC 1705A.6; Table 1705A.6, continuous; 1804A.6.
 2. Verify use of proper materials, densities, and lift thicknesses during placement and compaction of compacted fill: CBC 1705A.6.1; Table 1705A.6, periodic; 1804A.6.
- D. The Geotechnical Engineer of record or a Geotechnical Engineer selected by the District will provide continuous inspection of fill and will field test fill and earth backfill as placed and compacted, and inspect excavations and subgrade before concrete is placed and provide periodic inspection of open excavations, embankments, and other cuts or vertical surfaces of earth.
 1. The Geotechnical Engineer will submit a Verified Report indicating observations, tested fills, and opinion the fills were placed in accordance with the project specifications.
- E. Contractor shall remove unsatisfactory material, re-roll, adjust moisture, place new material, or in the case of excavations, provide proper protective measures, perform other operations necessary, as directed by the Geotechnical Engineer whose decisions and directions will be considered final.
- F. Soils Test and Inspection Procedure:
 1. Allow sufficient time for testing, and evaluation of results before material is needed. The Geotechnical Engineer shall be sole and final judge of suitability of all materials.
 2. Laboratory compaction tests to be used will be in accordance with ASTM D1557.
 3. Field density tests will be made in accordance with ASTM D1556/D1556M.
 4. Number of tests will be determined by Geotechnical Engineer. Materials in question may not be used pending test results.

5. Excavation and embankment inspection procedure. Geotechnical Engineer will visually or otherwise examine such areas for bearing values, cleanliness and suitability.
6. Earthwork Test Reports: In order to avoid misinterpretations by the reviewing agencies, all retest results shall be reported on the same sheet, immediately following the previous failure test to which it is related. Retests shall be clearly noted as such.

3.05 SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE

- A. Inspection: Comply with CBC 1705A.12.
- B. Testing: Comply with CBC 1705A.13.
- C. Cold Formed Steel Light Frame Construction:
 1. Field welding; periodic.
 2. Screw attachment, bolting, anchoring and other fastening of components within the main seismic force-resisting system; periodic.
- D. Architectural Components: Erection and fastening of components below; periodic.
 1. Interior and exterior veneer.
 2. Interior and exterior non-loadbearing walls and partitions.
 3. Suspended ceiling systems and their anchorage, per ICC ESR Report. CBC Section 1705A.12.5 and 1705A.13.2.
- E. Mechanical and Electrical Components:
 1. Anchorage of electric equipment required for emergency or standby power systems; periodic.
 2. Installation and anchorage of other electrical equipment; periodic.
 3. Vibration isolation systems where the approved Contract Documents require a nominal clearance of 1/4 inch or less between support frame and seismic restraint; periodic.
 4. Installation of mechanical and electrical equipment, including duct work, piping systems and their structural supports, where automatic fire sprinkler systems are installed.
 - a. Verify clearances have been provide as required by Section 13.2.3 of ASCE 7.
 - b. Verify nominal clearance of 3 inches has been provided between fire protection sprinkler drops and sprigs and: structural members not used collectively or independently to support the sprinklers; equipment attached to the building structure; and other systems' piping.
- F. Designated Seismic System Verification: Verify label, anchorage or mounting complies with certificate of compliance provided by manufacturer or fabricator.
- G. Structural Testing for Seismic Resistance:
 1. Concrete reinforcement: Comply with ACI 318, Section 20.2.2.5 and 21.1.5.2.
 - a. Materials Obtain mill certificates demonstrating compliance with ASTM A615/A615M; periodic.
 - b. Welding: Perform chemical tests complying with ACI 318, Section 26.6.4 to determine weldability; periodic.
 2. Structural Steel: Comply with the quality assurance requirements of AISC 341.
 3. Non-Structural Components:

- a. General Design Requirements: Obtain manufacturer certification of compliance with requirements of ASCE 7, Section 13.2.1; periodic.
- b. Designated Seismic Force-Resisting Non-Structural System Components: Obtain manufacturer certification of compliance with ASCE 7, Section 13.2.2; periodic.
- H. Structural Observations for Seismic Resistance: Visually observe structural system for general compliance with the approved Contract Documents; periodic.

3.06 SPECIAL INSPECTIONS FOR WIND RESISTANCE

- A. Cold-Formed Steel Light Frame Construction:
 - 1. Field welding; periodic.
 - 2. Screw attachment, bolting, anchoring and other fastening of components within the main wind force-resisting system; periodic
- B. Wind Resisting Components:
 - 1. Roof covering, roof deck, and floor framing connections; periodic.
 - 2. Exterior wall covering and wall connections to roof and floor diaphragms and framing; periodic.
- C. Structural Observations for Wind Resistance: Visually observe structural system for general compliance with the approved Contract Documents; periodic.

3.07 STRUCTURAL OBSERVATIONS FOR STRUCTURES

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

3.08 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

- A. Special Inspection Agency shall:
 - 1. Verify samples submitted by Contractor comply with the referenced standards and the approved Contract Documents.
 - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified reference standards.
 - 4. Ascertain compliance of materials and products with requirements of Contract Documents.
 - 5. Promptly notify Architect, SEOR, IOR, DSA, District and Contractor of observed irregularities or non-conformance of work or products.
 - 6. Perform additional tests and inspections required by Architect.
 - 7. Submit reports of all tests or inspections specified.
- B. Limits on Special Inspection Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the work.
- C. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- D. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.09 TESTING AGENCY DUTIES AND RESPONSIBILITIES

- A. Testing Agency Duties:
1. Test samples submitted by Contractor.
 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 3. Perform specified sampling and testing of products in accordance with specified standards.
 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
 6. Perform additional tests and inspections required by Architect.
 7. Attend preconstruction meetings and progress meetings.
 8. Submit reports of all tests or inspections specified.
- B. Limits on Testing or Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the work.
- C. Immediately upon determination of a test failure, the Laboratory shall telephone the results to the Architect. On the same day, Laboratory shall send test results by email to the Architect and to all relevant responsible parties of the project team, and District's Inspector
- D. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.
- E. Contractor will pay for re-testing required because of non-compliance with specified requirements.
- F. At the completion of the project, Testing Laboratory shall certify in writing and on all required DSA forms, that all work specified or required to be tested and inspected conforms to drawings, specifications and applicable building codes.
1. See DSA Procedure PR 13-01.

- G. Duties of the Laboratory of Record related to the use of form DSA 152 are as follows:
1. Meet with the Project Inspector, design professionals, and contractor as needed to mutually communicate and understand the testing and inspection program and the methods of communication appropriate for the project.
 2. Obtain a copy of the DSA approved construction documents from the design professional in general responsible charge prior to the commencement of construction
 3. Obtain a copy of the DSA approved Statement of Structural Tests and Special Inspections (form DSA 103) from the design professional in general responsible charge prior to the commencement of construction.
 4. Report all project related activities to the Project Inspector. The Project Inspector is responsible for monitoring the work of the Laboratory of Record and Special Inspectors to ensure the testing and special inspection program is satisfactorily completed
 5. Provide material testing as identified in the DSA approved construction documents.
 6. Submit test reports to the Project Inspector on the day the tests were performed for any tests performed on-site
 7. Submit material test reports in a timely manner such that construction is not delayed and not to exceed 14 days from the date the material tests were performed. Test reports are to be submitted to DSA, the Architect, structural engineer, Project Inspector and school district.
 - a. As a convenience, and if agreed upon by involved parties, the test reports may be submitted electronically as identified in Section 4 of this procedure.
 8. Immediately submit reports of material tests not conforming to the requirements of the DSA approved construction documents. These reports shall be submitted to the DSA, Architect, structural engineer, Project Inspector and school district.
 9. The Engineering Manager shall submit an interim Laboratory of Record Verified Report (form DSA 291) and the Geotechnical Engineer shall submit an interim Geotechnical Verified Report (form DSA 293) to DSA, the project inspector, school district and the Design Professional in General Responsible Charge.
 - a. The reports are required to be submitted upon any of the following events occurring:
 - 1) Within 14 days of the completion of the material testing/special inspection program.
 - 2) Work on the project is suspended for a period of more than one month.
 - 3) The services of the laboratory of record are terminated for any reason prior to completion of the project.
 - 4) The DSA requests a Verified Report. (See interim verified reports below. This is a "DSA request.")
 10. The Engineering Manager shall submit an interim verified report (form DSA 291) and the Geotechnical Engineer shall submit form DSA 293 to DSA and a copy to the project inspector for each of the applicable sections of the form DSA 152, prior to the project inspector signing off that section of the project inspection card, if that section required material testing. The sections are:
 - a. Initial Site Work

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

Inspector signing off that section of the project inspection card, if that section required special inspections. The sections are:

- a. Initial Site Work
- b. Foundation
- c. Vertical Framing
- d. Horizontal Framing
- e. Appurtenances
- f. Non-Building Site Structures
- g. Finish Site Work
- h. Other Work
- i. Final

16. The Verified Reports shall be sent electronically to the DSA.

- I. Duties of Special Inspectors, not employed by the Laboratory of Record, related to the use of form DSA 152 are as follows:
 1. Meet with the project inspector, Laboratory of Record, the design professionals, and the contractors as needed to mutually communicate and understand the testing and inspection program, and the methods of communication appropriate for the project.
 2. Report all project related activities to the project inspector. The project inspector is responsible for monitoring the work of the Laboratory of Record and special inspectors to ensure the testing and special inspection program is satisfactorily completed.
 3. Perform work under the direction of the design professional in general responsible charge, as defined in Section 4-335(f)1B of the California Administrative Code (Title 24, Part 1).
 4. Perform inspections in conformance with the DSA approved construction documents, applicable codes and code reference standards.
 5. Prepare detailed daily inspection reports outlining the work inspected and provide the project inspector a copy of the reports on the same day the inspections were performed.
 6. Immediately submit reports of materials or work not conforming to the requirements of the DSA approved construction documents. These reports shall be submitted to DSA, the Architect, structural engineer, project inspector and the school district.
 7. Submit daily special inspection reports in a timely manner such that construction is not delayed and not to exceed 14 days from the date the special inspections were performed. The reports are to be submitted to DSA, the Architect, structural engineer, project inspector and the school district.
 8. Submit Special Inspection Verified Report forms DSA 292 to DSA, the project inspector, the school district and the Design Professional in General Responsible Charge.
 - a. The reports are required to be submitted upon any of the following events occurring:
 - 1) Within 14 days of the completion of the special inspection work.
 - 2) Work on the project is suspended for a period of more than one month.
 - 3) The services of the special inspector are terminated for any reason prior to completion of the project.

- 4) DSA requests a verified report. (See interim verified reports below. This is a “DSA request.”)
9. Submit an interim Special Inspection Verified Report (form DSA 292) to DSA and a copy to the project inspector for each of the applicable sections of the form DSA 152, prior to the project inspector signing off that section of the project inspection card, if that section required special inspections.
 - a. The sections are:
 - 1) Initial Site Work
 - 2) Foundation Prep
 - 3) Vertical Framing
 - 4) Horizontal Framing
 - 5) Appurtenances
 - 6) Finish Site Work
 - 7) Other Work
 - 8) Final

3.10 CONTRACTOR DUTIES AND RESPONSIBILITIES

A. DSA Requirements:

1. Each Multi-Prime Contractor or Subcontractor shall comply with DSA Construction Oversight Procedure PR 13-01. California Code of Regulations (CCR), Title 24, Part 1, CCR, Chapter 4, Article 1 (Sections 4-211 through 4-220) and Group1, Articles 5 and 6 (Sections 4-331 through 4-344) which provide regulations governing the construction process for projects under the jurisdiction of the Division of the State Architect (DSA).
 - a. Assist the Project Inspector (IOR) and complete and fill out the following forms during the course of construction.
 - 1) Form-102-IC: Construction Start Notice/ Inspection Card Request: Verify Project Inspector has an active form issued by DSA.
 - 2) Form-151: Project Inspector Notifications: Contractor to notify IOR and assist.
 - 3) Form-152: Project Inspection Card: See below.
 - 4) Form-154: Notice of Deviations/ Resolution of Deviations: Contractor to verify all deviations are reviewed, corrected, and accepted by the design professional, and filed with DSA through the Project Inspector (IOR).
 - (a) When the Project Inspector identifies deviations from the DSA approved construction documents the inspector must verbally notify the contractor. If the deviations are not corrected within a reasonable time frame, the inspector is required to promptly issue a written notice of deviation to the contractor, with a copy sent to the design professional in general responsible charge and the DSA.
 - (b) When the noticed deviations are corrected, the inspector is required to promptly issue a written notice of resolution to the contractor, with a copy sent to the design professional in general responsible charge and the DSA.
 - (c) Deviations include both construction deviations and material deficiencies.
 - (d) The written notice of deviations shall be made using form DSA 154.
 - (e) The notice of resolution of deviations shall be made using the original form DSA 154 that reported the deviations.

- 5) Form-156: Commencement/Completion of Work Notification
 - 6) Form-6.C: Verified Report – Contractor: From each contractor having a contract with the school board.
2. Duties of Contractor related to the use of form DSA 152 are as follows:
- a. The Contractor shall carefully study the DSA approved documents and shall plan a schedule of operations well ahead of time.
 - b. If at any time it is discovered that work is being done which is not in accordance with the DSA approved construction documents, the Contractor shall correct the work immediately.
 - c. Verify that forms DSA 152 are issued for the project prior to the commencement of construction.
 - d. Meet with the design team, the Laboratory of Record and the Project Inspector to mutually communicate and understand the testing and inspection program and the methods of communication appropriate for the project.
 - e. Notify the Project Inspector, in writing, of the commencement of construction of each and every aspect of the work at least 48 hours in advance by submitting form DSA 156 (or other agreed upon written documents) to the Project Inspector.
 - f. Notify the Project Inspector of the completion of construction of each and every aspect of the work by submitting form DSA 156 (or other agreed upon written documents) to the Project Inspector.
 - g. Consider the relationship of the signed off blocks and sections of the form DSA 152 and the commencement of subsequent work. Until the Project Inspector has signed off applicable blocks and sections of the form DSA 152, the Contractor may be prohibited from proceeding with subsequent construction activities that cover up the unapproved work. Any subsequent construction activities, that cover up the unapproved work, will be subject to a “Stop Work Order” from the DSA or the district and are subject to removal and remediation if found to be in non-compliance with the DSA approved construction documents.
 - h. Submit the final verified report. All prime contractors are required to submit final Contractor Verified Reports (form DSA 6-C) to DSA and the project inspector.
 - 1) The reports are required to be submitted upon any of the following events occurring:
 - (a) The project is substantially complete. DSA considers the project to be complete when the construction is sufficiently complete in accordance with the DSA approved construction documents so that the owner can occupy or utilize the project.
 - (b) Work on the project is suspended for a period of more than one month.
 - (c) The services of the contractor are terminated for any reason prior to the completion of the project.
 - (d) DSA requests a verified report.
- B. Contractor Responsibilities, General:
1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
 2. Availability of Samples

- a. Contractor shall make materials required for testing available to Laboratory and assist in acquiring these materials as directed by the District's Inspector. The samples shall be taken under the immediate direction and supervision of the Testing Laboratory or District's Inspector.
 - b. If work which is required to be tested or inspected is covered up without prior notice or approval, such work may be uncovered at the discretion of Architect at no additional cost to the District. Refer to paragraph "Payments" herein.
 - c. Unless otherwise specified, Contractor shall notify Testing Laboratory a minimum of 10 working days in advance of all required tests, and a minimum of 2 working days in advance of all required inspections. All extra expenses resulting from a failure to notify the Laboratory will be paid by the District and backcharged to the Contractor.
 - d. Contractor shall give sufficient advance notice to Testing Laboratory in the event of cancellation or time extension of a scheduled test or inspection. Charges due to insufficient advance, notice of cancellations, or time extension will be paid for by the District and backcharged to the Contractor.
3. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.
 4. Provide incidental labor and facilities:
 - a. To provide access to work to be tested or inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
 - c. To facilitate tests or inspections.
 - d. To provide storage and curing of test samples.
 5. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
 6. Arrange with District's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 7. The Contractor shall notify the District's Inspector a minimum of 5 working days in advance of the manufacture of material to be supplied by him under the Contract Documents, which must be by terms of the Contract be tested, in order that the District may arrange for the testing of such material at the source of supply.
 8. Material shipped by the Contractor from the source of supply before having satisfactorily passed such testing and inspection or before the receipt of notice from said Inspector that such testing and inspection will not be required, shall not be incorporated in the Project.
 9. The District will select and pay testing laboratory costs for all tests and inspections, but may be reimbursed by the Contractor for such costs under the Contract conditions. Any direct payments by the Contractor to the testing laboratory on this project is prohibited.
- C. Contractor shall submit a written statement of responsibility to comply with CBC section 1704A.4.
1. Each contractor responsible for the construction of a main wind- or seismic-force-resisting system, designated seismic system or a wind- or seismic-resisting component listed in the statement of special inspections shall submit a written

statement of responsibility to the building official and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:

- a. Acknowledgment of awareness of the special requirements contained in the statement of special inspections;
 - b. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official;
 - c. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports; and
 - d. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- D. Contractor Responsibilities, Seismic Force-Resisting System, Designated Seismic System, and Seismic Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and District prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.
- E. Contractor Responsibilities, Wind Force-Resisting System and Wind Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and District prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.
- F. Unless otherwise directed, materials not conforming to the requirements of Contract Documents shall be promptly removed from the Project site.

3.11 MANUFACTURERS' AND FABRICATORS' FIELD SERVICES

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

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 01 35 53 - Security Procedures
- B. Section 01 51 00 - Temporary Utilities.
- C. Section 01 52 13 - Field Offices and Sheds.
- D. Section 01 55 00 - Vehicular Access and Parking.
- E. Section 01 58 13 - Temporary Project Signage.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
 - 1. Use 2016 as indicated in 2019 CBC Referenced Standards.

1.04 TEMPORARY UTILITIES - SEE SECTION 01 51 00

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. Existing facilities may not be used.
- C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.05 TELECOMMUNICATIONS SERVICES

- A. Provide equivalent equipment and connections for District's field office.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Internet Connections: Minimum of one; DSL modem or faster.

1.06 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

1. Provide temporary toilet facilities if maximum number of personnel on project is greater than 10.
 2. Submit proposed location of temporary toilet(s) to Construction Manager for approval.
 - a. Place on-site portable toilets away from building air intakes and entryway.
- B. Maintain daily in clean and sanitary condition.
- C. At end of construction, return facilities to same or better condition as originally found.

1.07 BARRIERS

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

1.08 FENCING

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

1.09 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and District's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with District's security program.
 1. Include construction surveillance camera system per the District.

1.10 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.

1.11 SMOKING AND TOBACCO

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

1.12 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 55 00

- 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.

1.13 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.

1.14 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.

1.15 FIELD OFFICES - SEE SECTION 01 52 13

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Provide separate private office similarly equipped and furnished, for use of District.
- D. Provide separate private office similarly equipped and furnished, for use of Architect and District.
- E. Locate offices a minimum distance of 30 feet from existing and new structures.

1.16 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 51 00
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary Utilities: Provision of electricity, lighting, and water.

1.02 RELATED REQUIREMENTS

- A. Section 01 50 00 - Temporary Facilities and Controls:
 - 1. Temporary telecommunications services for administrative purposes.
 - 2. Temporary sanitary facilities required by law.

1.03 REFERENCE STANDARDS

- A. AHRI 560 - U.S. Occupational Safety and Health Standards; current edition.

1.04 TEMPORARY ELECTRICITY

- A. Cost: By Contractor.
- B. Provide power service required from utility source.
- C. Power Service Characteristics: 480 volt, 200 ampere, three phase, four wire.
- D. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.
- E. Provide main service disconnect and over-current protection at convenient location and meter.
- F. Permanent convenience receptacles may be utilized during construction.
- G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.05 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of AHRI 560 and authorities having jurisdiction.
- B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.
- C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- D. Maintain lighting and provide routine repairs.
- E. Permanent building lighting may be utilized during construction.

1.06 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By Contractor.

- B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.
- C. Connect to existing water source.
 - 1. Exercise measures to conserve water.
 - 2. Provide separate metering and reimburse District for cost of water used.
- D. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 52 13
FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary field offices for use of Architect.
- B. Temporary field offices for use of Construction Manager.
- C. Temporary field offices for use of Project Inspector.
- D. Temporary field offices for use of Contractor.
- E. Maintenance and removal.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: use of premises and responsibility for providing field offices.
- B. Section 01 50 00 - Temporary Facilities and Controls:
 - 1. Temporary telecommunications services for administrative purposes.
 - 2. Temporary sanitary facilities required by law.
- C. Section 01 55 00: Parking and access to field offices.

1.03 USE OF EXISTING FACILITIES

- A. Existing facilities shall not be used for field offices.

1.04 USE OF PERMANENT FACILITIES

- A. Permanent facilities shall not be used for field offices.

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

- A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.02 CONSTRUCTION

- A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.
- B. Construction: Structurally sound, secure, weather tight enclosures for office. Maintain during progress of Work; remove when no longer needed.
- C. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy requirements.
- D. Exterior Materials: Weather resistant, finished in one color.
- E. Interior Materials in Offices: Sheet type materials for walls and ceilings, prefinished or painted; resilient floors and bases.
- F. Lighting for Offices: 50 fc at desk top height, exterior lighting at entrance doors.

- G. Fire Extinguishers: Appropriate type fire extinguisher at each office.

2.03 ENVIRONMENTAL CONTROL

- A. Heating, Cooling, and Ventilating: Automatic equipment to maintain comfort conditions.

2.04 CONTRACTOR OFFICE AND FACILITIES

- A. Size: For Contractor's needs and to provide space for project meetings.
- B. Telephone: As specified in Section 01 50 00.
- C. Furnishings in Meeting Area: Conference table and chairs to seat at least eight persons; racks and files for Contract Documents, submittals, and project record documents.
- D. Other Furnishings: Contractor's option.
- E. Equipment: Six adjustable band protective helmets for visitors, one 10 inch outdoor weather thermometer .

2.05 CONSTRUCTION MANAGER, DISTRICT, PROJECT INSPECTOR, ARCHITECT, AND ENGINEER OFFICE

- A. Separate space for sole use of District and Architect, with separate entrance door with new lock and two keys.
- B. Area: At least 150 sq ft, with minimum dimension of 8 ft.
- C. Provide two separate office trailers:
 - 1. One minimum 36 x 10 feet, with:
 - a. Interior Sanitary Facilities: private plumbed lavatory toilet facilities.
 - b. Minimum of one separate office space for the Project Inspector(s).
- D. Windows: At least three, with minimum total area equivalent to 10 percent of floor area, with an operable sash and insect screen. Locate to provide views of construction area.
- E. Electrical Distribution Panel: Four circuits minimum, 110 volt, 60 hz service.
- F. Minimum four 110 volt duplex convenience outlets, one on each wall.
- G. Minimum for each 10 foot length, provide 110 volt duplex convenience outlets, on each wall of the office open space.
- H. Provide four 110 volt duplex convenience outlets in each office.
- I. Telephone: As specified in Section 01 50 00.
- J. Sanitary Facilities: As specified in Section 01 50 00.
- K. Drinking Fountain: Convenient access by workers.
- L. Furnishings:
 - 1. One desk 54 by 30 inch, with three drawers.
 - 2. One drafting table 36 by 72 inch, with one equipment drawer and a 48 inch wide parallel straight edge.
 - 3. One computer workstation with 24 by 48 inch work surface, CPU shelf, retractable keyboard tray, and space for computer monitor and 11 by 17 inch printer.
 - 4. One metal, double-door storage cabinet under table.
 - 5. Plan rack to hold working drawings, shop drawings, and record documents.

6. One standard four-drawer legal size metal filing cabinet with locks and two keys per lock.
7. Six linear ft of metal bookshelves.
8. Two swivel arm chairs.
9. Two straight chairs.
10. One drafting table stool.
11. One tackboard 36 by 30 inch.
12. One waste basket per desk and table.
13. Four folding tables 30 by 72 inches; to be capable of being combined for use as a single conference table.

PART 3 EXECUTION

3.01 PREPARATION

- A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.02 INSTALLATION

- A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.
- B. Parking: Two hard surfaced parking spaces for use by District and Architect, connected to office by hard surfaced walk.

3.03 MAINTENANCE AND CLEANING

- A. Weekly janitorial services for offices; periodic cleaning and maintenance for offices.
- B. Maintain approach walks free of mud, water, and snow.

3.04 REMOVAL

- A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION

SECTION 01 55 00
VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Access roads.
- B. Parking.
- C. Existing pavements and parking areas.
- D. Permanent pavements and parking facilities.
- E. Construction parking controls.
- F. Flag persons.
- G. Flares and lights.
- H. Haul routes.
- I. Traffic signs and signals.
- J. Maintenance.
- K. Removal, repair.
- L. Mud from site vehicles.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: For access to site, work sequence, and occupancy.
- B. Section 01 58 13 - Temporary Project Signage: Post Mounted and Wall Mounted Traffic Control and Informational Signs.
- C. Section 31 22 00 - Grading: Specifications for earthwork and paving bases.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Temporary Construction: Contractor's option.
- B. Materials for Permanent Construction: As specified in product specification sections, including earthwork, paving base, and topping.

2.02 SIGNS, SIGNALS, AND DEVICES

- A. Post Mounted and Wall Mounted Traffic Control and Informational Signs: Specified in Section 01 58 13 - Temporary Project Signage.
- B. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.
- C. Flag Person Equipment: As required by local jurisdictions.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.
- B. Limit the number of haul trucks on site and establish a haul route. Install a gravel or base road on site for loading trucks. Haul route shall be reviewed and approved by Construction Manager.
- C. Provide a boundary/zone where equipment shall not enter because of proximity to active adjacent operation, and if necessary, equipment shall operate on alternative fuel to reduce diesel particulate matter.
- D. Establish construction site and access road speed limits and enforce them during the construction period.
- E. Restrict the hours of material transport to the periods and days permitted by both this contract and local noise or other applicable ordinance.
- F. Schedule haul trucks and material delivery trucks to prevent traffic congestion and impede the normal operation of the Facility. Set up truck queuing area away from public entrances.

3.02 ACCESS ROADS

- A. Use of existing on-site streets and driveways for construction traffic is permitted.
- B. Tracked vehicles not allowed on paved areas.
- C. Extend and relocate as work progress requires, provide detours as necessary for unimpeded traffic flow.
- D. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.
- E. Provide and maintain access to fire hydrants free of obstructions.

3.03 PARKING

- A. Use of designated areas of existing parking facilities by construction personnel is permitted.
 - 1. Construction Manager will meet with Contractor(s) to determine parking requirements.
- B. Construction Manager will notify security of parking area to be used by construction personnel if at variance with this procedure.
- C. Use of designated areas of new parking facilities by construction personnel is permitted.
- D. Contractor(s) and related personnel shall park in authorized areas only.
- E. Do not allow heavy vehicles or construction equipment in parking areas.
- F. Arrange for temporary parking areas to accommodate use of construction personnel.
- G. When site space is not adequate, provide additional off-site parking.

3.04 PERMANENT PAVEMENTS AND PARKING FACILITIES

- A. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.

- B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

3.05 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and District's operations.
- B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.
- C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.06 FLAG PERSONS

- A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.07 FLARES AND LIGHTS

- A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.08 HAUL ROUTES

- A. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
- B. Confine construction traffic to designated haul routes.
- C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.09 TRAFFIC SIGNS AND SIGNALS

- A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
- B. Relocate as work progresses, to maintain effective traffic control.

3.10 MAINTENANCE

- A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
- B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.11 REMOVAL, REPAIR

- A. Remove underground work and compacted materials to a depth of 2 feet; fill and grade site as specified.
- B. Repair existing facilities damaged by use, to original condition.
- C. Remove equipment and devices when no longer required.
- D. Repair damage caused by installation.
- E. Remove post settings to a depth of 2 feet.

3.12 MUD FROM SITE VEHICLES

- A. Provide means of removing mud from vehicle wheels before entering streets.

END OF SECTION

SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Responsibility to provide signs.
- B. Section 05 50 00 - Metal Fabrications: Miscellaneous connectors.

1.03 REFERENCE STANDARDS

- A. FHWA (SHS) - Standard Highway Signs and Markings; 2004, with Supplement (2012).

1.04 QUALITY ASSURANCE

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

1.05 SUBMITTALS

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

PART 2 PRODUCTS

2.01 SIGN MATERIALS

- A. Structure and Framing: New, wood, structurally adequate to support sign panel and suitable for specified finish.
- B. Sign Surfaces: Exterior grade plywood with medium or high density phenolic sheet overlay, minimum 3/4 inch thick, standard large sizes to minimize joints. Provide sheet thickness as required to span across framing members and provide even, smooth surface without waves or buckles.
- C. Rough Hardware: Galvanized steel, as specified in Section 05 50 00 - Metal Fabrications and Section 06 10 00 - Rough Carpentry..

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

2.02 PROJECT IDENTIFICATION SIGN

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

2.03 PROJECT INFORMATIONAL SIGNS

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

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

PART 3 EXECUTION

3.01 INSTALLATION

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

3.02 MAINTENANCE

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

3.03 REMOVAL

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

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Identification of District-supplied products.
- B. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- C. Section 01 40 00 - Quality Requirements: Product quality monitoring.
- D. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- E. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.
- F. Division 26 - Electrical.
- G. Division 28 - Electronic Safety and Security
- H. Divisions 31 - 33: Sitework.

1.03 REFERENCE STANDARDS

- A. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - 1. Use California Electrical Code.

1.04 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.

- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.05 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

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

3. Equipment: A product with operating parts, whether motorized or manually operated, that requires connections such as wiring or piping.
- C. Specific Product Requirements: Refer to requirements of Section 01 40 00 - Quality Requirements and individual product Specifications Sections in Divisions 2 through 33 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, shall 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. Electrical and Electronic Safety and Security: Comply with requirements specified in Divisions 26 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 Conditions or general requirements specified in Section 01 30 00 - Administrative Requirements and 01 31 14 - Facility Services Coordination regarding construction interfacing and coordination.

2.03 NEW PRODUCTS

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

2. Provide a permanent nameplate on each item of service-connected or power-operated equipment. Nameplates shall contain identifying information and essential operating data such as the following example:
 - a. Name of manufacturer
 - b. Name of product
 - c. Model and serial number
 - d. Capacity
 - e. Operating and Power Characteristics
 - f. Labels of Tested Compliance with Codes and Standards
 3. Refer to additional requirements which may be specified in various sections, as included in this Project Manual.
 4. For each item of service-connected or power-operated equipment, provide operating and safety instructions, permanently affixed and of durable construction, with legible machine lettering. Comply with all applicable requirements of authorities having jurisdiction and listing agencies.
- G. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to CEC/1, include lugs for terminal box.

2.04 PRODUCT OPTIONS

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

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

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

2.05 MAINTENANCE MATERIALS

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

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

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

3.02 OWNER-SUPPLIED PRODUCTS

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

3.03 TRANSPORTATION AND HANDLING

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

- H. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- I. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

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

- L. Comply with manufacturer's warranty conditions, if any.
- M. Do not store products directly on the ground.
- N. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- O. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- P. Prevent contact with material that may cause corrosion, discoloration, or staining.
- Q. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- R. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

3.05 INSTALLATION OF PRODUCTS

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

3.06 PROTECTION OF COMPLETED WORK

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

END OF SECTION

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

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

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

1.03 DEFINITIONS

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

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

1.04 REFERENCE STANDARDS

- A. AHRI 340/360 - Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500 MM (12- to 60-in.) Diameter; 2013.
- B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).
- C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.
- D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.
- E. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.
- F. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.
- G. GreenSeal GS-36 - Adhesives for Commercial Use; 2013.
- H. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).
- I. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).
- J. SCS (CPD) - SCS Certified Products; Current Edition.
- K. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.05 SUBMITTALS

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

5. Other methods approved by the building official.

1.06 QUALITY ASSURANCE

- A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
 1. Wet-Applied Products: State amount applied in mass per surface area.
 2. Paints and Coatings: Test tinted products, not just tinting bases.
 3. Evidence of Compliance: Acceptable types of evidence are the following;
 - a. Current UL (GGG) certification.
 - b. Current SCS (CPD) Floorscore certification.
 - c. Current SCS (CPD) Indoor Advantage Gold certification.
 - d. Current listing in CHPS (HPPD) as a low-emitting product.
 - e. Current CRI (GLP) certification.
 - f. Test report showing compliance and stating exposure scenario used.
 4. Product data submittal showing VOC content is NOT acceptable evidence.
 5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.
- B. VOC Content Test Method: AHRI 340/360 (EPA Method 24), or ASTM D3960, unless otherwise indicated.
 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
 - b. Published product data showing compliance with requirements.
 - c. Certification by manufacturer that product complies with requirements.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.07 REGULATORY REQUIREMENTS

- A. All VOC restricted products shall be compliant with local jurisdiction 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.

PART 2 PRODUCTS

2.01 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. AHRI 340/360.
 - b. SCAQMD 1113 Rule.
 - c. CARB (SCM).
 - d. CalGreen Building Standards Section 5.504, Table 504.4.3 "VOC Content Limits for Architectural Coatings".
- 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

.01 FORM

A. Identification:

1. Project Name: Rio Mesa High School - Home Bleachers
2. Project No.: 612.12353.08
3. Architect: Little Diversified Architectural Consulting

B. Use of This Form:

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

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

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

1.01 PRODUCT CERTIFICATION

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

1. [HAS] [HAS NOT] required the use of any ADHESIVES.
2. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.

B. Product data and MSDS sheets are attached.

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

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

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

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

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

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

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

A. Firm Name: _____

B. Print Name: _____

C. Signature: _____

D. Title: _____ (officer of company)

E. Date: _____

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures.
- C. Section 01 31 14 - Facility Services Coordination: Coordination of trades and BIM documents.
- D. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- E. Section 01 45 33 - Code-Required Special Inspections: Construction oversight procedures by DSA regarding the execution, approval, and closeout of this building project.
- F. Section 01 71 23 - Field Engineering: Additional requirements for field engineering and surveying work.
- G. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- H. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- I. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- J. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.
- K. Individual Product Specification Sections:
 - 1. Advance notification to other sections of openings required in work of those sections.
 - 2. Limitations on cutting structural members.

1.03 REFERENCE STANDARDS

- A. CFC Ch. 35 - California Fire Code - Chapter 35 - Welding and Other Hot Work; current edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.04 SUBMITTALS

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

1.05 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
 - 1. Minimum of 5 years of documented experience.
- B. For surveying work, employ a land surveyor registered in California and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form

of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

- C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in California. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
- D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in California.

1.06 PROJECT CONDITIONS

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

1.07 COORDINATION

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

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

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

PART 3 EXECUTION

3.01 EXAMINATION

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

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

3.02 PREPARATION

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

3.03 PREINSTALLATION MEETINGS

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

3.04 LAYING OUT THE WORK

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

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

3.05 GENERAL INSTALLATION REQUIREMENTS

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

3.06 ALTERATIONS

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

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

3.07 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
 1. Complete the work.

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

2. For an assembly, refinish entire unit.

3.08 PROGRESS CLEANING

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

3.09 PROTECTION OF INSTALLED WORK

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

3.10 SYSTEM STARTUP

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

3.11 PROJECT CLOSEOUT CONFERENCE

- A. Schedule and conduct a project closeout conference, at a time convenient to District and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
 - 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 - 2. Attendees: Authorized representatives of District, Commissioning Authority (CxA), Architect, and relevant consultants; Contractor and project superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Commissioning.
 - c. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - d. Submittal of written warranties.
 - e. Coordination of separate contracts.
 - f. District's partial occupancy requirements.
 - g. Installation of District's furniture, fixtures, and equipment.
 - h. Responsibility for removing temporary facilities and controls.
 - 4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, District, participants, and those affected by decisions made.

3.12 DEMONSTRATION AND INSTRUCTION

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

3.13 ADJUSTING

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

3.14 FINAL CLEANING

- A. Cleaning and Disposal Requirements, General: Conduct cleaning and disposal operations in compliance with all applicable codes, ordinances and regulations, including environmental protection laws, rules and practices.
- B. Execute final cleaning prior to final project assessment.
 - 1. Clean areas to be occupied by District prior to final completion before District occupancy.
- C. Substantial Completion Review Cleaning, General: Execute a thorough cleaning prior to Substantial Completion review by Architect and District. Employ experienced workers or professional cleaners for cleaning operations for Substantial Completion review.

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

3.15 CLOSEOUT PROCEDURES

- A. Clean-Up Retainage:
 - 1. Five (5) percent of each Contractor's bid will automatically be held in abeyance in their contract schedule of values for clean-up.
 - 2. If in the Construction Manager's opinion the Contractor is maintaining a clean project, a pro-rata share of this clean-up budget will be paid monthly to the Contractor in accordance with their approximate aggregate percentage of completion of the project.
 - 3. If a Contractor fails to heed written directives to clean-up during the course of the project, the work will be done at the Contractor's expense and a deductive change order will be written against their contract with the District.
 - 4. The establishment of this 5 percent budget in no way limits the cost for the Contractor to maintain a clean project.
- B. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and District.

- C. Accompany Architect, Construction Manager, and District Representative on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's comprehensive list of items to be completed or corrected.
 - 1. As authorized by the District; Architect and Architect's and District's consultants, as appropriate, will attend a meeting at the Project site to review Contract closeout procedures and to review the list of items to be completed and corrected (punch list) to make the Work ready for acceptance by the District.
 - 2. This meeting shall be scheduled not earlier than 14 days prior to the date anticipated for the Substantial Completion review.
- D. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- E. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
 - 1. Final Application for Payment: In the Application for Payment that coincides with the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed substantially complete.
 - 2. Warranties, Bonds and Certificates: Submit specific warranties, guarantees, workmanship bonds, maintenance agreements, final certifications and similar documents.
 - 3. Locks and Keys: Change temporary lock cylinders over to permanent keying and transmit keys to the District, unless otherwise directed or specified.
 - 4. Tests and Instructions: Complete start-up testing of systems, and instruction of the District's personnel. Remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
- F. Clearing and Cleaning: Prior to the Substantial Completion review, Contractor shall conduct a thorough cleaning and clearing of the Project area, including removal of construction facilities and temporary controls.
- G. Inspection and Testing: Prior to the Substantial Completion review, complete inspection and testing required for the Work, including securing of approvals by authorities having jurisdiction.
 - 1. Complete all inspections, tests, balancing, sterilization and cleaning of plumbing and HVAC systems.
 - 2. Complete inspections and tests of electrical power and signal systems.
 - 3. Complete inspections and tests of conveying (elevator or wheelchair lift) systems.
- H. District will occupy all of the building as specified in Section 01 10 00.
- I. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

1. Correction (Punch) List: Contractor shall prepare and distribute at the preliminary Contract closeout review meeting, a typewritten, comprehensive list of items to be completed and corrected (punch list) to make the Work ready for acceptance by the District.
 - a. The punch list shall include all items to be completed or corrected prior to the Contractor's application for final payment.
 - b. The punch list shall identify items by location (room number or name) and consecutive number. For example, 307-5 would identify item 5 in Room 307, Roof-4 would identify item 4 on Roof.
 - c. Contractor shall prepare separate lists according to categories used for Drawings. For example, provide lists for Architectural, Structural, Plumbing, Mechanical, Electrical, Fire Protection, Civil, and Landscape.
 - d. Architect, Architect's consultants and District's consultants, if in attendance, will conduct a brief walk-through of Project with the Contractor to review scope and adequacy of the punch list.
 - e. Verbal comments will be made to the Contractor by the Construction Manager, the Architect and the Architect's and District's consultants, if in attendance, during the walk-through. These comments will indicate generally the additions and corrections to be made to the punch list. Such comments shall not be considered to be comprehensive; Contractor shall use the comments as guidance in preparing the punch list for the Substantial Completion review.
2. Substantial Completion Meeting: On a date mutually agreed by the District, Architect, and Contractor, a meeting shall be conducted at the Project site to determine whether the Work is satisfactory and complete for filing a Notice of Completion (Substantial Completion).
 - a. Contractor shall provide three working days notice to Architect for requested date of Substantial Completion meeting.
 - b. The Construction Manager, the Architect and the Architect's and District's consultants, as authorized by the District, will attend the Substantial Completion meeting.
 - c. In addition to conducting a walk-through of the facility and reviewing the punch list, the purpose of the meeting shall include submission of warranties, guarantees and bonds to the District, submission of operation and maintenance data (manuals), provision of specified extra materials to the District, and submission of other Contract closeout documents and materials as required and if not already submitted.
 - d. The Construction Manager, the Architect and Architect's consultants, as appropriate, will conduct a walk-through of the facility with the Contractor and review the punch list.
 - e. Contractor shall correct the punch list and record additional items as may identified during the walk-through, including notations of corrective actions to be taken.
 - f. Contractor shall retype the punch list and distribute it within three working days to those attending the meeting.
 - g. If additional site visits by the Construction Manager, the Architect and the Architect's and District's consultants are required to review completion and

correction of the Work, the costs of additional visits shall be reimbursed to the District by the Contractor by deducting such costs from the Final Payment.

- J. Correct items of work listed in Final Correction Punch List and comply with requirements for access to District-occupied areas.
- K. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
 - 1. Architect's Certification of Substantial Completion:
 - a. When Architect determines that list of items to be completed and corrected (Punch List) is sufficiently complete for District to occupy Project for the use to which it is intended.
 - b. Architect will complete and issue to the District and Contractor a Certificate of Substantial Completion using:
 - 1) The American Institute of Architects Form G704 - Certificate of Substantial Completion
 - 2) or other form if directed by the District.
- L. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.16 FINAL PAYMENT

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

3.17 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the District.

END OF SECTION

SECTION 01 71 23
FIELD ENGINEERING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Field engineering services by Contractor.
- B. Land surveying services by Contractor.

1.02 DESCRIPTION OF SERVICES

- A. Specific services listed in this section are in addition to, and do not supersede, general Execution and Closeout Requirements.
- B. Sole responsibility for establishing all locations, dimensions and levels of items of work.
- C. Sole responsibility for provision of all materials required to establish and maintain benchmarks and control points, including batter boards, grade stakes, structure elevation stakes, and other items.
- D. Having a skilled instrument person(s) available on short notice when necessary for laying out the work.
- E. Keeping a transit, theodolite, or TST (total station theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the project site at all times.
- F. Provision of facilities and assistance necessary for Architect to check lines and grade points placed by Contractor.
 - 1. Performance of excavation or embankment work until after all cross-sectioning necessary for determining payment quantities for Unit Price work have been completed and accepted by Architect.
- G. Preparation and maintenance of daily reports of activity on the work. Submission of reports containing key progress indicators and job conditions to Architect.
 - 1. Number of employees at the Site.
 - 2. Number employees at the Site for each of Contractor's subcontractors.
 - 3. Breakdown of employees by trades.
 - 4. Major equipment and materials installed as part of the work.
 - 5. Major construction equipment utilized.
 - 6. Location of areas in which construction was performed.
 - 7. Materials and equipment received.
 - 8. Work performed, including field quality control measures and testing.
 - 9. Weather conditions.
 - 10. Safety.
 - 11. Delays encountered, amount of delay incurred, and the reasons for the delay.
 - 12. Instructions received from Architect or District, if any.

- H. Preparation and maintenance of professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the work.
- I. Prior to backfilling operations, surveying - locating, and recording on a copy of Contract Documents - an accurate representation of buried work and Underground Facilities encountered.
- J. Setting up and executing time-lapse photography of construction activities.

1.03 REFERENCE STANDARDS

- A. FGDC-STD-007.1 - Geospatial Positioning Accuracy Standards - Part 1: Reporting Methodology; 1998.
- B. FGDC-STD-007.2 - Geospatial Positioning Accuracy Standards - Part 2: Standards for Geodetic Networks; 1998.
- C. FGDC-STD-007.4 - Geospatial Positioning Accuracy Standards - Part 4: Architecture, Engineering, Construction, and Facilities Measurement; 2002.
- D. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.
- E. State Plane Coordinate System for California.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Submit in addition to items required in Section 01 70 00 - Execution and Closeout Requirements.
- C. Informational Submittals: Submit the following:
 - 1. Field Engineering: Submit daily reports, with content as indicated in this section.
 - a. When requested by Architect, submit for Record documentation verifying accuracy of field engineering including, but not limited to, Contractor's survey notes and field notes.
 - 2. Final property survey.

1.06 QUALITY ASSURANCE

- A. Field Engineer's Qualifications: As established in Section 01 70 00 - Execution and Closeout Requirements.
- B. Land Surveyor's Qualifications: As established in Section 01 70 00 - Execution and Closeout Requirements.
- C. Use adequate number of skilled and thoroughly-trained workers to perform the work of this section in a timely and comprehensive manner.
- D. Minimum accuracy for required work is as follows:
 - 1. Grade: Horizontal Tolerance: Plus or minus 0.5 feet, Vertical Tolerance: Plus or minus 0.05 feet.

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. Notify District's Representative and Architect of any discrepancies immediately in writing before proceeding to lay out the work. Locate and protect existing benchmarks and base line. Preserve permanent reference points during construction.
- B. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify existing conditions.

3.02 FIELD ENGINEERING

- A. Maintain field office files, drawings, specifications, and record documents.
- B. Coordinate field engineering services with Contractor's subcontractors, installers, and suppliers as appropriate.
- C. Prepare layout and coordination drawings for construction operations.
- D. Check and coordinate the work for conflicts and interferences, and immediately advise Architect and District of all discrepancies of which Contractor is aware.
- E. Cooperate as required with Architect and District in observing the work and performing field inspections.
- F. Review and coordinate work on a regular basis with shop drawings and Contractor's other submittals.
- G. In general, match existing adjacent grades and maintain existing flow lines.
- H. Check the location, line and grade of every major element as the work progresses. Notify the Architect when deviations from required lines or grades exceed allowable tolerances. Include in such notifications a thorough explanation of the problem, and a proposed plan and schedule for remedying the deviation. Do not proceed with remedial work without District's concurrence of the remediation plan.
- I. Check all formwork, reinforcing, inserts, structural steel, bolts, sleeves, piping, other materials and equipment for compliance with shop drawings and Contract Documents requirements.
- J. Check all bracing and shoring for structural integrity and compliance with designs prepared by the Contractor.

3.03 LAND SURVEYING

- A. General: Follow standards for geospatial positioning accuracy.
 1. FGDC-STD-007.1 as amended by Authority Having Jurisdiction.

2. FGDC-STD-007.2 as amended by Authority Having Jurisdiction.
 3. FGDC-STD-007.4 as amended by Authority Having Jurisdiction.
- B. Coordinate survey data with the State Plane Coordinate System of California.
- C. Contractor is responsible for the restoration of all property corners and control monuments damaged or destroyed by construction-related activities. Any disturbed monuments must be replaced at Contractor's expense by a surveyor licensed in California, and approved by the Architect.
1. Temporarily suspend work at such points and for such reasonable times as the District may require for resetting monuments. The Contractor will not be entitled to any additional compensation or extension of time.

3.04 CONSTRUCTION SURVEYING

- A. General: Perform surveying as applicable to specific items necessary for proper execution of work.
1. Alignment Staking: Provide alignment stakes at 50 foot intervals on tangent, and at 25 foot intervals on curves.
 2. Slope Staking: Provide slope staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. Re-stake at every ten-foot difference in elevation.
 3. Structure: Stake out structures, including elevations, and check prior to and during construction.
 4. Pipelines: Stake out pipelines including elevations, and check prior to and during construction.
 5. Site Utilities: Stake out utility lines including elevations, and check prior to and during construction.
 6. Road: Stake out roadway elevations at 50 foot intervals on tangent, and at 25 foot intervals on curves.
 7. Cross-sections: Provide original, intermediate, and final staking as required, for site work and other locations as necessary for quantity surveys.
 8. Easement Staking: Provide easement staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. If required by project conditions, provide wooden laths with flagging at 100 foot intervals.
 9. Record Staking: Provide permanent stake at each blind flange and each utility cap is provided for future connections. Use stakes for record staking of material(s) acceptable to Architect.
 10. Structural Frame: Upon completion, certify location and plumbness.
- B. Surveying to Determine Quantities for Payment.
1. For each application for progress payment, perform such surveys and computations necessary to determine quantities of work performed or placed. Perform surveys necessary for Architect to determine final quantities of work in place.
 2. Notify Architect at least 24 hours before performing survey services for determining quantities. Unless waived in writing by Architect, perform quantity surveys in presence of Architect.

- C. Record Log: Maintain a log of layout control work. Record any deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used.
- D. Use by the Architect: The Architect may at any time use line and grade points and markers established by the Contractor. The Contractor's surveys are a part of the work and may be checked by the Architect at any time.
- E. Accuracy:
 - 1. Establish Contractor's temporary survey references points for Contractor's use to at least second-order accuracy (e.g., 1:10000). Set construction staking used as a guide for the work to at least third-order accuracy (e.g., 1:5000). Provide the absolute margin for error specified below on the basis established by such orders.
 - a. Horizontal accuracy of easement staking: Plus or minus 0.1 feet.
 - b. Accuracy of other staking shall be plus or minus 0.04 feet horizontally and plus or minus 0.02 feet vertically.
 - c. Include an error analysis sufficient to demonstrate required accuracy in survey calculations.
 - 2. District reserves the right to check the Contractor's survey, measurements, and calculations. The requirement for accuracy will not be waived, whether this right is exercised or not.

3.05 SUPPORT AND BRACING

- A. General requirements: Design all support and bracing systems, if required. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design systems to not overstress the building structure.
- B. Seismic Bracing: Design where required by authorities having jurisdiction.
 - 1. Design and install all support systems to comply with the seismic requirements of the Construction Code of California.
 - 2. Design and install seismic bracing so as not to defeat the operation on any required vibration isolation or sound isolation devices.
 - 3. For seismic bracing guidelines for mechanical, electrical and plumbing systems, refer to SMACNA (SRM).

3.06 TIME-LAPSE PHOTOGRAPHY

- A. Provide as part of Construction Progress documentation.
- B. Set a pole at appropriate location(s), and provide a time-lapse camera to record the entire construction project. Camera (or cameras) is required to provide a field of view of the entire project area.
- C. Provide a camera that records at one frame per second rate, or as approved by Architect. Resulting time-lapse will be viewed at standard 25 frames-per-second speed.
 - 1. Program camera, or provide a timer-controller, to only record during construction work hours.
- D. Submit to the District and Architect a DVD containing the raw video on a weekly basis. Submit entire digital time-lapse photography record at the conclusion of the project.

3.07 REPORTS

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

3.08 RECORDS

- A. Maintain at the Site a complete and accurate log of control and survey work as it progresses.
 - 1. Organize and record survey data in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in California. Record Contractor's surveyor's original field notes, computations, and other surveying data in Contractor-furnished hard-bound field books. Contractor is solely responsible for completeness and accuracy of survey work, and completeness and accuracy of survey records, including field books. Survey records,(including field books) may be rejected by District due to failure to organize and maintain survey records in a manner that allows reasonable and independent verification of calculations, and/or allows identification of elevations, dimensions, and grades of the work.
 - 2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by Architect.
- B. Submit three copies of final property survey to District. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey. Include the following information:
 - 1. Structure locations from property lines, and distances to adjacent buildings.
 - 2. Dimensions and locations of drives, walks, walls, underground utilities, appurtenances, and major site features.
 - 3. Location of easements.
 - 4. Final grading topographic survey.

3.09 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Comply with the requirements Section 5.408 of the California Green Building Standards Code.
 - 1. Recycle and/or salvage for reuse a minimum of 65percent of the nonhazardous construction and demolition waste in accordance with Section 504.8.1.1, 5.408.1.2, or 5.408.1.3; or meet a local construction and demolition waste management ordinance, whichever is more stringent.
- B. District requires that this project generate the least amount of trash and waste possible.
- C. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- D. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- E. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
 - 1. Aluminum and plastic beverage containers.
 - 2. Corrugated cardboard.
 - 3. Wood pallets.
 - 4. Clean dimensional wood.
 - 5. 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 shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
1. Contractor's quantitative reports for construction waste materials as a condition of approval of progress payments.
- G. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements. CalGreen Section 5.408.1.1.
- H. The following sources may be useful in developing the Waste Management Plan:
1. California Recycling Department, at www.bsc.ca.gov/Home/CALGreen.aspx.
 2. General information contacts regarding construction and demolition waste:
 - a. EPA Construction and demolition (C&D) debris website: www.epa.gov/epawaste/conserves/imr/cdm/.

- b. Directory of Wood-Framed Building Deconstruction and Reused Building Materials Companies: www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr150.pdf.
 - c. Additional resources to be developed by Contractor with assistance from District and Contractor, as requested.
3. Recycling Haulers and Markets: The source list below contains local haulers and markets for recyclable materials. This list is provided for information only and is not necessarily comprehensive; other haulers and markets are acceptable.
- a. CAL-MAX: www.calrecycle.ca.gov/calmax/.
 - 1) A free service designed to help businesses find markets for non-hazardous materials they have traditionally discarded.
 - b. General Recycling/Reuse Centers: For information on qualified local solid waste haulers contact the California Department of Resources Recycling and Recovery - CalRecycle. The website lists wastes recycling facilities in counties throughout the State of California.
 - 1) <http://www.calrecycle.ca.gov/default.asp>
- I. Methods of trash/waste disposal that are not acceptable are:
- 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
 - 5. Incineration, either on- or off-site.
- J. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- D. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.
- E. 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:
 - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the local market for each material.
 - 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 - 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 - 6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
 - 7. Recycling Incentives: Describe procedures required to obtain credits, rebates, or similar incentives.
- D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.

- a. Inert materials shall achieve a construction waste diversion rate of at least 95 percent.
 - 1) These materials include, but are not limited to, concrete, asphalt and rock.
 - 2) Earthwork is not included.
 - 3) Excavated soil shall not be included in any of the calculations used to ensure compliance with this specification section.
 - b. The overall diversion rate must be based on weight.
 - c. The diversion rate of individual materials can be measured in either weight or volume, but the rate shall be converted into the units selected for calculating the overall diversion rate.
 - 1) All individual material diversions must be converted to a consistent set of units when calculating the overall diversion rate for the all reports and submittals required for the Work.
 - d. Conversion rate numbers shall be based on standard conversion rate data for construction projects provided by the California Integrated Waste Management Board (CIWMB). This data is available at the following internet location, <http://www.calrecycle.ca.gov/LGCentral/Library/dsg/ICandD.htm>.
2. Submit Report on a form acceptable to District.
 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 4. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
 5. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
 6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

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

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, District, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. As a minimum, provide:

- a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
 - b. Separate dumpsters for each category of recyclable.
 - c. Recycling bins at worker lunch area.
2. Provide containers as required.
 3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
 4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
 5. Locate enclosures out of the way of construction traffic.
 6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
 8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
 - G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
 - H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
 - I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

3.03 DISPOSAL OPERATIONS AND WASTE HAULING

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

7. Do not burn or bury waste materials on or off site. Appropriate on-site topical application of ground gypsum or wood, or use of site paving as granulated fill is considered reuse, not waste.

3.04 PLAN AND REPORT FORMS

- A. See suggested forms on the following pages.

END OF SECTION

CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING PLAN

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

Project Title:						
Contract or Work Order No.:						
Contractor's Name:						
Street Address:						
City:			State:		Zip:	
Phone: ()			Fax: ()			
E-Mail Address:						
Prepared by: (Print Name)						
Date Submitted:						
Project Period:		From:			TO:	
Reuse, Recycling or Disposal Processes To Be Used						
Describe the types of recycling processes or disposal activities that will be used for material generated in the project. Indicate the type of process or activity by number, types of materials, and estimated quantities that will be recycled or disposed in the sections below:						
01 - Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick)						
02 - Salvaging building materials or salvage items at an offsite salvage or re-use center (i.e. lighting, fixtures)						
03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)						
04 - Recycling source separated materials at an offsite recycling center (i.e. scrap metal or green materials)						
05 - Recycling commingled loads of C&D materials at an offsite mixed debris recycling center or transfer station						
06 - Recycling material as Alternative Daily Cover at landfills						
07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).						
08 - Disposal at a landfill or transfer station.						
09 - Other (please describe) _____						
Types of Material To Be Generated						
Use these codes to indicate the types of material that will be generated on the project						
A = Asphalt		C = Concrete		M = Metals		I = Mixed Inert
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:						
Date Submitted:				From:		TO:
Project Period:						
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
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. Owner issued Bidding Instructions and General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 45 33 - Code-Required Special Inspections: Construction oversight procedures by DSA regarding the execution, approval, and closeout of this building project.
- D. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- E. Individual Product Sections: Specific requirements for operation and maintenance data.
- F. Individual Product Sections: Warranties required for specific products or Work.
 - 1. Special Project warranty requirements for specific products or elements of the Work; commitments and agreements for continuing services to District.

1.03 DEFINITIONS

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

1.04 SUBMITTALS

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

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

1.05 WARRANTIES AND GUARANTEES

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

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

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

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

3.02 OPERATION AND MAINTENANCE DATA

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

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

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

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 1. Description of unit or system, and component parts.
 2. Identify function, normal operating characteristics, and limiting conditions.

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

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for District's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
 1. Provide duplicate electronic formatted (PDF) versions of the O&M binder for record purposes. Organize the same as the printed versions.

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

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with District's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Project Warranty and Guarantee Forms:
 - 1. Example forms for special Project warranties and guarantees are included at the end of this Section.
 - 2. Prepare written documents utilizing the appropriate form, ready for execution by the Contractor, or the Contractor and subcontractor, supplier or manufacturer.
 - a. Submit a draft to District through Architect for approval prior to final execution.

3. Refer to product Specifications Sections of Divisions 2 through 33 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 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building demolition .
- B. Selective demolition of built site elements.
 - 1. Demolition and removal of existing site improvements within Project area, as indicated on Drawings and as necessary to accomplish the Work, including:
 - a. Asphaltic concrete and portland cement concrete paving.
 - b. Abandoned underground utility lines outside of utility easement.
 - c. Pavement cutting and removal.
 - d. Debris removal.
 - 2. Handling and disposal of removed materials.
 - 3. Dewatering of excavations as necessary to control surface and sub-surface water.
- C. 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 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.
- D. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- E. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- F. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- G. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- H. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal.
- I. Section 31 22 00 - Grading: Topsoil removal.
- J. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.03 REFERENCE STANDARDS

- A. AHRI 560 - U.S. Occupational Safety and Health Standards; current edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.04 DEFINITIONS

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

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Construction Conference: Conduct a pre-construction conference one week prior to the start of the work of this section; require attendance by all affected trades.
- B. Convene a conference at the Project site 3 days prior to starting demolition to review the Drawings and Specifications, requirements of authorities having jurisdiction, instructions and

requirements of serving utilities, sequencing and interface considerations and project conditions.

- C. Conference shall be attended by Construction Manager, supervisory and quality control personnel of Contractor and all subcontractors performing this and directly-related Work.
- D. Submit minutes of meeting to District, Project Inspector and Architect, for Project record purposes.
- E. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.
 - 1. Refer to sequence requirements specified in Section 01 10 00 - Summary; and construction progress schedule requirements specified in Section 01 32 16 - Construction Progress Schedule.

1.06 MATERIALS OWNERSHIP

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

1.07 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Site Plan: Showing:
 - 1. Areas for temporary construction and field offices.
 - 2. Areas for temporary and permanent placement of removed materials.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
 - 2. Identify demolition firm and submit qualifications.
- D. Demolition phase:
 - 1. Proposed dust-control measures.
 - 2. 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.
 - 3. 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.

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

1.08 SUBMITTALS

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

1.09 QUALITY ASSURANCE

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

1.10 SCHEDULING

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

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

- A. Remove the entire building designated existing home bleachers.
- B. Remove paving and curbs as 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 a minimum of 4 feet below finished grade.
- E. Remove concrete slabs on grade as 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.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Conform to the relevant Article of the General Conditions, South Coast Air Quality Management District and other applicable regulatory procedures when discovering hazardous or contaminated materials.

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

- a. Provide equipment, sound-deadening devices, and take noise abatement measures that are necessary to comply with the requirements of this Contract.
 - b. At least once every five successive working days while work is being performed above 55 dB noise level, measure sound level for noise exposure due to the demolition.
 - 1) Measure sound levels on the 'A' weighing network of a General Purpose sound level meter at slow response.
 - 2) To minimize the effect of reflective sound waves at buildings, measurements may be taken three to six feet in front of any building face.
- 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.
 - 3. Use of explosives is not permitted.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - a. Survey condition of the building to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition.
 - 1) Retain a licensed and qualified civil or structural engineer to provide analysis, including calculations, necessary to ensure the safe execution of the demolition work.
 - b. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.
 - c. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - a. Provide, erect, and maintain temporary barriers, safety and security devices , for protection of streets, sidewalks, curbs, adjacent property and the public.
 - b. Protection: Protect existing construction and adjacent areas with temporary barriers and security devices in accordance with requirements specified in Section 01 50 00 - Temporary Facilities and Controls.
 - 1) Review location and type of construction of temporary barriers with District and/or the Construction Manager.
 - 2) Barriers shall control dust, debris and provide protection for persons occupying and using adjacent facilities.
 - 3) Maintain protected egress and access at all times, in accordance with requirements of authorities having jurisdiction and with permission of DSA (AHJ having jurisdiction).
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.

8. Do not close or obstruct roadways or sidewalks without permit.
 9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- H. Do not begin removal until receipt of notification to proceed from District.
 - I. Do not begin removal until built elements to be salvaged or relocated have been removed.
 - J. Protect existing structures and other elements that are not to be removed.
 1. Provide bracing and shoring.
 2. Prevent movement or settlement of adjacent structures.
 3. Stop work immediately if adjacent structures appear to be in danger.
 4. Protect existing landscaping materials, appurtenances, structures and items that are not to be demolished, or are on adjacent property.
 5. Mark location of utilities.
 - K. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
 - L. Hazardous Materials: Comply with AHRI 560 and state and local regulations.
 - M. Remove materials to be re-installed or retained in manner to prevent damage. Store and protect in accordance with requirements of Section 01 60 00 - Product Requirements.
 - N. Perform demolition in a manner that maximizes salvage and recycling of materials.
 1. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
 2. Dismantle existing construction and separate materials.
 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.
 - O. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.
 - P. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to District.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to District.

- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.
- I. Utility Lines, Posts and Structures:
 - 1. Work by Utility: Posts, conductors, guy wires, boxes, structures and equipment shown to be cleared or removed by the responsible utility company or agency shall be considered work under a separate contract.
 - 2. Coordination: The Contractor shall arrange, schedule and coordinate work by utility companies and agencies.
 - 3. Payment: Costs, if any, imposed by utility companies and agencies shall be included in the Contract Sum.

3.04 DEWATERING

- A. Dewatering: Dewater site in localized areas as Work progresses.
 - 1. Provide an adequate system to lower and control groundwater in order to permit excavation, construction of structures, and placement of fill materials under dry conditions.
 - 2. Install sufficient dewatering equipment to pre-drain waterbearing strata above and below bottom of structure foundations, drains, sewers, and other excavations.
 - 3. Maintain excavations free of standing water.
 - 4. Provide dewatering 24 hours per day in advance of placement of concrete.
 - 5. Allow no concrete to be placed in standing water.
 - 6. Ensure that trenching and excavations do not cave in due to water.
- B. Surface Run-off Water Control:
 - 1. Minimize flow of ground water from adjacent areas into Work areas.
 - 2. Do not restrict flow from adjacent properties such that natural flow is hindered.
- C. Water Disposal:
 - 1. Dispose of run-off by legal means and as acceptable to authorities having jurisdiction.
 - 2. Dispose of water removed from excavations in a manner to avoid endangering public health, property, and portions of Work under construction or completed.
 - 3. Dispose of water in a manner to avoid inconvenience to others engaged in work about site.
 - 4. Provide sumps, sedimentation tanks, and other flow control devices as required by authorities having jurisdiction.

3.05 PORTLAND CEMENT CONCRETE AND ASPHALTIC CONCRETE PAVING DEMOLITION

- A. Cutting: Make a saw cut at edges of existing paving to be removed, where portions of existing paving are indicated to remain.
- B. Cutting Method: When adjacent to new paving, cut with abrasive type, water-cooled saw to a minimum depth of 1-1/2 inches. Cut lines straight and square to face of paving.
- C. Aggregate Base: Existing aggregate base may be retained except where landscaping and overexcavation are indicated.
- D. Concrete Removal: Break concrete and remove debris. Preserve straight cut.
- E. Disposal: Remove debris from the site except where allowed or directed for fill for subsequent earthwork or for landscape walls.

3.06 DEBRIS AND WASTE REMOVAL

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

END OF SECTION

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

1.02 RELATED REQUIREMENTS

- A. Section 03 20 00 - Concrete Reinforcing.
- B. Section 03 30 00 - Cast-in-Place Concrete.
- C. Section 05 50 00 - Metal Fabrications: Placement of embedded steel anchors and plates in cast-in-place concrete.
- D. Section 31 23 16 - Excavation: Shoring and underpinning for excavation.
- E. Section 32 13 13 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

- A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).
 - 1. Use 2016 as indicated in 2019 CBC Ch 35 Referenced Standards.
- D. ACI 347R - Guide to Formwork for Concrete; 2014, with Errata (2017).
- E. PS 1 - Structural Plywood; 2009.
- F. CBC Chapter 19A.

1.04 DEFINITIONS

- A. Unexposed Finish: A general-use finish, with no appearance criteria, applicable to all formed concrete concealed from view after completion of construction.
- B. Exposed Finish: A general-use finish applicable to all formed concrete exposed to view and including surfaces which may receive a paint coating (if any).

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on void form materials and installation requirements.
 - 1. Form release agent.

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

1.06 QUALITY ASSURANCE

- A. Industry Standard: Formwork design and construction shall be in accordance with ACI 301, ACI 318, and ACI 347R.
- B. Maintain one copy of each installation standard on site throughout the duration of concrete work.
- C. Regulatory Requirements: Conform to formwork construction requirements of the California Building Code (CBC) Title 24, Part 2, Chapter 19A as amended and adopted by authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.
- B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.
- C. Chamfer outside corners of beams, joists, columns, and walls.
- D. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.
- E. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.
- F. Provide materials for contact with concrete which impart suitable surface quality to completed concrete. Use the following form types:
 - 1. Forms for Exposed Finish Concrete:
 - a. Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces.
 - b. Furnish in largest practical sizes to minimize number of joints and to conform to joint system shown on the Drawings.
 - 2. Forms for Unexposed Finish Concrete:
 - a. Plywood, lumber, metal, or another acceptable material.
 - b. Provide lumber dressed on at least two edges and one side for tight fit.
 - c. When unexposed concrete is intended to receive waterproofing, provide form as for exposed finish concrete.
- G. Provide materials to construct formwork to support forming materials in contact with concrete, of sufficient capacity to withstand pressures of concrete placement and to support concrete in place until cured, without distortion.

2.02 WOOD FORM MATERIALS

- A. Softwood Plywood for Concealed Surfaces: PS 1, undamaged face C Grade, Group 2 Plugged EXT or APA Structural I Sheathing.
- B. Hardboard: For curved surfaces, tempered hardboard, Masonite Corp., or equal.
- C. Lumber: Douglas fir or douglas fir-larch species; appropriate for intended use grade; with grade stamp clearly visible.
 - 1. Sound and undamaged straight edges, and solid knots, to maintain principal shores to support concrete until minimum strength is achieved as approved by Structural Engineer.
- D. Embedded Nailers: Clear all heart redwood or pressure preservative-treated (PPTDF) douglas fir, edges reverse beveled to key into concrete.

2.03 REMOVABLE PREFABRICATED FORMS

- A. Manufacturers:
 - 1. Fitzgerald Formliners: www.formliners.com.
 - 2. Greenstreak: www.greenstreak.com.
 - 3. Molded Fiber Glass Construction Products Co: www.mfgcp.com.
 - 4. Scott System, Inc: www.scottsystem.com.
 - 5. SureVoid Products, Inc: www.surevoid.com.
 - 6. Symons Corporation: www.symons.com.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Form / Mold Materials
 - 1. Molds: Rigid, dimensionally stable, nonabsorptive material, warp and buckle free, that provide continuous and true surfaces; nonreactive with concrete and capable of producing required finish surfaces.
 - a. Mold-Release Agent: Commercially produced liquid-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent surface or joint treatments of concrete.
 - 2. Form Liners:
 - a. Material: Acrylonitrile butadiene styrene.
 - b. Units of face design, texture, arrangement, and configuration indicated.
 - c. Pattern: As indicated on drawings.
 - d. Provide solid backing and form supports to ensure that form liners remain in place during concrete application.
 - e. Use with manufacturer's recommended liquid-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent surface or joint treatments of concrete.
- C. Preformed Plastic Forms: Thermoplastic polystyrene form liner, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
 - 1. As required to produce panel texture matching Architects control sample, as described below or as indicated on Drawings.

- D. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.
 - 1. As required to produce panel texture matching Architects control sample, as described below or as indicated on Drawings.
- E. Tubular Column Type: Round, spirally wound laminated fiber material, surface treated with release agent, non-reusable, of sizes indicated. Provide Sonotube Plus Fiber Forms manufactured by Sonoco Products Co., Hartsville, SC (803)383-7000. Provide wall thickness sufficient to maintain finished concrete surface true within 1/8-inch in 10 feet.]
 - 1. Provide special liner to eliminate spiral seam marks on finished concrete.
- F. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; 2 inches thick.

2.04 FORMWORK ACCESSORIES

- A. Form Ties: Removable, adjustable-length or snap-off type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects that could leave holes larger than 1 inch in concrete surface.
- B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
 - 1. Do not use materials containing diesel oil or petroleum-based compounds.
 - 2. Does not impair subsequent treatments of concrete surfaces or bond of applied coatings.
 - 3. VOC Content: In compliance with applicable local, State, and federal regulations.
 - 4. Products:
 - a. SpecChem, LLC; Bio Strip WB (water-based): www.specchemllc.com/#sle.
 - b. W. R. Meadows, Inc; Duogard: www.wrmeadows.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- D. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 50 00 .
- E. Screed Pins and Chairs:
 - 1. Provide units that leave no metal closer than 1-1/2 inch to the plane of the exposed concrete surface.
 - 2. Manufacturers:
 - a. Grann Adjustable Quick Screed (800/554-7266).
 - b. Dayton Richmond (800/745-3700).
 - c. Aztek (877/531-3344).
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 SYSTEM REQUIREMENTS

- A. Formwork Design Requirements: Formwork products and execution specified herein are for finish surface quality only.
 - 1. Design, layout and construction of formwork shall be solely the responsibility of the Contractor.
 - 2. Design and construct formwork, shoring and bracing to conform to California Building Code (CBC), Title 24, Part 2, Chapter 19A requirements and ACI 318.
 - 3. Resulting concrete shall conform to shapes, lines and dimensions indicated and required.
- B. Coordination:
 - 1. Coordinate Work specified in this Section with other Sections which require placement of embedded products and provision of openings and recesses.
 - 2. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from the Architect before proceeding.

3.03 EARTH FORMS

- A. Earth (Soil) Forms, General: Except as otherwise indicated on Drawings, conform to ACI 301, ACI 347R and California Building Code (CBC) requirements. Refer also to notes on Structural Drawings.
- B. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.04 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301, ACI 347R and California Building Code (CBC) Title 24, Part 2 requirements.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
 - 1. Use form ties of sufficient strength and sufficient quantities to prevent formwork spreading.
 - 2. Maintain principal shores to support concrete until minimum required strength is achieved.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
 - 1. Design and fabricate forms for easy removal, without impact, shock, or damage to concrete surfaces or other portions of the work.
 - 2. Design to support all applied loads until concrete is adequately cured, within allowable tolerances and deflection limits.

- D. Align joints and make watertight. Keep form joints to a minimum. Make forms watertight to prevent leakage of concrete mortar. Locate form joints, at exposed concrete, to be symmetrical about center of panel, unless otherwise noted. Align joints symmetrically at exposed conditions.
- E. Permanent openings: Provide openings to accommodate Work specified in other Sections. Size and locate openings accurately. Securely support items built into forms; provide additional bracing at openings and discontinuities in formwork.
- F. Temporary openings: Provide temporary openings for cleaning and inspection. Provide drain openings at bottoms of formwork to allow water to drain. Locate temporary openings in most inconspicuous locations at base of forms, closed with tight-fitting panels designed to minimize appearance of joints in finished concrete Work.
- G. Obtain approval before framing openings in structural members that are not indicated on drawings.
- H. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.
- I. Coordinate this section with other sections of work that require attachment of components to formwork.
- J. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.
- K. Inspection: Before placing of concrete, and after placement of reinforcing steel in the forms, provide notification so that proper inspection can be made. Make such notification at least 2 working days in advance of placing concrete.
- L. Rejection of Defective Work: Any movement or bellying of forms during construction or variations in excess of the tolerances specified shall be considered just cause for the removal of such forms and, in addition, the concrete construction so affected. Reconstruct forms, place new concrete and required reinforcing steel at no additional cost to the District.

3.05 APPLICATION - FORM RELEASE AGENT

- A. Form Release Agent: Provide either form materials with factory applied non-absorptive liner or field applied form coating to comply with applicable air quality regulations for VOC. If field applied coating is employed, thoroughly clean and recondition formwork and reapply coating before each use. Rust on form surfaces is not acceptable.
- B. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- C. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- D. Do not apply form release agent where concrete surfaces to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.06 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
 - 1. Install accessories in accordance with manufacturer's instructions and referenced standards, level, straight and plumb.
- B. Locate and set in place items that are cast directly into concrete.

- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
 - 1. Openings: Size and locate formed openings, depressions, recesses and chases to accommodate products to be applied to, built into and pass through concrete Work. Coordinate size, location and placement of inserts, embedded products, openings and recesses with Work specified in other Sections.
 - 2. Anchors and Other Devices: Set and build into concrete formwork anchorage devices and other embedded products required for Work to be attached to or supported by concrete elements.
 - 3. Locating Embedded Products and Openings: Use setting drawings, diagrams, instructions and templates to set embedded products.
 - 4. Screeds: Set screeds and establish level for tops of concrete slabs and leveling for finish surfaces. Shape surfaces as indicated on the Drawings. Provide cradle, pad or base type screed supports for concrete over waterproof membranes and vapor retarders.
- D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints are not apparent in exposed concrete surfaces.

3.07 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
 - 1. At above grade forms, flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
 - 2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.
- C. Formwork Reuse: Do not reuse wood and plywood forming materials which contact concrete, except as follows:
 - 1. High density plywood may be cleaned and reused for exposed concrete.
 - 2. Unfaced plywood may be reused for concealed concrete.
 - 3. Steel and fiberglass forming materials may be cleaned and reused.
- D. Patching and Repairs: Patch tie holes with sheet metal patches and restore forms to like new condition prior to reuse.

3.08 FORMWORK TOLERANCES

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

- B. Camber slabs and beams in accordance with ACI 301.

3.09 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.
 - 1. Comply with CBC Table 1705A.3, item 12.
- C. Do not reuse wood formwork more than 3 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.10 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
 - 1. Comply with California Building Code (CBC) requirements.
 - 2. Formwork supporting weight of concrete may not be removed until concrete has reached a minimum of specified 28-day compressive strength and no earlier than 21 days after pour.
 - 3. Removal of Load Bearing Formwork:
 - a. Do not remove shoring and forms supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, until concrete has attained its 28 day specified compressive strength, unless otherwise specified or permitted by the Structural Engineer of Record.
 - b. Determine the actual compressive strength has attained is adequate to support the weight of the concrete and superimposed loads.
 - c. Maintain curing and protection operations after form removal.
 - 4. Removal of Non Load Bearing Formwork After Superimposed Loads or as Approved by Engineer:
 - a. Provided that concrete has hardened sufficiently, that it is not damaged, and has achieved sufficient strength to support its own weight and all imposed construction and design loads, forms not actually supporting weight of concrete or weight of soffit forms may be removed after concrete has cured at not less than 50 degrees F for 24 hours.
 - b. Maintain curing and protection operations after form removal.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
 - 1. Remove formwork progressively so no unbalanced loads are imposed on structure. Remove formwork without damaging concrete surfaces.
 - 2. Remove or snap off metal spreader ties inside wall surface. Cut nails and form ties off flush and leave surfaces level and clean.
- C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

3.11 PATCHING

- A. Schedule: Patch forming and tie holes immediately after form removal.
- B. Cleaning: Clean surface of all loose materials and soiling.
- C. Patching: Patch all holes and depressions with grouting gun and grout mix of one part cement and 2-1/2 parts mortar sand.

3.12 FORMWORK SCHEDULE

- A. Footings and Walls, Not Exposed to View: Site fabricated plywood or lumber, coated with form release agent.
- B. Footings and Walls, Exposed to View: Site fabricated plywood, coated with form release agent compatible with applied finish coatings.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories.
- B. Section 03 30 00 - Cast-in-Place Concrete.
- C. Division 26 - Electrical: Grounding connection to concrete reinforcement.

1.03 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete; 2016.
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018.
- D. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement; 2016.
- E. AWS A5.5/A5.5M - Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding; 2006.
- F. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
- G. CRSI (DA4) - Manual of Standard Practice; 2009.
- H. CRSI (P1) - Placing Reinforcing Bars; 2011.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Reinforcement supporting and spacing devices at exposed concrete only, to demonstrate non-corroding and non-staining characteristics.
 - 2. Adhesive compounds.
- C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.
- D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.
- E. Quality Control Submittals: Submit the following information related to quality assurance requirements specified:
 - 1. Certifications: Submit to the testing laboratory mill test certificates for all reinforcing steel, showing physical and chemical analysis. If steel is to be welded, include in chemical

analysis the percentages of carbon, manganese, copper, nickel, and chromium, and optionally the percentages of molybdenum and vanadium.

2. Certifications: If steel is to be welded, submit certifications to the testing laboratory signed by AWS Certified Welding Inspector (CWI) of prequalified welding procedures, qualifications of welding procedures unless prequalified, qualification of welding operators, and qualification of welders.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with CRSI (DA4), CRSI (P1), ACI 301, and ACI 318.
 1. Maintain one copy of each document on project site.
- B. Regulatory Requirements: Conform to California Building Code (CBC) Title 24 Part 2, Chapter 19A requirements as amended and adopted by authorities having jurisdiction, for details of reinforcement.
- C. Provide Architect, Project Inspector, and Special Inspector with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.
- D. Coordinate Work specified in this Section with other Sections which require placement of embedded products and provision of openings and recesses.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver reinforcement bars new and free from rust and mill scale in original bundles marked with durable identification tags.
- B. Storage: Store reinforcement to avoid excessive rusting or fouling with grease, oil, dirt or other bond-weakening coatings.
- C. Handling: Take precautions to maintain reinforcement identification after bundles are broken.

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 1. Deformed billet-steel bars.
 2. Unfinished.
- B. Reinforcing Steel: #3 Deformed bars, ASTM A996/A996M Grade 40 (280), Type A.
- C. Reinforcement Accessories:
 1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
 2. Chairs, Bolsters, Bar Supports, Spacers: Wire-bar-type devices, complying with CRSI (DA4), for spacing, supporting and fastening reinforcing bars and welded wire reinforcement in place. Sized and shaped for adequate support of reinforcement during concrete placement.
 - a. Supports at Slab on Grade: Provide devices with load-bearing pads or horizontal runners where base material does not support chair legs, to prevent puncture of vapor retarder/barrier or provide precast concrete block bar supports of equal or greater strength to specified concrete.

- b. Corrosion Resistance:
 - 1) Provide stainless steel or plastic components for placement within 1-1/2 inches of weathering surfaces.
 - (a) Provide plastic coated, plastic-tipped (CRSI, Class 1) or stainless steel types at exposed-to-view concrete surfaces.
 - (b) Provide only stainless steel (CRSI Class 2) at exterior exposed surfaces to be painted.
- 3. Welding Electrodes: AWS A5.5/A5.5M E80XX, low hydrogen, with a minimum yield point of 80,000 psi, for welding grade 60 reinforcing steel.

2.02 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
- B. Welding of reinforcement is permitted only with the specific approval of Architect. Perform welding in accordance with AWS D1.4/D1.4M.
- C. Fusion welded reinforcing steel assemblies are not permitted.
- D. Locate reinforcing splices not indicated on drawings at point of minimum stress. See Structural Drawings,
 - 1. Review locations of splices with Architect (Structural Engineer) before fabrication and placement. .

PART 3 EXECUTION

3.01 PREPARATION

- A. Cleaning: Clean reinforcement to remove loose rust and mill scale, soil, and other materials which may reduce or destroy bond with concrete.
- B. Adjustment and Inspection: Do not bend or straighten reinforcement in a manner injurious to material. Do not use bars with kinks or bends not shown on Drawings and reviewed shop drawings, or bars with reduced cross-section due to corrosion or other cause.
- C. Do not bend bars No. 5 and larger in the field.
- D. Do not bend bars more than once in the same location.

3.02 PLACEMENT

- A. General: Place and secure reinforcement as specified herein, as indicated and noted on Drawings and in compliance with recommended details and methods of reinforcement placement and support specified in CRSI Placing Reinforcing Bars.
- B. Place, support and secure reinforcement against displacement. Do not deviate from required position.
 - 1. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- C. Do not displace or damage vapor barrier.
- D. Accommodate placement of formed openings.
- E. Maintain concrete cover around reinforcing as indicated on Structural Drawings:
- F. Comply with applicable code for concrete cover over reinforcement.

1. If not otherwise indicated on Drawings or specified herein, provide concrete cover in compliance with ACI 318.
- G. Bond and ground all reinforcement to requirements of Division 26.
- H. Coordination: Locate reinforcement to accommodate embedded products and formed openings and recesses.
- I. Wire Reinforcement Placement: Place reinforcement in sheets as long as practicable, lapping adjoining pieces at least one full mesh and lace splices with 16 gage wire. Offset end laps in adjacent widths to prevent continuous laps. Extend reinforcement to within 1-inch of edge at slabs on grade. Cut mesh at expansion joints and full depth control joints.
- J. Dowels: Secure tie dowels in place before depositing concrete. Provide No. 3 bars for securing dowels where no other reinforcement is provided.
- K. Reinforcement Splices, General: Provide standard reinforcement splices by lapping ends, placing bars in contact and tightly wire tying. Comply with details and requirements of ACI 318 for minimum lap of spliced bars and criteria indicated on the Drawings.
 1. Clearances for Splices: Wherever possible, provide minimum 1-1/2 inch clearance between sets of splices. Stagger horizontal bars so that adjacent splices are minimum 48 inches apart.
- L. Reinforcement Supports: Support reinforcement on metal chairs, spacers or metal hangers to provide required coverage and to properly locate reinforcement. Do not use wood. Avoid cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.
 1. Support Spacing: Space chairs and accessories in conformance with CRSI Placing Reinforcing Bars.
- M. Welding of Reinforcement Steel
 1. Welding: Perform welding under continuous inspection and supervision of a qualified Registered Deputy Inspector employed by testing and inspection agency. Weld reinforcement as indicated on Drawings.

If mill test report is not available, make chemical analysis of bars representative of bars to be welded. Bars with CE above 0.75 shall not be welded.
 2. No welds shall be made at bends in reinforcing bars. Welds to be 1 inch minimum from bends
- N. Corrections During Concrete Placement: Maintain reinforcing steel workers on-site during placement of concrete for resetting reinforcement displaced by runways, workers and other causes.

3.03 FIELD QUALITY CONTROL

- A. An independent testing agency, as specified in Section 01 40 00 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.
 1. Concrete floor slabs on grade are to be continuously inspected as recommended in the geotechnical report.

- B. Inspector of Record, as specified in Section 01 45 33 - Code-Required Special Inspections, will inspect installed reinforcement for conformance to contract documents before concrete placement.
 - 1. Concrete floor slabs on grade are to be continuously inspected as recommended in the geotechnical report.
- C. Defective Reinforcement Work: The following shall be considered defective and may be ordered to be removed and reconstructed at no change in Contract Time or Sum.
 - 1. Bars with kinks or bends not shown on Drawings.
 - 2. Bars injured due to bending or straightening.
 - 3. Bars heated or bent.
 - 4. Reinforcement not placed in accordance with Drawings and Specifications.
 - 5. Rusty or oily bars.
 - 6. Bars exposed in surface of concrete or without adequate concrete cover.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete foundations and anchor bolts.
- B. Joint devices associated with concrete work.
- C. Miscellaneous concrete elements, including equipment pads and thrust blocks.
- D. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.
- B. Section 03 20 00 - Concrete Reinforcing.
- C. Section 32 13 13 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- D. ACI 306R - Guide to Cold Weather Concreting; 2016.
- E. ACI 308R - Guide to External Curing of Concrete; 2016.
- F. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).
 - 1. Use 2014 as indicated in 2019 CBC Ch 35 Referenced Standards.
- G. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
 - 1. Use 2013 as indicated in 2019 CBC Ch 35 Referenced Standards.
- H. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.
- I. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2018.
 - 1. Use 2017 as indicated in 2019 CBC Ch 35 Referenced Standards.
- J. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.
- K. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.
- L. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
 - 1. Use 2015 as indicated in 2019 CBC Ch 35 Referenced Standards.
- M. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.

- N. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes; 2018.
- O. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2016.
- P. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2015.
- Q. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.
- R. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2017.
- S. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. Including printed statement of VOC content and material safety data sheets.
- C. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
 - 2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
- D. Shop Drawings: Submit proposed layout of construction and control joints for approval.
- E. Test Reports: Submit report for each test or series of tests specified.
- F. Mix Design: Submit mix designs prepared, stamped and signed by a Civil Engineer licensed in the State of California.
- G. Quality Control Submittals:
 - 1. Field tests: Submit reports of all slump, strength and air content tests as required by authorities having jurisdiction and as indicated on the Drawings and specified herein.
 - 2. Delivery tickets: Have available copies of delivery tickets complying with ASTM C94/C94M for each load of concrete delivered to site. Include on the tickets the additional information specified in the ASTM document.
- H. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- I. Project Record Documents: Accurately record actual locations of embedded utilities and components that are concealed from view upon completion of concrete work.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
 - 1. Maintain one copy of each document on site.
- B. Follow recommendations of ACI 305R when concreting during hot weather .

- C. When air temperature in the shade and away from artificial heat falls below 40 degrees F, or when concrete without special protection is likely to be subject to freezing temperatures before expiration of specified curing period, follow recommendations of ACI 306R when concreting during cold weather.
- D. Regulatory Requirements:
 - 1. Conform to California Building Code (CBC) Chapter 19A requirement, as amended and adopted by authorities having jurisdiction.
 - 2. Chemical products field-applied to concrete shall comply with applicable air quality requirements of authorities having jurisdiction.
 - a. Comply with Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions, CALGreen Section 5.504.4 Finish material pollutant control; 5.504.4.1 Adhesives, sealants and caulks; 5.504.4.3 Paints and coatings.
- E. Testing Agency Services: District will engage an independent testing and inspection agency to conduct tests and perform other services specified for quality control during construction, as required by Sections 01 40 00 - Quality Requirements and Section 01 45 33 - Code-Required Special Inspections.
- F. Coordination: Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories. Coordinate concrete requirements with Work specified for underground utilities and mechanical and electrical equipment pads and bases.

1.06 DELIVERY AND HANDLING

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

PART 2 PRODUCTS

2.01 FORMWORK

- A. Comply with requirements of Section 03 10 00.

2.02 REINFORCEMENT MATERIALS

- A. Comply with requirements of Section 03 20 00.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type II - Moderate Portland type.
 - 1. Cement used in contact with soil shall be Type V - Sulfate Resistant.
 - 2. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
 - 1. Acquire aggregates for entire project from same source.
 - 2. Fine and coarse aggregates, CBC Title 24, Part 2, and as follows.

- a. Structural Concrete: Maximum size not larger than 1/5 of narrowest dimension between forms, 1/3 depth of slab nor 3/4 of minimum clear spacing between individual reinforcing bars. Maximum aggregate size shall be 1 inch.
- C. Water: Clean fresh and potable, free of amounts of acids, alkalis and organic materials detrimental to concrete production.

2.04 ADMIXTURES

- A. Chemical Admixture:
- B. Do not use chemicals that result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- C. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
 - 1. Manufacturers:
 - a. Euclid Chemical Company; ACCELGUARD 80: www.euclidchemical.com/#sle.
 - b. Accelguard 80 by Euclid Chemical Co.
 - c. Pozzutec 20 by Master Builders Technology, Inc.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
 - 1. Manufacturers:
 - a. L.M. Scofield Company: www.scofield.com.
 - b. Eucon Retarder 75 by Euclid Chemical Co.
 - c. Pozzolite R by Master Builders Technology, Inc.
 - d. Plastiment by Sika Corporation.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Water Reducing Admixture: ASTM C494/C494M Type A.
 - 1. Manufacturers:
 - a. Euclid Chemical Company; EUCON NW: www.euclidchemical.com/#sle.
 - b. Eucon WR-75 by Euclid Chemical Co.
 - c. Pozzolite Normal or Polyheed by Master Builders Technology, Inc.
 - d. Plastocrete 161 by Sika Corporation.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORY MATERIALS

- A. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Grout: Comply with ASTM C1107/C1107M.
 - 2. Height Change, Plastic State; when tested in accordance with ASTM C827/C827M:
 - a. Maximum: Plus 4 percent.
 - b. Minimum: Plus 1 percent.
 - 3. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
 - 4. Minimum Compressive Strength at 28 Days: 8,000 pounds per square inch.
 - 5. Flowable Products:

- a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; DURAGROUT:
www.laticrete.com/our-products/concrete-construction-chemicals/#sle.
 - c. Sika Corporation; SikaGrout 328: www.us.sika.com.
 - d. SpecChem, LLC; SC Precision Grout: www.specchemllc.com/#sle.
 - e. US SPEC; MP Grout: www.usspec.com.
 - f. W. R. Meadows, Inc; 588-10K: www.wrmeadows.com/#sle.
 - g. W. R. Meadows, Inc; 1428 HP: www.wrmeadows.com/#sle.
 - h. Substitutions: See Section 01 60 00 - Product Requirements.
6. Low-Slump, Dry Pack Products:
- a. Dayton Superior Corporation; Dri Pak Precast Grout:
www.daytonsuperior.com/#sle.
 - b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; Duragrout: www.lmcc.com/#sle.
 - c. Sika Corporation; SikaGrout 212: www.us.sika.com.
 - d. US SPEC; GP Grout: www.usspec.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.
1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
 - a. Maximum Height Change: Plus 4 percent.
 - b. Minimum Height Change: Plus 1 percent.
 2. Minimum Compressive Strength at 7 days, ASTM C579: 12,000 pounds per square inch.
OR
 3. Minimum Compressive Strength at 7 days, ASTM D695: 12,000 pounds per square inch.
 4. Manufacturers:
 - a. Euclid Chemical Company; E3-DEEP POUR: www.euclidchemical.com/#sle.
 - b. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - c. Euclid Chemical Co.; www.euclidchemical.com.
 - d. Five Star Products, Inc; Five Star DP Epoxy Grout: www.fivestarproducts.com.
 - e. L&M Construction Chemicals, Inc.; www.lmcc.com.
 - f. Sika Corporation; Sika Grout Pak 42: www.us.sika.com.
 - g. SpecChem, LLC; SpecPoxy Grout: www.specchemllc.com.
 - h. US Mix Products Co.; www.usspec.com.
 - i. W.R. Meadows, Inc.; REZI-WELD 3/2: www.wrmeadows.com.
 - j. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
1. Acrylic or Styrene Butadiene:
 2. Manufacturers:
 - a. BASF Building Systems; MasterEmaco A 400 or A 600: www.buildingsystems.basf.com.
 - b. Dayton Superior Corp.; Acrylic Bonding Agent J40: www.daytonsuperior.com
 - c. Euclid Chemical Company; AKKRO-7T: www.euclidchemical.com/#sle.
 - d. L&M Construction Chemicals, Inc.; Everbond: www.lmcc.com.
 - e. MeadowBurke Co.; Arcylic Bond: meadowburke.com.
 - f. Sika Corporation; Sika Latex by Sika Corporation: www.us.sika.com.
 - g. Simpson Strong-Tie; FX-Bondcrete: www.strongtie.com
 - h. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com/#sle.
 - i. W. R. Meadows, Inc; ACRY-LOK-: www.wrmeadows.com/#sle.
 - j. US Spec Division of US Mix Products Co.; Acrylcoat, Dura: www.usspec.com.
 - k. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Epoxy Bonding System:
1. Complying with ASTM C881/C881M and of Type required for specific application.
 2. Manufacturers:
 - a. Adhesives Technology Corporation; Crackbond SLV-302, Crackbond LR-321, Crackbond LR-321 LPL, Ultrabond 2100 LPL, Ultrabond 2100, Ultrabond 1, Ultrabond 2, or Ultrabond HS200: www.atcepoxy.com/#sle.
 - b. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com/#sle.
 - c. Euclid Chemical Company; DURALFLEX GEL: www.euclidchemical.com/#sle.
 - d. Euclid Chemical Company; DURALFLEX LV: www.euclidchemical.com/#sle.
 - e. Euclid Chemical Company; DURAL 452 GEL, DURAL 452 LV, or DURAL 452 MV: www.euclidchemical.com/#sle.
 - f. Dayton Superior Corporation; Slow Set Bonding Agent: www.daytonsuperior.com/#sle.
 - g. Sika Corporation; Sikadur 31 Hi Mod Gel or Sikadur 32 Hi Mod Bonder: www.us.sika.com.
 - h. Simpson Strong-Tie; FX-752 Epoxy Bonding Agent, FX-762 High-Modulus Epoxy Bonding Agent, FX-792LPL Long Pot Life Epoxy Bonding Agent: www.strongtie.com
 - i. SpecChem, LLC; SpecPoxy 1000, SpecPoxy 2000, SpecPoxy 3000, or SpecPoxy 3000FS: www.specchemllc.com/#sle.
 - j. W. R. Meadows, Inc; Rezi-Weld Gel Paste, Rezi-Weld Gel Paste State, Rezi-Weld 1000: www.wrmeadows.com/#sle.
 - k. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Acetate Bonding Agent: Non-redispersable polyvinyl acetate.
1. Interior only except areas exposed to moisture

2. Manufacturers:
 - a. Dayton Superior Corp.; PVA Bonding Agent J41: www.daytonsuperior.com
 - b. Euclid Chemical Co.; Tammsweld: www.euclidchemical.com.
 - c. L&M Construction Chemicals, Inc.; Everweld II: www.lmcc.com.
 - d. Larsen Products Corp; Weldcrete: www.larsenproducts.com/#sle.
 - e. W.R. Meadows, Inc.; Deck-O-Weld: www.wrmeadows.com.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 CONCRETE MIX DESIGN

- A. Mix Design: Contractor shall coordinate with the Testing Laboratory of Record, under supervision of Civil Engineer licensed in the State of California, to determine mix proportions to fulfill specified requirements for strength, aggregate, size and workability of concrete.
- B. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
 1. Comply with Chapter 19A requirements.
- C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- E. Normal Weight Concrete:
 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on Structural Drawings.
 2. Water-Cement Ratio: Maximum 40 percent by weight.
 3. Maximum Slump: As indicated on Structural Drawings.
 4. Maximum Aggregate Size: As indicated on Structural Drawings.

2.08 MIXING

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

PART 3 EXECUTION

3.01 EXAMINATION

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

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

3.02 PREPARATION

- A. Verify that forms are clean and free of rust before applying release agent.
- B. Prepare previously placed concrete by cleaning with hydro-blasting or wet sand blasting to provide suitable surface for bonding. Provide minimum aggregate exposure of 1/4 inch.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
 2. Use latex bonding agent only for non-load-bearing applications.

3.03 CONCRETE MIXING

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

3.04 PLACING CONCRETE

- A. Notify District's Inspector and DSA at least 2 working days in advance of placing concrete.
- B. Place concrete in accordance with ACI 304R. General: Comply with ACI 318 as adopted by CBC, Title 24, Part 2, Chapter 19A and as follows:
 1. Schedule continuous placement of concrete to prevent the formation of cold joints.
 2. Ready mix concrete shall be delivered in accordance with ASTM C94/C94M. Concrete shall be placed within 90 minutes after start of mixing.

3. Provide construction joints if concrete for a particular element or component cannot be placed in a continuous operation.
 - a. Submit for review, proposed locations of joints prior to pouring. See Structural Drawings for additional requirements.
 4. Deposit concrete as close as possible to its final location, to avoid segregation.
- C. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
1. Consolidate concrete by means of mechanical vibrators, inserted vertically in freshly placed concrete in a systematic pattern at close intervals. Penetrate previously placed concrete to ensure that separate concrete layers are knitted together.
 2. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
 3. Do not use vibrators to move concrete laterally.
- D. Notify Architect not less than 48 hours prior to commencement of placement operations.
- E. Ensure reinforcement and inserts are not disturbed during concrete placement.
- F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

3.05 CONCRETE FINISHING

- A. Repair surface defects, immediately after removing formwork.

3.06 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 1. Normal concrete: Not less than seven days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

3.07 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Field Certifications: For all concrete, provide signed copy of batch plant's certificate stating quantity of each material, amount of water, admixtures, departure time and date accompanying each load of materials or concrete.
- E. Field Tests of Concrete: Perform tests in accordance with applicable California Building Code requirements, ACI 301 and requirements of authorities having jurisdiction.

- F. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- G. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure four concrete test cylinders. Obtain test samples for every 2,000 sq ft - 50 cu yd or less of slab and structural concrete of each class of concrete placed (CBC requirement).
 - 1. Test one cylinder at 7 days and two at 28 days after placement.
 - 2. Maintain fourth cylinder to be tested at 56 days only if 28-day test fails to meet strength requirement.
 - 3. Take one additional test cylinder during cold weather concreting and cure it at job site under same conditions as concrete it represents. Test cold weather cylinder at 28 days.
- H. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- I. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.08 DEFECTIVE CONCRETE

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

3.09 PROTECTION

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

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural steel framing members.
- B. Grouting under base plates.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.
- B. Section 13 34 16 - Grandstands and Bleachers.

1.03 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; 2017.
- B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.
- C. AISC 358 - Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications; 2016.
- D. AISC 360 - Specification for Structural Steel Buildings; 2016.
- E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- G. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2018.
- H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- I. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014, with Editorial Revision (2017).
- J. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 2018.
- K. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).
- L. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2018.
- M. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.
- N. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2016.
- O. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film; 2017.

- P. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2019.
- Q. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry; 2018.
- R. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2015.
- S. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- T. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- U. AWS D1.8/D1.8M - Structural Welding Code - Seismic Supplement; 2016.
- V. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2018.
- W. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2014, with Errata (2015).
- X. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- Y. SSPC-SP 3 - Power Tool Cleaning; 2018.
- Z. SSPC-SP 13 - Surface Preparation of Concrete; 1997 (Reaffirmed 2003).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, attachments, and fasteners.
 - 2. Indicate cambers and loads.
 - 3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Fabricator Test Reports: Comply with ASTM A1011/A1011M.
- D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
- E. Fabricator's Qualification Statement.
- F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
- B. Fabricator: Company specializing in performing the work of this section with minimum five years of documented experience.
- C. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
- D. Erector: Company specializing in performing the work of this section with minimum five years of documented experience.

- E. Inspection: The District will employ a special inspector during all welding, and high-strength bolt installations and tightening operations, in accordance with California Building Code (CBC) requirements and other requirements of authorities having jurisdiction.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Comply with applicable provisions of the following building codes, including special inspection provisions:
 - 1. California Building Code (CBC), Chapters 17A and 22A.
- B. Comply with applicable provisions of the following specifications and documents as modified by the building codes:
 - 1. AISC 303.
 - 2. AISC 358.
 - 3. AISC 360 including high-seismic applications.
 - 4. AWS D1.1/D1.1M, "Structural Welding Code-Steel".
 - 5. AWS D1.8/D1.8M, "Structural Welding Code-Seismic Supplement".
 - 6. RCSC (HSBOLT).

2.02 MATERIALS

- A. Steel Angles, Plates, and Channels: ASTM A36/A36M.
 - 1. Unless indicated as Grade 50 on Drawings.
- B. Steel W Shapes and Tees: ASTM A992/A992M.
- C. Rolled Steel Structural Shapes: ASTM A992/A992M.
- D. Steel Bars: ASTM A108.
- E. Steel Plate: ASTM A514/A514M.
- F. Steel Sheet: ASTM A1011/A1011M, Designation SS, Grade 30 hot-rolled, or ASTM A1008/A1008M, Designation SS, Grade 30 cold-rolled.
- G. Pipe: ASTM A53/A53M, Grade B, Finish black.
- H. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A.
- I. Welding Materials: AWS D1.1/D1.1M and AWS D1.8/D1.8M ; type required for materials being welded.
- J. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Provide minimum compressive strength as indicated on Drawings.
 - 2. Height Change, Plastic State; when tested according to ASTM C827/C827M:
 - a. Maximum: Plus 4 percent.
 - b. Minimum: Plus 1 percent.
- K. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

1. SSPC-Paint 15, standard color.
 2. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- L. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.
- C. Fabricate connections for bolt, nut, and washer connectors.
- D. Develop required camber for members.

2.04 FINISH

- A. General: Materials and fabrication procedures shall be subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency, as specified in Section 01 40 00 - Quality Requirements and Section 01 45 33 - Code-Required Special Inspections.
 1. Such inspections and tests do not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
 2. Promptly remove and replace materials or fabricated components that do not comply.
- B. Prepare structural component surfaces in accordance with SSPC-SP 3.
- C. Shop prime structural steel members. Do not prime surfaces that will be field welded or in contact with concrete.
- D. Galvanize all exterior structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.

2.05 SOURCE QUALITY CONTROL

- A. Provide shop testing and analysis of structural steel.
- B. Welded Connections: Visually inspect all shop-welded connections and test at least 20 percent of welds using one of the following:
 1. Radiographic testing performed in accordance with ASTM E94/E94M.
 2. Ultrasonic testing performed in accordance with ASTM E164.
 3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 4. Magnetic particle inspection performed in accordance with ASTM E709.
 - a. Performed on root pass and on finished weld.
 - b. Cracks or zones of incomplete fusion or penetration not acceptable.
- C. See also part 3 article "Field Quality Control".

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

- A. Erect structural steel in compliance with AISC 303.
- B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Field weld components indicated on shop drawings.
- D. Do not field cut or alter structural members without approval of Architect.
- E. After erection, prime welds, abrasions, and surfaces not galvanized, except surfaces to be in contact with concrete.
- F. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

- A. Level and plumb individual members of structure within specified AISC tolerances.
- B. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- C. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Welded Connections: Visually inspect all field-welded connections and test at least 100 percent of welds using one of the following:
 - 1. Radiographic testing performed in accordance with ASTM E94/E94M.
 - 2. Ultrasonic testing performed in accordance with ASTM E164.
 - 3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 - 4. Magnetic particle inspection performed in accordance with ASTM E709.
- C. Report: Welding inspector will submit a signed report to the Architect, Structural Engineer, Project Inspector, and Authority Having Jurisdiction (Division of the State Architect) verifying that welding was performed in compliance with specified and Code-mandated requirements and that adequate methods were used to determine the quality of the welding.
- D. Re-Inspection: After correction of deficiencies in structural steel work which inspections and test reports indicate, additional inspections and tests will be performed to confirm that structural steel complies with specified requirements. Costs of re-inspections shall be paid in accordance with Conditions of the Contract.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel and aluminum items.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014, with Editorial Revision (2017).
- F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2018.
- G. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).
- H. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2019a.
- I. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.
- J. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings; 2018, with Editorial Revision.
- K. ASTM B85/B85M - Standard Specification for Aluminum-Alloy Die Castings; 2018, with Editorial Revision.
- L. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
 - 1. Use 2014 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- M. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- N. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- O. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi

Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2019.

- P. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- Q. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
 - 1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- R. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata.
 - 1. Use 2015 as indicated in 2019 CBC Ch. 35 Referenced Standards.
- S. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2018.
- T. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.
- D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: Conform to applicable requirements of California Building Code (CBC), Title 24, Part 2, as amended and adopted by authorities having jurisdiction.
 - 1. Comply with Title 24, Part 9, California Fire Code Chapter 35 "Welding and Other Hot Work."
- B. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.
- C. Welder's Qualifications:
 - 1. Welding shall be performed by certified welders qualified in accordance with procedures specified in applicable referenced AWS standard, using materials, procedures and equipment of the type required for the Work.
 - 2. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Structural Steel: ASTM A992/A992M.
 - 1. Galvanized Steel: From fully killed or semi-killed steel, except silicon content in the range 0 to 0.4 percent or 0.15 to 0.25 percent, as applicable, only.

- B. Steel Sections: ASTM A36/A36M, for channels, angles and plates.
- C. Steel Tubing: ASTM A500/A500M, Grade B cold-formed structural tubing.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
- F. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.
- G. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- I. Galvanize all exterior steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.
- J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5052 alloy, H32 or H22 temper.
- C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6063 alloy, T6 temper.
- D. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.
- E. Aluminum-Alloy Sand Castings: ASTM B26/B26M.
- F. Aluminum-Alloy Die Castings: ASTM B85/B85M.
- G. Bolts, Nuts, and Washers: Stainless steel.
- H. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

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

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

2.04 FABRICATED ITEMS

- A. Rough Hardware
 - 1. Provide bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as indicated on Drawings.
- B. Other Products and Fabrications
 - 1. Other Products and Fabrications: Provide all materials not specifically described but required for a complete and proper installation, as selected by the Contractor, subject to review and acceptance by Construction Manager and Architect.
- C. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; galvanized finish.

2.05 FINISHES - STEEL

- A. Mechanical Finishes: Complete finishing prior to fabrication wherever possible.
 - 1. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match finish.
 - 2. Protect finish on exposed surfaces by using temporary protective covering.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Galvanizing of Structural Steel Members: Galvanize all exterior steel members after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.
- D. Galvanizing of Non-structural Items: Galvanize all exterior steel members after fabrication to ASTM A123/A123M requirements.

2.06 FINISHES - ALUMINUM

- A. Exterior Aluminum Surfaces: Class I natural anodized.
- B. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
- C. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.07 FABRICATION TOLERANCES

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

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Coordination: Coordinate metal fabrications Work with Work specified in other Sections so that related Work shall be accurately and properly joined.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal and galvanizing where site welding is required.

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

3.03 INSTALLATION

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

3.04 TOLERANCES

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

END OF SECTION

SECTION 13 34 16
GRANDSTANDS AND BLEACHERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Permanent grandstand, as indicated on Drawings.
- B. Design engineering of bleachers as a complete system, including foundations.

1.02 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
 - 1. Use 2016 as indicated in 2019 CBC Ch 35 Referenced Standards.
- B. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014, with Editorial Revision (2017).
- C. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- D. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata.
 - 1. Use 2015 as indicated in 2019 CBC Ch 35 Referenced Standards.
- E. AWS D1.8/D1.8M - Structural Welding Code - Seismic Supplement; 2016.
- F. ICC 300 - Standard for Bleachers, Folding and Telescoping Seating, and Grandstands; 2017.
- G. NFPA 102 - Standard for Grandstands, Folding and Telescoping Seating, Tents, and Membrane Structures; 2016.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Complete layout with dimensions, seat heights, row spacing and rise, aisle widths and locations, points of connection to substrate, assembly dimensions, and material types and finishes.
 - 1. Provide drawings customized to this project.
 - 2. Include Professional Engineer certification.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section, with not less than three years of documented experience.
- B. Installer Qualifications: Manufacturer's installation crew.
- C. Welder Qualifications: Certified by AWS for the process employed.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's one-year warranty against defects in materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Product: DSA Approved Documents as manufactured by Southern Bleacher Company, Inc., www.southernbleacher.com, or approved equal.
 - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.
 - 2. Substitution may or may not be accepted after Architect and District review with complete evaluation for content and schedule impact.
 - 3. Substitutions shall include all costs for redesign with consequential changes by other trades along with the Architect and related approvals by governing agencies.
 - a. Revision to shop drawings illustrating changes is not considered adequate for DSA review and approval.
 - b. A minimum fee of \$10,000.00 for DSA review processing by the Architect will need to be included for additional DSA review of any substituted system other than the basis of design.
 - c. An additional minimum allowance of \$10,000.00 is required for Architect's time to review the substituted system prior to submitting for governing agency approval.
 - d. The indicated fee amounts are minimums. These are subject to increase pending Architect and DSA reviews of the proposed substitution.
 - 4. Substitutions may be acceptable, based on Architect's review and approval, for submittal to DSA.
 - a. If substituted manufacturer cannot reproduce design and DSA approval in a timely manner, then they shall be subject to a time and material back charge for any delays in the project.
 - b. Architect approval is required prior to DSA submittal and DSA approval is required prior to installation.

2.02 DESIGN REQUIREMENTS

- A. Comply with ICC 300.
- B. Design and size components have been done to withstand the following load requirements without damage or permanent set, when tested in accordance with ASCE 7, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
- C. Design framing system to withstand the following loads:

1. Live Load: 100 pounds per square foot over gross horizontal projection.
 2. Live Load on Seat and Tread Plank: 120 pounds per linear foot
 3. Lateral Sway Stress: 24 pounds per linear foot of seat plank.
 4. Perpendicular Sway Stress: 10 pounds per linear foot of seat plank.
 5. Wind Load: 30 pounds per square foot over vertical projection.
- D. Design handrails and railings to withstand the following loads:
1. Concentrated Load on Handrails: 200 pounds in any direction.
 2. Concentrated Load on Guardrails: 200 pounds in any direction along top rail.
 3. Live Load on Handrails: 50 pounds per linear foot, applied in any direction.
 4. Live Load on Guardrails:
 - a. Horizontal: 50 pounds per linear foot, applied at the guardrail height.
 - b. Vertical: 100 pounds per linear foot, simultaneously applied vertically to top of guardrail.
- E. Design bleacher systems to other physical requirements specified in this Section.

2.03 APPLICATIONS

- A. Grandstand: See Drawings for dimensions.
1. Provide a design certified by a licensed Professional Engineer licensed in California.
 2. Provide a design that has been in use for at least 5 years; submit documentation.
 3. Design to comply with applicable requirements of NFPA 102 and requirements of code authorities having jurisdiction; where conflicts between requirements occur, comply with whichever is more stringent.
 4. Provide guardrails with chain link fence infill at sides and back.
 5. Provide guardrails on front wherever the first tread is more than 24 inches (610 mm) above ground level.
 6. Provide stair railings at each set of steps.

2.04 COMPONENTS

- A. Framing System: Prefabricated, modular frames with cross bracing.
1. Material: Extruded aluminum structural angle sections, of alloy 6061-T6, with mill finish.
 2. Frame Spacing: Maximum of 72 inches.
 3. Sized for vertical rise of 8 inches and horizontal depth of 24 inches per row, with seat 17 inches above tread.
 4. Welding: AWS D1.1/D1.1M, AWS D1.2/D1.2M, and AWS D1.8/D1.8M. By AWS certified welders.
 5. Anchorage as indicated on Drawings.
- B. Tread Planks: Extruded aluminum sections, of alloy 6063-T6, with ribbed top and mill finish.
1. Size: 2 inches deep by 10 inches wide.
 2. Provide end caps on each exposed end.

3. Wherever sections are placed end to end, provide joint sleeve assembly of same material to maintain alignment.
- C. Seat Planks: Extruded aluminum sections, of alloy 6063-T6, with ribbed top and Class II AA-M10C22A31 natural anodized finish.
 1. Size: 2 inches deep by 10 inches wide.
 2. Provide end caps on each exposed end.
 3. Wherever sections are placed end to end, provide joint sleeve assembly of same material to maintain alignment.
- D. Step Planks: Extruded aluminum sections, of alloy 6063-T6, with ribbed top and mill finish.
 1. Size: 2 inches deep by 12 inches wide.
 2. Provide end caps on each exposed end.
- E. Riser Planks: Extruded aluminum sections, of alloy 6063-T6, with mill finish.
 1. Size: 6 inches high.
 2. Provide end caps on each exposed end.
- F. Plank End Caps: Formed aluminum, of alloy 6063-T6, with Class II AA-M10C22A31 natural anodized finish.
- G. Railings: Anodized aluminum pipe railing with formed elbows at corners and caps at ends of straight runs, fastened to framing system.
 1. Pipe Size: 1.66 inch outside diameter.
 2. Height at Front: 42 inches above tread.
 3. Height at Back and Sides: 42 inches above adjacent seat.
 4. Infill at Back and Sides: 9 gage diameter aluminum wire woven chain link with twisted selvages, fastened to aluminum pipe panel frame.
- H. Fasteners:
 1. Bolts and Nuts: ASTM A307, steel, hot-dipped galvanized or cadmium-plated.
 2. Hold-Down Clips: Aluminum, alloy 6063-T6.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are consistent with those on the shop drawings.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Do not field cut or alter seats or structural members without approval.
- C. Provide manufacturer's field representative to inspect completed installation.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products after Substantial Completion.

END OF SECTION

SECTION 26 05 05
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Additional requirements for alterations work.

1.03 SUBMITTALS

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

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents.
- D. Report discrepancies to Architect before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from District at least 24 hours before partially or completely disabling system.
 - 2. Make temporary connections to maintain service in areas adjacent to work area.

- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Notify District before partially or completely disabling system.
 - 2. Notify local fire service.
 - 3. Make notifications at least 24 hours in advance.
 - 4. Make temporary connections to maintain service in areas adjacent to work area.
- F. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Notify District at least 24 hours before partially or completely disabling system.
 - 2. Notify telephone utility company at least 24 hours before partially or completely disabling system.
 - 3. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
 - 1. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- F. Disconnect and remove abandoned panelboards and distribution equipment.
- G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- I. Repair adjacent construction and finishes damaged during demolition and extension work.
- J. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- K. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR

- A. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Underground feeder and branch-circuit cable.
- C. Service entrance cable.
- D. Metal-clad cable.
- E. Power and control tray cable.
- F. Manufactured wiring systems.
- G. Wiring connectors.
- H. Electrical tape.
- I. Heat shrink tubing.
- J. Oxide inhibiting compound.
- K. Wire pulling lubricant.
- L. Cable ties.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 13 - Medium-Voltage Cables: Cables and terminations for systems 601 V through 35,000 V.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 28 46 00 - Fire Detection and Alarm: Fire alarm system conductors and cables.
- F. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- H. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.
- I. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2007.
- J. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.
- K. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- N. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- O. UL 183 - Manufactured Wiring Systems; Current Edition, Including All Revisions.
- P. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- Q. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- R. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- S. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.
- T. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- U. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.
- V. UL 1277 - Electrical Power and Control Tray Cables with Optional Optical-Fiber Members; Current Edition, Including All Revisions.
- W. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
 - 3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Manufactured Wiring System Shop Drawings: Provide plan views indicating proposed system layout with components identified; indicate branch circuit connections.
- D. Field Quality Control Test Reports.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.
- G. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Manufactured Wiring Systems Cable Assemblies: One of each configuration, 6 feet length.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

1. Exceptions:
 - a. Use manufactured wiring systems for branch circuits in open areas for lighting.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from distribution box to panelboard.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is permitted only as follows:
 1. Where not otherwise restricted, may be used:
 - a. For damp, wet, or corrosive locations as a substitute for NFPA 70, Type NMC nonmetallic-sheathed cable, when nonmetallic-sheathed cable is permitted.
 2. In addition to other applicable restrictions, may not be used:
 - a. Where exposed to view.
 - b. Where exposed to damage.
- E. Service entrance cable is permitted only as follows:
 1. Where not otherwise restricted, may be used:
 - a. For underground service entrance, installed in raceway.
- F. Armored cable is not permitted.
- G. Metal-clad cable is permitted only as follows:
 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
 2. In addition to other applicable restrictions, may not be used:
 - a. Unless approved by District.
 - b. Where not approved for use by the authority having jurisdiction.
 - c. Where exposed to view.
 - d. Where exposed to damage.
 - e. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
 - f. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.
- H. Manufactured wiring systems are permitted only as follows:
 1. Where not otherwise restricted, may be used:
 - a. For branch circuits where concealed above accessible ceilings for lighting and in open ceiling areas for lighting.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from distribution box to panelboard.
 2. In addition to other applicable restrictions, may not be used:
 - a. Unless approved by District.

- b. Where not approved for use by the authority having jurisdiction.
- c. Where exposed to damage.
- d. For damp, wet, or corrosive locations.
- e. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- E. Comply with NEMA WC 70.
- F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- H. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.
- I. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.
- J. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.
- K. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- L. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- M. Minimum Conductor Size:
 - 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 125 feet: 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
 - 3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
 - 2. Control Circuits: 14 AWG.
- N. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- O. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
3. Color Code:
 - a. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - c. 240/120 V High-Leg Delta, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B (High-Leg): Orange.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - d. 240/120 V, 1 Phase, 3 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Neutral/Grounded: White.
 - e. Equipment Ground, All Systems: Green.
 - f. Isolated Ground, All Systems: Green with yellow stripe.
 - g. Travelers for 3-Way and 4-Way Switching: Pink.
 - h. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. Encore Wire Corporation: www.encorewire.com/#sle.
 - c. Southwire Company: www.southwire.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
 2. Control Circuits: Stranded.
- D. Insulation Voltage Rating: 600 V.

- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. Size 4 AWG and Larger: Type XHHW-2.
 - b. Installed Underground: Type XHHW-2.
 - c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.04 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

- A. Manufacturers:
 - 1. Cerro Wire LLC: www.cerrowire.com/#sle.
 - 2. Encore Wire Corporation: www.encorewire.com/#sle.
 - 3. Southwire Company: www.southwire.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type UF multiple-conductor cable listed and labeled as complying with UL 493, Type UF-B.
- C. Provide equipment grounding conductor unless otherwise indicated.
- D. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- E. Insulation Voltage Rating: 600 V.

2.05 SERVICE ENTRANCE CABLE

- A. Manufacturers:
 - 1. Copper Service Entrance Cable:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. Encore Wire Corporation: www.encorewire.com/#sle.
 - c. Southwire Company: www.southwire.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Service Entrance Cable for Above-Ground Use: NFPA 70, Type SE multiple-conductor cable listed and labeled as complying with UL 854, Style R.
- C. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44, Type RHH/RHW-2.
- D. Conductor Stranding: Stranded.
- E. Insulation Voltage Rating: 600 V.

2.06 METAL-CLAD CABLE

- A. Manufacturers:
 - 1. AFC Cable Systems Inc: www.afcweb.com/#sle.
 - 2. Encore Wire Corporation: www.encorewire.com/#sle.

3. Southwire Company: www.southwire.com/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
 - C. Conductor Stranding:
 1. Size 10 AWG and Smaller: Solid.
 2. Size 8 AWG and Larger: Stranded.
 - D. Insulation Voltage Rating: 600 V.
 - E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
 - F. Provide oversized neutral conductors where indicated or required.
 - G. Provide dedicated neutral conductor for each phase conductor where indicated or required.
 - H. Grounding: Full-size integral equipment grounding conductor.
 1. Provide additional isolated/insulated grounding conductor where indicated or required.
 - I. Armor: Steel, interlocked tape.
 - J. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.07 POWER AND CONTROL TRAY CABLE

- A. Manufacturers:
 1. Encore Wire Corporation: www.encorewire.com/#sle.
 2. Okonite: www.okonite.com/#sle.
 3. Southwire Company: www.southwire.com/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type TC cable listed and labeled as complying with UL 1277.
- C. Where exposed run cable is indicated between cable tray and utilization equipment in qualifying industrial establishments as determined by authorities having jurisdiction, provide tray cable marked as Type TC-ER in accordance with NFPA 70.
- D. Conductor Stranding: Stranded.
- E. Insulation Voltage Rating: 600 V.
- F. Insulation: Type XHHW or XHHW-2.
- G. Grounding: Full-size integral equipment grounding conductor.
- H. Jacket: PVC or Chlorinated Polyethylene (CPE).

2.08 MANUFACTURED WIRING SYSTEMS

- A. Manufacturers:
 1. AFC Cable Systems Inc: www.afcweb.com/#sle.
 2. RELOC Wiring Solutions, a brand of Acuity Brands, Inc: www.relocwiring.com/#sle.
 3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Description: Manufactured wiring assemblies complying with NFPA 70 Article 604, and listed and labeled as complying with UL 183.
- C. Provide components necessary to transition between manufactured wiring system and other wiring methods.
- D. Branch Circuit Cables:
 - 1. Conductor Stranding (Size 10 AWG and Smaller): Solid.
 - 2. Insulation Voltage Rating: 600 V.
 - 3. Insulation: Type THHN.
 - 4. Provide dedicated neutral conductor for each phase conductor where indicated or required.
 - 5. Grounding: Full-size integral equipment grounding conductor.
 - a. Provide additional isolated/insulated grounding conductor where indicated or required.
 - b. Provide redundant grounding, suitable for general purpose, non-essential electrical systems in non-hazardous patient care areas of health care facilities where indicated or required.
 - 6. Armor: Steel, interlocked tape.
- E. Connectors: Keyed and color-coded to prevent interconnection of different voltages.
- F. Fixture Leads: Type TFN insulation.

2.09 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 - 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 - 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
7. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
 1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - c. NSI Industries LLC: www.nsiindustries.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- G. Push-in Wire Connectors: Rated 600 V, 221 degrees F.
 1. Manufacturers:
 - a. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - b. NSI Industries LLC: www.nsiindustries.com/#sle.
 - c. Wago Corporation: www.wago.us/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com.
 - b. IlSCO: www.ilsco.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com.
 - b. IlSCO: www.ilsco.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com.
 - b. IlSCO: www.ilsco.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.10 ACCESSORIES

- A. Electrical Tape:

1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
 2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
 3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
 4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
 5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
 6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Burndy LLC: www.burndy.com.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
1. Manufacturers:
 - a. Burndy LLC: www.burndy.com.
 - b. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - c. IlSCO: www.ilSCO.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. American Polywater Corporation: www.polywater.com/#sle.
 - c. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Cable Ties: Material and tensile strength rating suitable for application.

1. Manufacturers:
 - a. Burndy LLC: www.burndy.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Circuiting Requirements:
 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 2. When circuit destination is indicated without specific routing, determine exact routing required.
 3. Arrange circuiting to minimize splices.
 4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
 8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is permitted where not otherwise prohibited, except for the following:
 - a. Branch circuits fed from ground fault circuit interrupter (GFCI) circuit breakers.
 - b. Branch circuits fed from feed-through protection of GFI receptacles.
 - c. Branch circuits with dimming controls.
 - d. Branch circuits with isolated grounding conductor.
 9. Provide oversized neutral/grounded conductors where indicated and as specified below.
 - a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.
 - b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.

- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.
- E. Install metal-clad cable (Type MC) in accordance with NECA 120.
- F. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- G. Exposed Cable Installation (only where specifically permitted):
 - 1. Route cables parallel or perpendicular to building structural members and surfaces.
 - 2. Protect cables from physical damage.
- H. Direct Burial Cable Installation:
 - 1. Provide trenching and backfilling in accordance with Section 31 23 16.13 - Trenching.
 - 2. Install cable with minimum cover of 24 inches unless otherwise indicated or required.
 - 3. Protect cables from damage in accordance with NFPA 70.
 - 4. Provide underground warning tape in accordance with Section 26 05 53 along entire cable length.
- I. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- J. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 - 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- K. Terminate cables using suitable fittings.
 - 1. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- L. Install conductors with a minimum of 12 inches of slack at each outlet.
- M. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

- N. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- O. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- P. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- Q. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
 - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
 - 3. Wet Locations: Use heat shrink tubing.
- R. Insulate ends of spare conductors using vinyl insulating electrical tape.
- S. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- T. Identify conductors and cables in accordance with Section 26 05 53.
- U. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- V. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

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

- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
 - 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.
- F. Ground plate electrodes.
- G. Ground enhancement material.
- H. Ground access wells.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
 - 1. Includes oxide inhibiting compound.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 26 56 00 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.03 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify exact locations of underground metal water service pipe entrances to building.
 - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- C. Shop Drawings:
 1. Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Field quality control test reports.
- F. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
 - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- E. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Metal Underground Water Pipe(s):
 - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
 - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
 - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
 - 3. Metal In-Ground Support Structure:
 - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
 - 4. Concrete-Encased Electrode:
 - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
 - 5. Ground Ring:
 - a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
 - b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
 - c. Provide ground enhancement material around conductor where indicated.

- d. Provide connection from ground ring conductor to:
 - 1) Ground rod electrodes located as indicated.
- 6. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet from each other and any other ground electrode.
 - c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
 - d. Provide ground enhancement material around electrode where indicated.
 - e. Provide ground access well for each electrode.
- 7. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
- 8. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
 - a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
 - b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
 - c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
- 9. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.
- F. Service-Supplied System Grounding:
 - 1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
 - 2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- G. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
 - 1. Provide grounding electrode system for each separate building or structure.
 - 2. Provide equipment grounding conductor routed with supply conductors.
 - 3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
 - 4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.
- H. Separately Derived System Grounding:
 - 1. Separately derived systems include, but are not limited to:

- a. Transformers (except autotransformers such as buck-boost transformers).
 - b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
 3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
 4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
 5. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
 6. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
 7. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.
- I. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
 7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:

- a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
 - b. Metal gas piping.
- 8. Provide bonding for interior metal air ducts.
- 9. Provide bonding for metal building frame.
- 10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.
- J. Isolated Ground System:
 - 1. Where isolated ground receptacles or other isolated ground connections are indicated, provide separate isolated/insulated equipment grounding conductors.
 - 2. Connect isolated/insulated equipment grounding conductors only to separate isolated/insulated equipment ground busses.
 - 3. Connect the isolated/insulated equipment grounding conductors to the solidly bonded equipment ground bus only at the service disconnect or separately derived system disconnect. Do not make any other connections between isolated ground system and normal equipment ground system on the load side of this connection.
- K. Communications Systems Grounding and Bonding:
 - 1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
 - 2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
 - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
 - b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
 - c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
 - d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
- L. Cable Tray Systems: Also comply with Section 26 05 36.
- M. Pole-Mounted Luminaires: Also comply with Section 26 56 00.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
 - 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).

2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gage of specified conductors.
- C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
 4. Manufacturers - Mechanical and Compression Connectors:
 - a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
 - b. Burndy LLC: www.burndy.com.
 - c. Harger Lightning & Grounding: www.harger.com/#sle.
 - d. Thomas & Betts Corporation: www.tnb.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
 5. Manufacturers - Exothermic Welded Connections:
 - a. Burndy LLC: www.burndy.com.
 - b. Cadweld, a brand of Erico International Corporation: www.erico.com/#sle.
 - c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC; _____: www.thermoweld.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
 2. Size: As indicated.
 3. Holes for Connections: As indicated or as required for connections to be made.
 4. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
 - b. Erico International Corporation: www.erico.com/#sle.
 - c. Harger Lightning & Grounding: www.harger.com/#sle.
 - d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC; _____: www.thermoweld.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
 2. Material: Copper-bonded (copper-clad) steel.
 3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
 4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.
 5. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.

- b. Erico International Corporation: www.erico.com/#sle.
 - c. Galvan Industries, Inc: www.galvanelectrical.com/#sle.
 - d. Harger Lightning & Grounding: www.harger.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Ground Plate Electrodes:
- 1. Material: Copper.
 - 2. Size: 24 by 24 by 1/4 inches, unless otherwise indicated.
 - 3. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
 - b. Erico International Corporation: www.erico.com/#sle.
 - c. Harger Lightning & Grounding: www.harger.com/#sle.
 - d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- G. Ground Enhancement Material:
- 1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.
 - 2. Resistivity: Not more than 20 ohm-cm in final installed form.
 - 3. Manufacturers:
 - a. Erico International Corporation: www.erico.com/#sle.
 - b. Harger Lightning & Grounding: www.harger.com/#sle.
 - c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Ground Access Wells:
- 1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
 - 2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
 - a. Round Wells: Not less than 8 inches in diameter.
 - b. Rectangular Wells: Not less than 12 by 12 inches.
 - 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
 - 4. Cover: Factory-identified by permanent means with word "GROUND".
 - 5. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
 - b. Erico International Corporation: www.erico.com/#sle.
 - c. Harger Lightning & Grounding: www.harger.com/#sle.
 - d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.

- e. Substitutions: See Section 01 60 00 - Product Requirements.
- I. Oxide Inhibiting Compound: Comply with Section 26 05 19.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
 - 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
 - 2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.
- D. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches.
- E. Make grounding and bonding connections using specified connectors.
 - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- F. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.

- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- D. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- E. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
- F. Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- D. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.
- E. Installer's Qualification Statement: Include evidence of compliance with specified requirements.
- F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.
- C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- D. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
- E. Installer Qualifications for Field-Welding: As specified in Section 05 50 00.
- F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 4. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.
- C. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 2. Conduit Clamps: Bolted type unless otherwise indicated.
 - 3. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Erico International Corporation: www.erico.com.
 - c. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
 - d. Thomas & Betts Corporation: www.tnb.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
 - 1. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Erico International Corporation: www.erico.com.

- c. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
 - d. Thomas & Betts Corporation: www.tnb.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 - 1. Comply with MFMA-4.
 - 2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
 - 3. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 - 4. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
 - 5. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
 - 6. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Thomas & Betts Corporation: www.tnb.com.
 - c. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 - e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
- F. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 - 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch diameter.
 - b. Busway Supports: 1/2 inch diameter.
 - c. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.
 - d. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
 - e. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
 - f. Outlet Boxes: 1/4 inch diameter.
 - g. Luminaires: 1/4 inch diameter.
- G. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
 - 1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - 2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
 - 3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
 - 4. Manufacturers:

- a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
- b. Erico International Corporation: www.erico.com.
- c. PHP Systems/Design: www.phpsd.com.
- d. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
- e. Substitutions: See Section 01 60 00 - Product Requirements.

H. Anchors and Fasteners:

- 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
- 2. Concrete: Use preset concrete inserts or expansion anchors.
- 3. Solid or Grout-Filled Masonry: Use expansion anchors.
- 4. Steel: Use beam clamps, machine bolts, or welded threaded studs.
- 5. Sheet Metal: Use sheet metal screws.
- 6. Wood: Use wood screws.
- 7. Plastic and lead anchors are not permitted.
- 8. Powder-actuated fasteners are permitted only as follows:
 - a. Where approved by Architect.
 - b. Use only threaded studs; do not use pins.
- 9. Hammer-driven anchors and fasteners are not permitted.
- 10. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
- 11. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
- 12. Manufacturers - Mechanical Anchors:
 - a. Hilti, Inc: www.us.hilti.com.
 - b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com.
 - c. Powers Fasteners, Inc: www.powers.com.
 - d. Simpson Strong-Tie Company Inc: www.strongtie.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- 13. Manufacturers - Powder-Actuated Fastening Systems:
 - a. Hilti, Inc: www.us.hilti.com.
 - b. ITW Ramset, a division of Illinois Tool Works, Inc: www.ramset.com.
 - c. Powers Fasteners, Inc: www.powers.com.
 - d. Simpson Strong-Tie Company Inc: www.strongtie.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
 - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Conduit Support and Attachment: Also comply with Section 26 05 33.13.
- J. Box Support and Attachment: Also comply with Section 26 05 33.16.
- K. Interior Luminaire Support and Attachment: Also comply with Section 26 51 00.
- L. Exterior Luminaire Support and Attachment: Also comply with Section 26 56 00.
- M. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- N. Secure fasteners according to manufacturer's recommended torque settings.
- O. Remove temporary supports.
- P. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 26 05 33.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. PVC-coated galvanized steel rigid metal conduit (RMC).
- D. Flexible metal conduit (FMC).
- E. Liquidtight flexible metal conduit (LFMC).
- F. Electrical metallic tubing (EMT).
- G. Rigid polyvinyl chloride (PVC) conduit.
- H. Conduit fittings.
- I. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.
- B. Section 07 84 00 - Firestopping.
- C. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Metal clad cable (Type MC), armored cable (Type AC), and manufactured wiring systems, including uses permitted.
- D. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
 - 1. Includes additional requirements for fittings for grounding and bonding.
- E. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- F. Section 26 05 33.16 - Boxes for Electrical Systems.
- G. Section 26 05 33.23 - Surface Raceways for Electrical Systems.
- H. Section 26 05 39 - Underfloor Raceways for Electrical Systems.
- I. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- J. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- K. Section 31 23 16 - Excavation.
- L. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.
- M. Section 31 23 23 - Fill: Bedding and backfilling.
- N. Section 33 71 19 - Electrical Underground Ducts, Ductbanks, and Manholes.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.

- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2018.
- I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
- J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2016.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- N. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- O. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- P. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- Q. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- R. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

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

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- C. Shop Drawings:
 1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
 2. Include proposed locations of roof penetrations and proposed methods for sealing.
- D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 1. Under Slab on Grade: Use rigid PVC conduit.
 2. Exterior, Direct-Buried: Use rigid PVC conduit.
 3. Exterior, Embedded Within Concrete: Use PVC-coated galvanized steel rigid metal conduit.
 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
 5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use PVC-coated galvanized steel rigid metal conduit elbows for bends.
 6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.

7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- D. Embedded Within Concrete:
1. Within Slab on Grade: Not permitted.
 2. Within Slab Above Ground: Not permitted.
 3. Within Concrete Walls Above Ground: Use electrical metallic tubing (EMT) or rigid PVC conduit.
 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.
 5. Where electrical metallic tubing (EMT) emerges from concrete into salt air, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit.
- J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
1. Locations subject to physical damage include, but are not limited to:
 - a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
- K. Exposed, Exterior: Use galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit.
- L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- M. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
1. Maximum Length: 6 feet.
- N. Connections to Vibrating Equipment:
1. Dry Locations: Use flexible metal conduit.
 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 3. Maximum Length: 6 feet unless otherwise indicated.
 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.

2.02 CONDUIT REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Fittings for Grounding and Bonding: Also comply with Section 26 05 26.
- C. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 1/2 inch (16 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Control Circuits: 1/2 inch (16 mm) trade size.
 - 4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
 - 5. Underground, Interior: 1 inch (27 mm) trade size.
 - 6. Underground, Exterior: 1 inch (27 mm) trade size.
- F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedeg.com/#sle.
 - 2. Republic Conduit: www.republic-conduit.com/#sle.
 - 3. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedeg.com/#sle.
 - 2. Republic Conduit: www.republic-conduit.com/#sle.
 - 3. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 - 1. Thomas & Betts Corporation: www.tnb.com.
 - 2. Robroy Industries: www.robroy.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil.
- D. Interior Coating: Urethane, minimum thickness of 2 mil.
- E. PVC-Coated Fittings:
 - 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
 - 2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - 4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.
 - 5. Interior Coating: Urethane, minimum thickness of 2 mil.
- F. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil.

2.06 FLEXIBLE METAL CONDUIT (FMC)

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc: www.afcweb.com.
 - 2. Electri-Flex Company: www.electriflex.com.
 - 3. International Metal Hose: www.metalhose.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.

2.07 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc: www.afcweb.com.
 - 2. Electri-Flex Company: www.electriflex.com.
 - 3. International Metal Hose: www.metalhose.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.

2.08 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:

1. Allied Tube & Conduit: www.alliedeg.com.
 2. Republic Conduit: www.republic-conduit.com/#sle.
 3. Wheatland Tube Company: www.wheatland.com.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 4. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.
 5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
 6. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.09 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
1. Cantex Inc: www.cantexinc.com/#sle.
 2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
 3. JM Eagle: www.jmeagle.com/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.10 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.

- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.
- E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- F. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.
- G. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
 - 1. Products:
 - a. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.
 - b. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for the conduit/duct arrangement to be installed.
 - 1. Products:
 - a. Advance Products & Systems, LLC; Duct Bank Spacers: www.apsonline.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- I. Bore Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for installation within casing; furnished with roller wheels to facilitate installation, openings to facilitate grout flow, and holes for stabilization cable; suitable for the casing and conduit/duct arrangement to be installed.
 - 1. Products:
 - a. Advance Products & Systems, LLC; Bore Spacers: www.apsonline.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).

- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- G. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 - 5. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
 - 6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 - 7. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 - 9. Arrange conduit to provide no more than 150 feet between pull points.
 - 10. Route conduits above water and drain piping where possible.
 - 11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 - 12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
 - 13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - 14. Group parallel conduits in the same area together on a common rack.
- H. Conduit Support:
 - 1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide required vibration isolation and/or seismic controls in accordance with Section 26 05 48.
 3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 4. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 5. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 6. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 7. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 8. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 9. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
 10. Use of spring steel conduit clips for support of conduits is not permitted.
 11. Use of wire for support of conduits is not permitted.
 12. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- I. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
 7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.

3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
 7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
- K. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 31 23 16.13.
 2. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches.
 - b. Under Slab on Grade: 12 inches to bottom of slab.
 3. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length for service entrance where not concrete-encased.
- L. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Include proposed conduit arrangement with submittals.
 2. Maximum Conduit Size: 1 inch (27 mm) unless otherwise approved.
 3. Install conduits within middle one third of slab thickness.
 4. Secure conduits to prevent floating or movement during pouring of concrete.
- M. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.
- N. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where conduits are subject to earth movement by settlement or frost.
- O. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.

- 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- P. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- Q. Provide grounding and bonding in accordance with Section 26 05 26.
- R. Identify conduits in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 26 05 33.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Floor boxes.
- D. Underground boxes/enclosures.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- E. Section 26 05 33.23 - Surface Raceways for Electrical Systems:
 - 1. Accessory boxes designed specifically for surface raceway systems.
 - 2. Lay-in wireways and wiring troughs with removable covers.
- F. Section 26 05 39 - Underfloor Raceways for Electrical Systems: Junction boxes for underfloor duct systems.
- G. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- H. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- I. Section 26 27 26 - Wiring Devices:
 - 1. Wall plates.
 - 2. Floor box service fittings.
 - 3. Poke-through assemblies.
 - 4. Access floor boxes.
 - 5. Additional requirements for locating boxes for wiring devices.
- J. Section 26 28 13 - Fuses: Spare fuse cabinets.
- K. Section 33 71 19 - Electrical Underground Ducts, Ductbanks, and Manholes: Concrete manholes for electrical systems.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. SCTE 77 - Specification for Underground Enclosure Integrity; 2017.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 508A - Industrial Control Panels; 2013.
- L. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- M. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
 6. Coordinate the work with other trades to preserve insulation integrity.
 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
 8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

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

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for outlet and device boxes, junction and pull boxes, cabinets and enclosures, boxes for hazardous (classified) locations, and underground boxes/enclosures.
 - 1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.
- C. Samples:
 - 1. Floor Boxes: Provide one sample(s) of each floor box proposed for substitution upon request.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual locations for outlet and device boxes, junction boxes, pull boxes, cabinets and enclosures, and underground boxes/enclosures.
- F. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
 4. Use nonmetallic boxes where exposed rigid PVC conduit is used.
 5. Use suitable concrete type boxes where flush-mounted in concrete.
 6. Use suitable masonry type boxes where flush-mounted in masonry walls.
 7. Use raised covers suitable for the type of wall construction and device configuration where required.
 8. Use shallow boxes where required by the type of wall construction.
 9. Do not use "through-wall" boxes designed for access from both sides of wall.
 10. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 11. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 12. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
 13. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 14. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 15. Minimum Box Size, Unless Otherwise Indicated:
 - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
 - b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
 - c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
 16. Wall Plates: Comply with Section 26 27 26.
 17. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com.
 - c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com.
 - d. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
 - e. Thomas & Betts Corporation: www.tnb.com.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.

- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
 - 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 - 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1, painted steel.
 - b. Outdoor Locations: Type 3R, painted steel.
 - 3. Junction and Pull Boxes Larger Than 100 cubic inches:
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 - b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
 - 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
 - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
 - b. Back Panels: Painted steel, removable.
 - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
 - 5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
 - 6. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com.
 - c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Floor Boxes:
 - 1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
 - 2. Use cast iron floor boxes within slab on grade.
 - 3. Use sheet-steel, cast iron, or nonmetallic floor boxes within slab above grade.
 - 4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
 - 5. Manufacturer: Same as manufacturer of floor box service fittings.
- E. Underground Boxes/Enclosures:
 - 1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
 - 2. Size: As indicated on drawings.
 - 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
 - 4. Provide logo on cover to indicate type of service.
 - 5. Applications:

- a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 8 load rating.
 - b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 15 load rating.
 - c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
- a. Manufacturers:
 - 1) Hubbell Incorporated; Quazite Products: www.hubbellpowersystems.com.
 - 2) MacLean Highline: www.macleanhighline.com.
 - 3) Oldcastle Precast, Inc: www.oldcastleprecast.com.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.
 - b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required.
 - 2. Unless dimensioned, box locations indicated are approximate.
 - 3. Locate boxes as required for devices installed under other sections or by others.
 - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
 - 4. Locate boxes so that wall plates do not span different building finishes.

5. Locate boxes so that wall plates do not cross masonry joints.
 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
 8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
 9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
 - b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
 10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.
 11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.
 - c. Electrical rooms.
 - d. Mechanical equipment rooms.
- I. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- L. Floor-Mounted Cabinets: Mount on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
- M. Install boxes as required to preserve insulation integrity.
- N. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- O. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.
- P. Underground Boxes/Enclosures:
 1. Install enclosure on gravel base, minimum 6 inches deep.
 2. Flush-mount enclosures located in concrete or paved areas.
 3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
 4. Provide cast-in-place concrete collar constructed in accordance with Section 03 30 00, minimum 10 inches wide by 12 inches deep, around enclosures that are not located in concrete areas.
 5. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- Q. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- R. Close unused box openings.
- S. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- T. Provide grounding and bonding in accordance with Section 26 05 26.
- U. Identify boxes in accordance with Section 26 05 53.

3.03 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 26 05 33.23
SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface raceway systems.
- B. Wireways.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
 - 1. Includes metal channel (strut) used as raceway.
- C. Section 26 05 33.13 - Conduit for Electrical Systems.
- D. Section 26 05 33.16 - Boxes for Electrical Systems.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 27 23 - Indoor Service Poles.
- G. Section 26 27 26 - Wiring Devices: Receptacles.
- H. Section 27 10 00 - Structured Cabling: Voice and data jacks.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- D. NEMA PRP 5 - Installation Guidelines for Surface Nonmetallic Raceway; 2015.
- E. UL 5 - Surface Metal Raceways and Fittings; Current Edition, Including All Revisions.
- F. UL 5A - Nonmetallic Surface Raceways and Fittings; Current Edition, Including All Revisions.
- G. UL 111 - Outline of Investigation for Multioutlet Assemblies; Current Edition, Including All Revisions.
- H. UL 870 - Wireways, Auxiliary Gutters, and Associated Fittings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of raceways with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate rough-in locations of outlet boxes provided under Section 26 05 33.16 and conduit provided under Section 26 05 33.13 as required for installation of raceways provided under this section.

3. Verify minimum sizes of raceways with the actual conductors and components to be installed.
 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not install raceways until final surface finishes and painting are complete.
 2. Do not begin installation of conductors and cables until installation of raceways is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.
1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.
- C. Shop Drawings:
1. Pre-wired Surface Raceway Systems: Provide plan and elevation views including dimensioned locations of wiring devices and circuiting arrangements.
 2. Wireways: Provide dimensioned plan and elevation views including adjacent equipment with all required clearances indicated.
- D. Samples: Three of each type and color of surface raceway system specified, 6 inches in length.
- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 RACEWAY REQUIREMENTS

- A. Provide all components, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

2.02 SURFACE RACEWAY SYSTEMS

- A. Manufacturers:
 - 1. MonoSystems, Inc: www.monosystems.com/#sle.
 - 2. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Surface Metal Raceways: Listed and labeled as complying with UL 5.
- C. Surface Nonmetallic Raceways: Listed and labeled as complying with UL 5A.
- D. Multioutlet Assemblies: Listed and labeled as complying with UL 111.
- E. Metal Channel (Strut) Used as Raceway: Comply with Section 26 05 29.
- F. Surface Raceway System:
 - 1. Raceway Type: Single channel, painted steel.
 - 2. Length: As indicated on the drawings.
 - 3. Color: To be selected by Architect.
 - 4. Accessory Device Boxes: Suitable for the devices to be installed; color to match raceway.
 - 5. Integrated Device Provisions:
 - a. Receptacles:
 - 1) Comply with Section 26 27 26, except for finishes.
 - 2) Configuration: As indicated on the drawings.
 - 3) Color: Match raceway.
 - 4) Spacing: As indicated on the drawings.
 - b. Communications Outlets:
 - 1) Voice and Data Jacks: Include provisions for jacks furnished by others.
 - 2) Configuration: As indicated on the drawings.
 - 3) Spacing: As indicated on the drawings.

2.03 WIREWAYS

- A. Manufacturers:
 - 1. Cooper B-Line, a division of Cooper Industries: www.cooperindustries.com/#sle.
 - 2. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.
 - 3. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Lay-in wireways and wiring troughs with removable covers; listed and labeled as complying with UL 870.

- C. Wireway Type, Unless Otherwise Indicated:
 - 1. Indoor Clean, Dry Locations: NEMA 250, Type 1, painted steel with screw-cover.
 - 2. Outdoor Locations: NEMA 250, Type 3R, painted steel with screw-cover; include provision for padlocking.
- D. Finish for Painted Steel Wireways: Manufacturer's standard grey unless otherwise indicated.
- E. Minimum Wireway Size: 4 by 4 inches unless otherwise indicated.
- F. Where wireway size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.04 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Factory test each production unit for pre-wired surface raceway systems to verify proper wiring.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes and conduit terminations are installed in proper locations and are properly sized in accordance with NFPA 70 to accommodate raceways.
- C. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Surface Nonmetallic Raceways: Install in accordance with NEMA PRP 5.
- D. Install raceways plumb and level.
- E. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pullboxes. Increase size of wireway where necessary.
- F. Secure and support raceways in accordance with Section 26 05 29 at intervals complying with NFPA 70 and manufacturer's requirements.
- G. Close unused raceway openings.
- H. Provide grounding and bonding in accordance with Section 26 05 26.
- I. Identify raceways in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect raceways for damage and defects.

- C. Surface Raceway Systems with Integrated Devices: Test each wiring device to verify operation and proper polarity.
- D. Correct wiring deficiencies and replace damaged or defective raceways.

3.04 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 PROTECTION

- A. Protect installed raceways from subsequent construction operations.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Floor marking tape.
- G. Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A. Section 09 91 13 - Exterior Painting.
- B. Section 09 91 23 - Interior Painting.
- C. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- D. Section 26 05 36 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.
- E. Section 26 05 73 - Power System Studies: Arc flash hazard warning labels.
- F. Section 26 23 00 - Low-Voltage Switchgear: Factory-installed mimic bus.
- G. Section 26 27 26 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.
- H. Section 27 10 00 - Structured Cabling: Identification for communications cabling and devices.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.
- D. Samples:
 1. Identification Nameplates: One of each type and color specified.
 2. Warning Signs and Labels: One of each type and legend specified.
- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Switchgear:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use identification nameplate to identify main and tie devices.
 - 5) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - b. Switchboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.

- 4) Use identification nameplate to identify main overcurrent protective device.
 - 5) Use identification nameplate to identify load(s) served for each branch device.
Do not identify spares and spaces.
- c. Motor Control Centers:
- 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use identification nameplate to identify main overcurrent protective device.
 - 5) Use identification nameplate to identify load(s) served for each branch device.
Do not identify spares and spaces.
- d. Panelboards:
- 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- e. Transformers:
- 1) Identify kVA rating.
 - 2) Identify voltage and phase for primary and secondary.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify load(s) served. Include location when not within sight of equipment.
- f. Enclosed switches, circuit breakers, and motor controllers:
- 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
- g. Busway:
- 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Provide identification at maximum intervals of 40 feet.
 - 5) Use identification nameplate to identify load(s) served for each plug-in unit.
Include location when not within sight of equipment.
- h. Time Switches:
- 1) Identify load(s) served and associated circuits controlled. Include location.
- i. Enclosed Contactors:
- 1) Identify ampere rating.
 - 2) Identify voltage and phase.

- 3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
- 4) Identify coil voltage.
- 5) Identify load(s) and associated circuits controlled. Include location.
- j. Transfer Switches:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
 - 4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
- k. Electricity Meters:
 - 1) Identify load(s) metered.
2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
 - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
3. Emergency System Equipment:
 - a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
 - b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
 - c. Use identification nameplate to identify emergency operating instructions for emergency system equipment.
4. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
5. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
6. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
7. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
8. Use identification label on inside of door at each fused switch to identify required NEMA fuse class and size.
9. Use identification label on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
10. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

11. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
 - a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 09 91 23 and 09 91 13.
 12. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
 - a. Service equipment.
 - b. Industrial control panels.
 - c. Motor control centers.
 - d. Elevator control panels.
 - e. Industrial machinery.
 13. Arc Flash Hazard Warning Labels: Comply with Section 26 05 73.
 14. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
 15. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
 16. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
 17. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.
- B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
 2. Identification for Communications Conductors and Cables: Comply with Section 27 10 00.
 3. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 4. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.

- d. In cable tray, at maximum intervals of 20 feet.
 - 5. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
 - 6. Use underground warning tape to identify direct buried cables.
- C. Identification for Raceways:
- 1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
 - 2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.
 - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
 - 1) Color Code:
 - (a) Emergency Power System: Red.
 - 2) Field-Painting: Comply with Section 09 91 23 and 09 91 13.
 - 3) Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19.
 - 3. Use identification labels or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
 - 4. Use identification labels or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
 - 5. Use underground warning tape to identify underground raceways.
 - 6. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.
- D. Identification for Cable Tray: Comply with Section 26 05 36.
- E. Identification for Boxes:
- 1. Use voltage markers to identify highest voltage present.
 - 2. Use voltage markers or color coded boxes to identify systems other than normal power system.
 - a. Color-Coded Boxes: Field-painted in accordance with Section 09 91 23 and 09 91 13 per the same color code used for raceways.
 - 1) Emergency Power System: Red.
 - 2) Fire Alarm System: Red.
 - b. For exposed boxes in public areas, do not color code.
 - 3. Use identification labels to identify circuits enclosed.
 - a. For exposed boxes in public areas, provide identification on inside face of cover.
 - b. Accessible but concealed: Provide identification on outside surface of cover plate.
 - 4. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
- F. Identification for Devices:
- 1. Identification for Communications Devices: Comply with Section 27 10 00.

2. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
 3. Factory Pre-Marked Wallplates: Comply with Section 26 27 26.
 4. Use identification label to identify fire alarm system devices.
 - a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
 5. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
 - a. For receptacles in public areas or in areas as directed by Architect, provide identification on outside surface of cover plate.
 6. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
 7. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.
- G. Identification for Luminaires:
1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Manufacturers:
 - a. Brimar Industries, Inc: www.brimar.com/#sle.
 - b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
 - c. Seton Identification Products: www.seton.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
 - a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Manufacturers:

- a. Brady Corporation: www.bradyid.com.
 - b. Brother International Corporation: www.brother-usa.com/#sle.
 - c. Panduit Corp: www.panduit.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - a. Use only for indoor locations.
 3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
1. Minimum Size: 1 inch by 2.5 inches.
 2. Legend:
 - a. System designation where applicable:
 - 1) Emergency Power System: Identify with text "EMERGENCY".
 - 2) Fire Alarm System: Identify with text "FIRE ALARM".
 - b. Equipment designation or other approved description.
 - c. Other information as indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height:
 - a. System Designation: 1 inch.
 - b. Equipment Designation: 1/2 inch.
 - c. Other Information: 1/4 inch.
 - d. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.
 5. Color:
 - a. Normal Power System: White text on black background.
 - b. Emergency Power System: White text on red background.
 - c. Fire Alarm System: White text on red background.
- D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch by 2.5 inches.
 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/4 inch.
 5. Color: Black text on white background unless otherwise indicated.
 - a. Exceptions:
 - 1) Provide white text on red background for general information or operational instructions for emergency systems.
 - 2) Provide white text on red background for general information or operational instructions for fire alarm systems.

- E. Format for Caution and Warning Messages:
 - 1. Minimum Size: 2 inches by 4 inches.
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/2 inch.
 - 5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Receptacle Identification:
 - 1. Minimum Size: 3/8 inch by 1.5 inches.
 - 2. Legend: Power source and circuit number or other designation indicated.
 - a. Include voltage and phase for other than 120 V, single phase circuits.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch.
 - 5. Color: Black text on clear background.
- G. Format for Control Device Identification:
 - 1. Minimum Size: 3/8 inch by 1.5 inches.
 - 2. Legend: Load controlled or other designation indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch.
 - 5. Color: Black text on clear background.
- H. Format for Fire Alarm Device Identification:
 - 1. Minimum Size: 3/8 inch by 1.5 inches.
 - 2. Legend: Designation indicated and device zone or address.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch.
 - 5. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com.
 - 2. HellermannTyton: www.hellermanntyton.com.
 - 3. Panduit Corp: www.panduit.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
 - 1. Do not use handwritten text.
- F. Minimum Text Height: 1/8 inch.
- G. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com.
 - 2. Brimar Industries, Inc: www.brimar.com/#sle.
 - 3. Seton Identification Products: www.seton.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- D. Minimum Size:
 - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
 - 2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 - 3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
 - 4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
- E. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
 - 2. Markers for System Identification:
 - a. Emergency Power System: Text "EMERGENCY".
- F. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com.
 - 2. Brimar Industries, Inc: www.brimar.com/#sle.
 - 3. Seton Identification Products: www.seton.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- C. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

- D. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.
- E. Legend: Type of service, continuously repeated over full length of tape.
- F. Color:
 - 1. Tape for Buried Power Lines: Black text on red background.
 - 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.06 FLOOR MARKING TAPE

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com.
 - 2. Brimar Industries, Inc: www.brimar.com/#sle.
 - 3. Seton Identification Products: www.seton.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlamine, 3 inches wide, with alternating black and white stripes.

2.07 WARNING SIGNS AND LABELS

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.brimar.com/#sle.
 - 2. Clarion Safety Systems, LLC: www.clarionsafety.com.
 - 3. Seton Identification Products: www.seton.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C. Warning Signs:
 - 1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
 - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 - 3. Minimum Size: 7 by 10 inches unless otherwise indicated.
- D. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - a. Do not use labels designed to be completed using handwritten text.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 - 3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.
 - 5. Branch Devices: Adjacent to device.
 - 6. Interior Components: Legible from the point of access.
 - 7. Conduits: Legible from the floor.
 - 8. Boxes: Outside face of cover.
 - 9. Conductors and Cables: Legible from the point of access.
 - 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
 - 1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 26 05 73
POWER SYSTEM STUDIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Short-circuit study.
- B. Protective device coordination study.
- C. Arc flash and shock risk assessment.
 - 1. Includes arc flash hazard warning labels.
- D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 53 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.
- B. Section 26 11 16 - Secondary Unit Substations.
- C. Section 26 13 00 - Medium-Voltage Switchgear.
- D. Section 26 13 21 - Air Interrupter Switches.
- E. Section 26 18 39 - Medium-Voltage Motor Controllers.
- F. Section 26 21 00 - Low-Voltage Electrical Service Entrance.
 - 1. Includes Utility Company contact information.
- G. Section 26 23 00 - Low-Voltage Switchgear.
- H. Section 26 24 13 - Switchboards.
- I. Section 26 24 16 - Panelboards.
- J. Section 26 24 19 - Motor-Control Centers.
- K. Section 26 25 13 - Low-Voltage Busways.
- L. Section 26 28 13 - Fuses.
- M. Section 26 28 16.13 - Enclosed Circuit Breakers.
- N. Section 26 28 16.16 - Enclosed Switches.
- O. Section 26 29 13 - Enclosed Controllers.
- P. Section 26 35 33.16 - Low-Voltage Power Factor Correction Equipment.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
- B. IEEE 141 - IEEE Recommended Practice for Electrical Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).
- C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

- D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.
- E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.
- F. IEEE 1584 - IEEE Guide for Performing Arc Flash Hazard Calculations; 2018.
- G. NEMA MG 1 - Motors and Generators; 2017.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
 - 2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Pre-Study Meeting: Conduct meeting with Owner to discuss system operating modes and conditions to be considered in studies.
- C. Sequencing:
 - 1. Submit study reports prior to or concurrent with product submittals.
 - 2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect.
 - 3. Verify naming convention for equipment identification prior to creation of final drawings, reports, and arc flash hazard warning labels (where applicable).
- D. Scheduling:
 - 1. Arrange access to existing facility for data collection with District.
 - 2. Where work of this section involves interruption of existing electrical service, arrange service interruption with District.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Study preparer's qualifications.
- C. Field testing agency's qualifications.
- D. Study reports, stamped or sealed and signed by study preparer.
- E. Product Data: In addition to submittal requirements specified in other sections, include manufacturer's standard catalog pages and data sheets for equipment and protective devices indicating information relevant to studies.
 - 1. Include characteristic time-current trip curves for protective devices.

2. Include impedance data for busway.
 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 4. Include documentation of listed series ratings upon request.
 5. Identify modifications made in accordance with studies that:
 - a. Can be made at no additional cost to District.
 - b. As submitted will involve a change to the contract sum.
- F. Arc Flash Hazard Warning Label Samples: One of each type and legend specified.
- G. Site-specific arc flash hazard warning labels.
- H. Field quality control reports.
- I. Certification that field adjustable protective devices have been set in accordance with requirements of studies.
- J. Project Record Documents: Revise studies as required to reflect as-built conditions.
1. Include hard copies with operation and maintenance data submittals.
 2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

1.06 POWER SYSTEM STUDIES

- A. Scope of Studies:
1. Perform analysis of new electrical distribution system as indicated on drawings.
 2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
 3. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.
 - a. Known Operating Modes:
 - 1) Utility as source.
 - 2) Generator as source.
 - 3) Utility/generator in parallel.
 - 4) Bus tie breaker open/close positions.
 - 5) Maintenance settings.
- B. General Study Requirements:
1. Comply with NFPA 70.
 2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.
- C. Data Collection:
1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.

- a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
 - 1) Obtain up-to-date information from Utility Company.
 - 2) Utility Company: As indicated on drawings.
 - b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.
 - c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.
 - d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
 - e. Protective Devices:
 - 1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
 - 2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
 - f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
 - g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.
- D. Short-Circuit Study:
- 1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
 - 2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
 - a. Maximum utility fault currents.
 - b. Maximum motor contribution.
 - c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
 - 3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.
- E. Protective Device Coordination Study:
- 1. Comply with applicable portions of IEEE 242 and IEEE 399.
 - 2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
 - 3. Analyze protective devices and associated settings for suitable margins between time-current curves to achieve full selective coordination while providing adequate protection for equipment and conductors.
- F. Arc Flash and Shock Risk Assessment:
- 1. Comply with NFPA 70E.

2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
 - a. To clarify IEEE 1584 statement that "equipment below 240 V need not be considered unless it involves at least one 125 kVA or larger low-impedance transformer in its immediate power supply" for purposes of studies, study preparer to include equipment rated less than 240 V fed by transformers less than 125 kVA in calculations.
 - b. Where reasonable, study preparer may assume a maximum clearing time of two seconds in accordance with IEEE 1584, provided that the conditions are such that a worker's egress from an arc flash event would not be inhibited.
 - c. For single-phase systems, study preparer to perform calculations assuming three-phase system in accordance with IEEE 1584, yielding conservative results.
 3. For equipment with main devices mounted in separate compartmentalized sections, perform calculations on both the line and load side of the main device.
 4. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
 - a. Maximum and minimum utility fault currents.
 - b. Maximum and minimum motor contribution.
 - c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
- G. Study Reports:
1. General Requirements:
 - a. Identify date of study and study preparer.
 - b. Identify study methodology and software product(s) used.
 - c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
 - d. Identify base used for per unit values.
 - e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
 - f. Include conclusions and recommendations.
 2. Short-Circuit Study:
 - a. For each scenario, identify at each bus location:
 - 1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
 - 2) Fault point X/R ratio.
 - 3) Associated equipment short circuit current ratings.
 - b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
 3. Protective Device Coordination Study:
 - a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.
 - b. For each graph include (where applicable):
 - 1) Partial single-line diagram identifying the portion of the system illustrated.

- 2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
 - 3) Conductors: Damage curves.
 - 4) Transformers: Inrush points and damage curves.
 - 5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
 - 6) Motors: Full load current, starting curves, and damage curves.
 - 7) Capacitors: Full load current and damage curves.
 - c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
 - 1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
 - 2) Include ground fault pickup and delay.
 - 3) Include fuse ratings.
 - 4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.
 - d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.
4. Arc Flash and Shock Risk Assessment:
- a. For each scenario, identify at each bus location:
 - 1) Calculated incident energy and associated working distance.
 - 2) Calculated arc flash boundary.
 - 3) Bolted fault current.
 - 4) Arcing fault current.
 - 5) Clearing time.
 - 6) Arc gap distance.
 - b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.
 - c. Identify locations where the calculated maximum incident energy exceeds 40 calories per sq cm.
 - d. Include recommendations for reducing the incident energy at locations where the calculated maximum incident energy exceeds 8 calories per sq cm.

1.07 QUALITY ASSURANCE

- A. Study Preparer Qualifications: Professional electrical engineer licensed in California and with minimum five years experience in the preparation of studies of similar type and complexity using specified computer software.
 1. Study preparer may be employed by the manufacturer of the electrical distribution equipment.
 2. Study preparer may be employed by field testing agency.
- B. Field Testing Agency Qualifications: Independent testing organization specializing in testing, analysis, and maintenance of electrical systems with minimum five years experience; NETA Accredited Company.

1. Field Supervisor: Certified electrical testing technician; NETA ETT Level III.
- C. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.
 1. Acceptable Software Products:
 - a. EasyPower LLC: www.easypower.com/#sle.
 - b. ETAP/Operation Technology, Inc: www.etap.com/#sle.
 - c. Power Analytics Corporation: www.poweranalytics.com/#sle.
 - d. SKM Systems Analysis, Inc: www.skm.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

PART 2 PRODUCTS

2.01 ARC FLASH HAZARD WARNING LABELS

- A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
 1. Materials: Comply with Section 26 05 53.
 2. Minimum Size: 4 by 6 inches.
 3. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
 - a. Include orange header that reads "WARNING" where calculated incident energy is less than 40 calories per square cm.
 - b. Include red header that reads "DANGER" where calculated incident energy is 40 calories per square cm or greater.
 - c. Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.
 - d. Include the following information:
 - 1) Arc flash boundary.
 - 2) Available incident energy and corresponding working distance.
 - 3) Site-specific PPE (personnel protective equipment) requirements.
 - 4) Nominal system voltage.
 - 5) Limited approach boundary.
 - 6) Restricted approach boundary.
 - 7) Equipment identification.
 - 8) Date calculations were performed.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install arc flash warning labels in accordance with Section 26 05 53.

3.02 FIELD QUALITY CONTROL

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

- B. Provide the services of field testing agency or equipment manufacturer's representative to perform inspection, testing, and adjusting.
- C. Inspect and test in accordance with NETA ATS, except Section 4.
- D. Adjust equipment and protective devices for compliance with studies and recommended settings.
- E. Notify Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.
- F. Submit detailed reports indicating inspection and testing results, and final adjusted settings.

3.03 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Training: Include as part of the base bid training for District's personnel on electrical safety pertaining to arc flash and shock hazards.
 - 1. Use site-specific arc flash and shock risk assessment report as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of four hours of training.
 - 3. Instructor: Representative of entity performing study.
 - 4. Location: At project site.

END OF SECTION

SECTION 26 05 83
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 05 33.13 - Conduit for Electrical Systems.
- C. Section 26 05 33.16 - Boxes for Electrical Systems.
- D. Section 26 27 26 - Wiring Devices.
- E. Section 26 28 16.16 - Enclosed Switches.
- F. Section 26 29 13 - Enclosed Controllers.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
 - 2. Determine connection locations and requirements.
- B. Sequencing:
 - 1. Install rough-in of electrical connections before installation of equipment is required.
 - 2. Make electrical connections before required start-up of equipment.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - 1. Colors: Comply with NEMA WD 1.
 - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
 - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Disconnect Switches: As specified in Section 26 28 16.16 and in individual equipment sections.
- C. Wiring Devices: As specified in Section 26 27 26.
- D. Flexible Conduit: As specified in Section 26 05 33.13.
- E. Wire and Cable: As specified in Section 26 05 19.
- F. Boxes: As specified in Section 26 05 33.16.

2.02 EQUIPMENT CONNECTIONS

- A. As indicated:
 - 1. Electrical Connection: Flexible conduit.
 - 2. Electrical Connection: Cord and plug (NEMA 6-20R).
 - 3. Provide field-installed disconnect switch.
 - 4. Voltage: 120 volts, 3 phase, 60 Hz.
 - 5. Load rating: 19 kW plus 7.5 hp.
 - 6. FLA: 31.6 amperes.
 - 7. WSA: 38.3 amperes.
 - 8. Branch Circuit: 80 ampere fuse, maximum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.

- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.
- B. Outdoor motion sensors.
- C. Time switches.
- D. In-wall time switches.
- E. In-wall interval timers.
- F. Outdoor photo controls.
- G. Daylighting controls.
- H. Lighting contactors.
- I. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 33.16 - Boxes for Electrical Systems.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 05 73 - Power System Studies.
- F. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
 - 1. Includes finish requirements for wall controls specified in this section.
 - 2. Includes accessory receptacles, switches, dimmers and wall plates, to match lighting controls specified in this section.
- G. Section 26 51 00 - Interior Lighting.
- H. Section 26 56 00 - Exterior Lighting.

1.03 REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices; current edition.
- B. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2010.
- C. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols; 2004 (R2010).
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2016.
- H. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).
- I. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.
- J. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 773 - Plug-in, Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.
- M. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
- N. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
- O. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.
- P. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.
- Q. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.
- R. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
 - 3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
 - 4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
 - 5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:
 - 1. Do not install lighting control devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 - 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- C. Shop Drawings:
 - 1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
 - 2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.
- D. Samples:
 - 1. Occupancy Sensors: One for each type and color specified.
 - 2. In-Wall Time Switches: One for each type and color specified.
 - 3. In-Wall Interval Timers: One for each type and color specified.
 - 4. Daylighting Control Photo Sensors: One for each type and color specified.
- E. Field Quality Control Reports.
- F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Operation and Maintenance Data: Include detailed information on device programming and setup.
- H. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Locking Receptacle-Mounted Outdoor Photo Controls: Five percent of total quantity installed for each type, but not less than two of each type.
 - 3. Electronic Trip Circuit Breakers: Provide one portable test set.
 - 4. Indicating Lights: Two of each different type.
- I. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all occupancy sensors.
- C. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.
- D. Provide two year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.
- C. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.02 OCCUPANCY SENSORS

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell.com/#sle.
 - 2. Lutron Electronics Company, Inc: www.lutron.com.
 - 3. Sensor Switch Inc: www.sensorswitch.com.
 - 4. WattStopper: www.wattstopper.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
 - 6. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. All Occupancy Sensors:
 - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
 - 2. Sensor Technology:
 - a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.

- b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
 - c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
 - d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
 4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
 5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
 6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
 7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
 8. Sensitivity: Field adjustable.
 9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
 10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
 11. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
 12. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
 13. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.
 14. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.
 15. Wireless Sensors:
 - a. RF Range: 30 feet through typical construction materials.
 - b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
 - c. Power: Battery-operated with minimum ten-year battery life.
- C. Wall Switch Occupancy Sensors:
1. All Wall Switch Occupancy Sensors:

- a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
 - b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.
 - c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
 - d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
 - e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - f. Provide selectable audible alert to notify occupant of impending load turn-off.
 - g. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.
 - h. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors where indicated.
- 2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.
 - 3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet.
 - 4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.
- D. Wall Dimmer Occupancy Sensors:
- 1. General Requirements:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
 - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
 - c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
 - e. Provide field adjustable dimming preset for occupied state.
 - f. Provide fade-to-off operation to notify occupant of impending load turn-off.
 - g. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.
 - 2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

- E. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
 - a. Description: Low profile occupancy sensors designed for ceiling installation.
 - b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
 - c. Provide field selectable setting for disabling LED motion detector visual indicator.
 - d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
 - e. Finish: White unless otherwise indicated.
 2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
 - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
 3. Ultrasonic Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
 - b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
 - c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet at a mounting height of 9 feet.
 4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
 - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
 5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
 - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet.
- F. Directional Occupancy Sensors:
1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
 - a. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
 - b. Finish: White unless otherwise indicated.
 2. Passive Infrared (PIR) Directional Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.
 - b. Long Range Sensors: Capable of detecting motion within a distance of 80 feet at a mounting height of 10 feet.

- c. High Bay Sensors: Capable of detecting motion within a distance of 50 feet at a mounting height of 30 feet.
 - 3. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.
- G. Luminaire Mounted Occupancy Sensors: Designed for direct luminaire installation and control, suitable for use with specified luminaires.
 - 1. Fluorescent High Bay Luminaire Mounted Occupancy Sensors: Passive infrared (PIR) type with a field of view of 360 degrees unless otherwise indicated.
 - a. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.
 - b. Finish: White unless otherwise indicated.
 - c. Circular Coverage Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 20 feet.
 - d. Linear Aisle Coverage Sensors: Capable of detecting motion within an area of 20 feet wide by 60 feet long at a mounting height of 40 feet.
 - e. Accessories:
 - 1) Provide mounting bracket for lowering occupancy sensor such that luminaire does not block sensor field of view where required.
- H. Power Packs for Low Voltage Occupancy Sensors:
 - 1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
 - 2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
 - 3. Input Supply Voltage: Dual rated for 120/277 V ac.
 - 4. Load Rating: As required to control the load indicated on drawings.
- I. Power Packs for Wireless Occupancy Sensors:
 - 1. Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line voltage loads.
 - 2. Input Supply Voltage: Dual rated for 120/277 V ac.
 - 3. Load Rating: As required to control the load indicated on drawings.
 - 4. Provide auxiliary contact closure output where indicated.
 - 5. Rated Life of Relay: One million cycles.
- J. Accessories:
 - 1. Provide heavy duty coated steel wire protective guards compatible with specified occupancy sensors where indicated.

2.03 OUTDOOR MOTION SENSORS

- A. Manufacturers:
 - 1. Hubbell Lighting, Inc: www.hubbellighting.com.
 - 2. Lithonia Lighting: www.lithonia.com.

3. WattStopper: www.wattstopper.com.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
 5. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. Description: Factory-assembled wet location listed device suitable for wall or ceiling/eave mounting, with integral swivel for field adjustment of coverage, capable of detecting motion for automatic control of load indicated.
 - C. Sensor Technology: Passive Infrared (PIR) designed to detect occupancy by sensing movement of thermal energy between zones.
 - D. Operation: Unless otherwise indicated, motion sensor to turn load on when motion is detected and to turn load off when no motion is detected during an adjustable turn-off delay time interval.
 - E. Turn-Off Delay: Field adjustable, with time delay settings available up to 15 minutes.
 - F. Integral Photocell: For dusk to dawn operation.
 - G. Manual Override: Activated by switching power off to unit and then back on.
 - H. Load Rating: 1,000 W incandescent and fluorescent load at 120 V ac.
 - I. Coverage: Capable of detecting motion within a distance of 50 feet at a mounting height of 8 feet, with a field of view of 270 degrees.
 - J. Finish: Color to be selected.
 - K. Provide integral lamp holders suitable for two 150 watt PAR 38 lamps.

2.04 TIME SWITCHES

- A. Manufacturers:
 1. Intermatic, Inc: www.intermatic.com.
 2. Tork, a division of NSI Industries LLC: www.tork.com.
 3. Substitutions: See Section 01 60 00 - Product Requirements.
 4. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. Digital Electronic Time Switches:
 1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
 2. Program Capability:
 - a. 7-Day Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days.
 - b. Astronomic Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
 3. Schedule Capacity: Not less than 16 programmable on/off operations.
 4. Provide automatic daylight savings time and leap year compensation.

5. Provide power outage backup to retain programming and maintain clock.
6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
7. Input Supply Voltage: As indicated on the drawings.
8. Output Switch Configuration: As required to control the load indicated on drawings.
9. Output Switch Contact Ratings: As required to control the load indicated on drawings.
10. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:
 - a. Indoor clean, dry locations: Type 1.
 - b. Outdoor locations: Type 3R.
11. Provide flush-mounted unit where indicated, where mounted in public areas, or where mounted adjacent to flush-mounted equipment.

2.05 IN-WALL TIME SWITCHES

- A. Manufacturers:
 1. Intermatic, Inc: www.intermatic.com.
 2. Tork, a division of NSI Industries LLC: www.tork.com.
 3. Substitutions: See Section 01 60 00 - Product Requirements.
 4. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. Digital Electronic In-Wall Time Switches:
 1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.
 2. Program Capability:
 - a. 7-Day Time Switches: Capable of different schedule for each day of the week.
 - b. Astronomic Time Switches: Capable of different schedule for each day of the week and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
 3. Schedule Capacity: Not less than 40 programmable on/off operations.
 4. Provide automatic daylight savings time compensation.
 5. Provide power outage backup to retain programming and maintain clock.
 6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
 7. Switch Configuration: Suitable for use in either SPST or 3-way application.
 8. Contact Ratings: As required to control the load indicated on drawings.

2.06 IN-WALL INTERVAL TIMERS

- A. Manufacturers:
 1. Intermatic, Inc: www.intermatic.com.

2. Tork, a division of NSI Industries LLC: www.tork.com.
 3. Substitutions: See Section 01 60 00 - Product Requirements.
 4. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. Digital Electronic In-Wall Interval Timers:
1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.
 2. Program Capability: Designed to turn load off at end of preset time interval.
 3. Time Interval: Field selectable range of presets available up to 12 hours.
 4. Provide field selectable audible and visual indication to warn that end of interval operation is about to turn off load.
 5. Provide power outage backup to retain programming and maintain clock.
 6. Manual override: Capable of both turning load off and resetting timer to original preset time interval.
 7. Switch Configuration: Suitable for use in either SPST or 3-way application.
 8. Contact Ratings: As required to control the load indicated on drawings.
- C. Spring Wound In-Wall Interval Timers:
1. Description: Factory-assembled controller with mechanical spring wound timing mechanism requiring no electricity to operate; suitable for mounting in standard wall box; rotary control operator with matching wall plate factory marked with time interval units; listed and labeled as complying with UL 916 or UL 917.
 2. Program Capability: Designed to turn load off at end of preset time interval.
 3. Time Interval: User selectable from zero up to 15 minutes.
 4. Manual override: Provide hold feature to disable timer for constant on operation.
 5. Switch Configuration: SPST.
 6. Contact Ratings: As required to control the load indicated on drawings.

2.07 OUTDOOR PHOTO CONTROLS

- A. Manufacturers:
1. Intermatic, Inc: www.intermatic.com.
 2. Tork, a division of NSI Industries LLC: www.tork.com.
 3. Substitutions: See Section 01 60 00 - Product Requirements.
 4. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. Stem-Mounted Outdoor Photo Controls:
1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
 2. Housing: Weatherproof, impact resistant polycarbonate.

3. Photo Sensor: Cadmium sulfide.
 4. Provide external sliding shield for field adjustment of light level activation.
 5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
 6. Voltage: As required to control the load indicated on the drawings.
 7. Failure Mode: Fails to the on position.
 8. Load Rating: As required to control the load indicated on the drawings.
 9. Provide accessory wall-mounting bracket where indicated or as required to complete installation.
- C. Locking Receptacle-Mounted Outdoor Photo Controls
1. Description: Plug-in locking type photo control unit complying with ANSI C136.10 for mounting on a compatible receptacle, listed and labeled as complying with UL 773.
 2. Housing: Weatherproof, impact resistant UV stabilized polypropylene, color to be selected.
 3. Photo Sensor: Cadmium sulfide.
 4. Light Level Activation: 1 to 3 footcandles turn-on and 1.5 to 1 turn-off to turn-on ratio with instant turn-on and delayed turn-off.
 5. Voltage: As required to control the load indicated on the drawings.
 6. Failure Mode: Fails to the on position.
 7. Load Rating: As required to control the load indicated on the drawings.
 8. Surge Protection: 160 joule metal oxide varistor.
 9. Provide the following accessories where indicated or as required to complete installation:
 - a. Receptacle: Complying with ANSI C136.10.
 - b. Mounting Bracket.
 - c. Shorting Cap: Suitable for replacing locking photo control to complete circuit.
- D. Button Type Outdoor Photo Controls
1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
 2. Housing: Weather resistant polycarbonate.
 3. Photo Sensor: Cadmium sulfide.
 4. Light Level Activation: 1 to 3 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
 5. Voltage: As required to control the load indicated on the drawings.
 6. Failure Mode: Fails to the on position.
 7. Load Rating: As required to control the load indicated on the drawings.

2.08 DAYLIGHTING CONTROLS

A. Manufacturers:

1. Hubbell Building Automation, Inc: www.hubbellautomation.com
 2. Lutron Electronics Company, Inc: www.lutron.com.
 3. Sensor Switch Inc: www.sensorswitch.com.
 4. WattStopper: www.wattstopper.com.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
 6. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.
- C. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.
1. Sensor Type: Filtered silicon photo diode.
 2. Sensor Range:
 - a. Indoor Photo Sensors: 5 to 100 footcandles.
 - b. Outdoor Photo Sensors: 5 to 250 footcandles.
 3. Finish: White unless otherwise indicated.
 4. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.
 5. Wireless Daylighting Control Photo Sensors:
 - a. RF Range: 30 feet through typical construction materials.
 - b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
 - c. Power: Battery-operated with minimum ten-year battery life.
- D. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts, for direct continuous dimming of up to 50 ballasts.
- E. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
1. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
 2. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
 3. Control Capability:
 - a. Single Zone Switching Modules: Capable of controlling one programmable channel.
 - b. Multi-Zone Switching Modules: Capable of controlling up to three separately programmable channels.
- F. Daylighting Control Switching Modules for Wireless Sensors:

1. Description: Plenum rated, self-contained relay compatible with specified wireless photo sensors for switching of line voltage loads in response to changes in measured light levels according to selected settings.
 2. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
 3. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
 4. Control Capability: Capable of controlling one programmable channel.
 5. Input Supply Voltage: Dual rated for 120/277 V ac.
 6. Load Rating: As required to control the load indicated on drawings.
 7. Provide auxiliary contact closure output where indicated.
 8. Rated Life of Relay: One million cycles.
- G. Daylighting Control Dimming Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors and with specified dimming ballasts, for both continuous dimming of compatible dimming ballasts and switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
1. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
 2. Control Capability: Capable of controlling up to three separately programmable channels, with up to 50 ballasts per channel.
 3. Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
 4. Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.
- H. Daylighting Control Dimming Modules for Wireless Sensors:
1. Description: Plenum rated control unit compatible with specified wireless photo sensors and with specified dimming ballasts, for continuous dimming of compatible dimming ballasts in response to changes in measured light levels according to selected settings.
 2. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
 3. Load to be turned off when available daylight is sufficient to fully dim the load, after the selected time delay.
 4. Control Capability: Capable of controlling up to 32 ballasts with up to two separately programmable daylighting zones.
- I. Power Packs for Low Voltage Daylighting Control Modules:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.

2. Input Supply Voltage: Dual rated for 120/277 V ac.
 3. Load Ratings: As required to control the load indicated on drawings.
- J. Accessories:
1. Where indicated, provide compatible accessory wall switches for manual override control.

2.09 LIGHTING CONTACTORS

- A. Manufacturers:
1. ABB/GE: www.geindustrial.com/#sle.
 2. Eaton Corporation: www.eaton.com.
 3. Rockwell Automation Inc; Allen-Bradley Products; : ab.rockwellautomation.com.
 4. Schneider Electric; Square D Products: www.schneider-electric.us.
 5. Siemens Industry, Inc; <: www.usa.siemens.com.
 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on the drawings.
- C. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect.
1. Disconnects: Circuit breaker type.
 - a. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
 - b. Provide auxiliary interlock for disconnection of external control power sources where applicable.
- D. Short Circuit Current Rating:
1. Provide contactors with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- E. Enclosures:
1. Comply with NEMA ICS 6.
 2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1 or Type 12.
 3. Finish: Manufacturer's standard unless otherwise indicated.

2.10 ACCESSORIES

- A. Auxiliary Contacts:
1. Comply with NEMA ICS 5.
 2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.

- B. Pilot Devices:
 - 1. Comply with NEMA ICS 5; heavy-duty type.
 - 2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
 - 3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
 - 4. Indicating Lights: Push-to-test type unless otherwise indicated.
 - 5. Provide LED lamp source for indicating lights and illuminated devices.
- C. Control and Timing Relays:
 - 1. Comply with NEMA ICS 5.
 - 2. Provide number and type of relays indicated or required to perform necessary functions.
 - 3. Timing Relays: Electronic or pneumatic as indicated.
 - a. Adjustable Timing Range: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of lighting control devices provided under this section.
 - 1. Mounting Heights: As indicated on the drawings.

2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
 3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.
- G. Provide required supports in accordance with Section 26 05 29.
- H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- I. Identify lighting control devices in accordance with Section 26 05 53.
- J. Occupancy Sensor Locations:
1. Location Adjustments: Do not make adjustments to locations without obtaining approval from the Architect.
 2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- K. Outdoor Photo Control Locations:
1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
 2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.
- L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.
- M. Daylighting Control Photo Sensor Locations:
1. Location Adjustments: Do not make adjustments to locations without obtaining approval from the Architect.
 2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
 3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.
- N. Combination Enclosed Lighting Contactors:

1. Except where indicated to be mounted adjacent to the equipment they supply, mount lighting contactors such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- O. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- P. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.
- Q. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.
- R. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.
- S. Where indicated or required, provide cabinet or enclosure in accordance with Section 26 05 33.16 for mounting of lighting control device system components.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Test time switches to verify proper operation.
- E. Test outdoor photo controls to verify proper operation, including time delays where applicable.
- F. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.
- G. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.
- D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings in written report to be included with submittals.
- F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

- G. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 COMMISSIONING

- A. See Section 01 91 13 - General Commissioning Requirements for commissioning requirements.

3.08 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.
- D. Training: Train District's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.
 - 3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
 - 4. Location: At project site.

END OF SECTION

SECTION 26 22 00
LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General purpose transformers.
- B. K-factor transformers rated for nonlinear loads.
- C. Shielded transformers.
- D. Small power centers.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33.13 - Conduit for Electrical Systems: Flexible conduit connections.
- E. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
 - 1. Includes requirements for the seismic qualification of equipment specified in this section.
- F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 26 24 16 - Panelboards.

1.03 REFERENCE STANDARDS

- A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.
- B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.
- C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.
- F. NEMA ST 20 - Dry-Type Transformers for General Applications; 2014.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.
- K. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.
 - 1. Vibration Isolators: Include attachment method and rated load and deflection.
 - 2. K-factor Rated Transformers: Include K-factor ratings.
 - 3. Buck-boost Transformers: Include voltage selection tables and wiring diagrams for autotransformer configurations.
 - 4. Shielded Transformers: Include shielding method and noise attenuation performance.
 - 5. Small Power Centers: Include panelboard bus ampacity, integrated short circuit ampere rating, and circuit breaker sizes and ampere ratings.
- C. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.
 - 1. Small Power Centers: Include panel arrangements.
 - 2. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.
- E. Source Quality Control Test Reports: Include reports for tests designated in NEMA ST 20 as design and routine tests.
- F. Field Quality Control Test Reports.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Maintenance Data: Include recommended maintenance procedures and intervals.
- I. Project Record Documents: Record actual locations of transformers.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.
 - 1. Greater than 10 kVA: 104 degrees F maximum.
 - 2. Less than 10 kVA: 77 degrees F maximum.
- B. Ambient Temperature: Do not exceed 86 degrees F average or 104 degrees F maximum measured during any 24 hour period during and after installation of transformers.

1.09 WARRANTY

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.geindustrial.com/#sle.
- B. Eaton Corporation: www.eaton.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. Siemens Industry, Inc: www.usa.siemens.com.
- E. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Source Limitations: Furnish transformers produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 TRANSFORMERS - GENERAL REQUIREMENTS

- A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

- B. Seismic Qualification: Provide transformers suitable for application under seismic design criteria in accordance with Section 26 05 48 where required. Include certification of compliance with submittals.
- C. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
 - 1. Altitude: Less than 3,300 feet.
 - 2. Ambient Temperature:
 - a. Greater than 10 kVA: Not exceeding 104 degrees F.
 - b. Less than 10 kVA: Not exceeding 77 degrees F.
 - 3. Ambient Temperature: Not exceeding 86 degrees F average or 104 degrees F maximum measured during any 24 hour period.
- D. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.
- E. Impregnate core and coil assembly with non-hygroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
- F. Basic Impulse Level: 10 kV.
- G. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- H. Isolate core and coil from enclosure using vibration-absorbing mounts.
- I. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.03 GENERAL PURPOSE TRANSFORMERS

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.
- B. Primary Voltage: 480 volts delta, 3 phase.
- C. Secondary Voltage: 120/240 volts, 1 phase.
- D. Insulation System and Allowable Average Winding Temperature Rise:
 - 1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
 - 2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- E. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.
- F. Winding Taps:
 - 1. Less than 3 kVA: None.
 - 2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
 - 3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.

4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.
- G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- H. Sound Levels: Standard sound levels complying with NEMA ST 20.
- I. Mounting Provisions:
 1. Less than 15 kVA: Suitable for wall mounting.
 2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
 3. Larger than 75 kVA: Suitable for floor mounting.
- J. Transformer Enclosure: Comply with NEMA ST 20.
 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor clean, dry locations: Type 2.
 - b. Outdoor locations: Type 3R.
 2. Construction: Steel.
 - a. Less than 15 kVA: Totally enclosed, non-ventilated.
 - b. 15 kVA and Larger: Ventilated.
 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
 4. Provide lifting eyes or brackets.
- K. Accessories:
 1. Mounting Brackets: Provide manufacturer's standard brackets.
 2. Weathershield Kits: Provide for ventilated transformers installed outdoors to provide a listed NEMA 250, type 3R assembly.
 3. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

2.04 K-FACTOR TRANSFORMERS RATED FOR NONLINEAR LOADS

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 1561, and designed to supply nonlinear loads to the degree designated by the UL defined K-factor; ratings as indicated on the drawings.
- B. Primary Voltage: 480 volts delta, 3 phase.
- C. Secondary Voltage: 120/240 volts, 1 phase.
- D. K-factor Rating: K-4, or higher.
- E. Insulation System and Allowable Average Winding Temperature Rise: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- F. Coil Conductors: Continuous aluminum windings with terminations brazed or welded. Individually insulate secondary conductors and arrange to minimize hysteresis and eddy current losses at harmonic frequencies. Size secondary neutral conductor at twice the secondary phase conductor ampacity.
- G. Winding Taps: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
- H. Neutral Bus: Sized to accommodate twice the rated secondary current.

- I. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- J. Sound Levels: Standard sound levels complying with NEMA ST 20.
- K. Mounting Provisions:
 - 1. Up to 75 kVA: Suitable for wall, floor, or trapeze mounting.
 - 2. Larger than 75 kVA: Suitable for floor mounting.
- L. Electrostatic Shield: Provide grounded copper electrostatic shield between primary and secondary windings to attenuate electrical noise.
- M. Transformer Enclosure: Comply with NEMA ST 20.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor clean, dry locations: Type 2.
 - b. Outdoor locations: Type 3R.
 - 2. Construction: Steel, ventilated.
 - 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
 - 4. Provide lifting eyes or brackets.
- N. Accessories:
 - 1. Mounting Brackets: Provide manufacturer's standard brackets.
 - 2. Weathershield Kits: Provide for ventilated transformers installed outdoors to provide a listed NEMA 250, type 3R assembly.
 - 3. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

2.05 SHIELDED TRANSFORMERS

- A. Description: Self-cooled, two winding, shielded isolation transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.
- B. Insulation System and Allowable Average Winding Temperature Rise:
 - 1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
 - 2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- C. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.
- D. Winding Taps:
 - 1. Less than 3 kVA: None.
 - 2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
 - 3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
 - 4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.
- E. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- F. Sound Levels: Standard sound levels complying with NEMA ST 20.

- G. Winding Shield: Electrostatic, with separate insulated grounding connection.
- H. Mounting Provisions:
 - 1. Less than 15 kVA: Suitable for wall mounting.
 - 2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
 - 3. Larger than 75 kVA: Suitable for floor mounting.
- I. Transformer Enclosure: Comply with NEMA ST 20.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - 2. Construction: Steel.
 - a. Less than 15 kVA: Totally enclosed, non-ventilated.
 - b. 15 kVA and Larger: Ventilated.
 - 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
 - 4. Provide lifting eyes or brackets.
- J. Accessories:
 - 1. Mounting Brackets: Provide manufacturer's standard brackets.
 - 2. Weathershield Kits: Provide for ventilated transformers installed outdoors to provide a listed NEMA 250, type 3R assembly.
 - 3. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

2.06 SMALL POWER CENTERS

- A. Description: Factory assembled unit with integral primary circuit breaker, transformer, and distribution section with secondary main and branch circuit breakers; ratings and panel arrangements as indicated on the drawings.
- B. Primary Voltage: 480 volts delta, 3 phase.
- C. Secondary Voltage: 120/240 volts, single phase.
- D. Insulation System and Allowable Average Winding Temperature Rise:
 - 1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
 - 2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- E. Coil Conductors: Continuous windings.
- F. Winding Taps: Two 5 percent full capacity primary taps below rated voltage.
- G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- H. Sound Levels: Standard sound levels complying with NEMA ST 20.
- I. Mounting Provisions: Suitable for wall mounting.
- J. Unit Enclosure:
 - 1. Environment Type per NEMA 250: Type 3R.
 - 2. Construction: Steel.
 - 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.

4. Provide lifting eyes or brackets.
5. Provide lockable hinged door for compartment housing circuit breakers.
- K. Provide unit listed as suitable for use as service entrance.
- L. Secondary Distribution Panel:
 1. Comply with applicable requirements of Section 26 24 16.
 2. Bus: Copper.
 3. Branch Circuit Breakers: Bolt-on.

2.07 SOURCE QUALITY CONTROL

- A. Factory test transformers according to NEMA ST 20.
- B. Sound Level Tests: Perform factory test designated in NEMA ST 20 as "design" test on each production unit.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.
- C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install transformers in accordance with NECA 409 and IEEE C57.94.
- D. Use flexible conduit, under the provisions of Section 26 05 33.13, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.
- F. Install transformers plumb and level.
- G. Transformer Support:
 1. Provide required support and attachment in accordance with Section 26 05 29, where not furnished by transformer manufacturer.
 2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
 3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.

- 4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- H. Provide grounding and bonding in accordance with Section 26 05 26.
- I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
- J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.
- K. Where furnished as a separate accessory, install transformer weathershield per manufacturer's instructions.
- L. Identify transformers in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS Sections 7.2.1.1 and 7.2.1.2. Tests and inspections listed as optional are not required.

3.04 ADJUSTING

- A. Measure primary and secondary voltages and make appropriate tap adjustments.
- B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from transformer components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Load centers.
- D. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
 - 1. Includes requirements for the seismic qualification of equipment specified in this section.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- G. Section 26 22 00 - Low-Voltage Transformers: Small power centers with integral primary breaker, transformer, and panelboard.
- H. Section 26 27 13 - Electricity Metering: For interface with equipment specified in this section.
- I. Section 26 28 13 - Fuses: Fuses for fusible switches and spare fuse cabinets.
- J. Section 26 43 00 - Surge Protective Devices.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).
- F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- G. NEMA PB 1 - Panelboards; 2011.
- H. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

- I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- L. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- M. UL 67 - Panelboards; Current Edition, Including All Revisions.
- N. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- O. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- P. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- Q. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- R. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.
- S. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
 - 1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
 2. Include wiring diagrams showing all factory and field connections.
 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 4. Include documentation of listed series ratings upon request.
 5. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.
- E. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.
- F. Field Quality Control Test Reports.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- I. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- J. Maintenance Materials: Furnish the following for District's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Panelboard Keys: Two of each different key.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.geindustrial.com/#sle.
- B. Eaton Corporation: www.eaton.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. Siemens Industry, Inc: www.usa.siemens.com.
- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Seismic Qualification: Provide panelboards and associated components suitable for application under the seismic design criteria specified in Section 26 05 48 where required. Include certification of compliance with submittals.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- D. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 - 2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
 - 3. Label equipment utilizing series ratings as required by NFPA 70.
- E. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- F. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- G. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- H. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

2. Provide 200 percent rated neutral bus and lugs where indicated, where oversized neutral conductors are provided, or where panelboards are fed from K-rated transformers.
 3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
 4. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
- J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
 - c. Provide removable end walls for NEMA Type 1 enclosures.
 - d. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- K. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- L. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list and label panelboards as a complete assembly including surge protective device.
- M. Panelboard Contactors: Where panelboard contactors are indicated, provide electrically operated, mechanically held magnetic contactor complying with NEMA ICS 2.
1. Ampere Rating: Not less than ampere rating of panelboard bus.
 2. Short Circuit Current Rating: Not less than the panelboard short circuit current rating.
 3. Coil Voltage: As required for connection to control system indicated.
- N. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
 - a. Use zero sequence ground fault detection method unless otherwise indicated.
 - b. Provide test panel and field-adjustable ground fault pick-up and delay settings.
 - c. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control ground fault delay functions for system coordination purposes.
- O. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- P. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.
- Q. Provide the following features and accessories where indicated or where required to complete installation:
 1. Feed-through lugs.
 2. Sub-feed lugs.

2.03 POWER DISTRIBUTION PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 1. Phase and Neutral Bus Material: Aluminum.
 2. Ground Bus Material: Aluminum.
- D. Circuit Breakers:
 1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
 2. Provide thermal magnetic circuit breakers unless otherwise indicated.
 3. Provide electronic trip circuit breakers where indicated.
- E. Enclosures:
 1. Provide surface-mounted enclosures unless otherwise indicated.
 2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 - 2. Phase and Neutral Bus Material: Aluminum.
 - 3. Ground Bus Material: Aluminum.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
 - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
 - 2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 - 3. Provide clear plastic circuit directory holder mounted on inside of door.
- F. Provide column-width panelboards with accessory column-width cable trough and pullbox where indicated.

2.05 LOAD CENTERS

- A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.
- B. Bussing:
 - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 - 2. Bus Material: Aluminum or copper.
- C. Circuit Breakers: Thermal magnetic plug-in type.
- D. Enclosures:
 - 1. Provide flush-mounted enclosures unless otherwise indicated.
 - 2. Fronts: Provide cover without door to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.
 - 3. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

2.06 OVERCURRENT PROTECTIVE DEVICES

- A. Fusible Switches:
 - 1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA KS 1, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
 - 2. Fuse Clips: As required to accept indicated fuses.

- a. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- 3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- 4. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Provide compression lugs where indicated.
 - c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
- B. Molded Case Circuit Breakers:
 - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 - 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
 - 3. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Provide compression lugs where indicated.
 - c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
 - b. Provide interchangeable trip units where indicated.
 - 5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
 - a. Provide the following field-adjustable trip response settings:
 - 1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
 - 2) Long time delay.
 - 3) Short time pickup and delay.
 - 4) Instantaneous pickup.
 - 5) Ground fault pickup and delay where ground fault protection is indicated.
 - b. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault

- sensing systems to control short time delay and ground fault delay functions for system coordination purposes.
- c. Provide communication capability where indicated: Compatible with system indicated.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
 7. Provide the following circuit breaker types where indicated:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
 - c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
 - d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
 - e. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
 8. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
 9. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.
 10. Do not use tandem circuit breakers.
 11. Do not use handle ties in lieu of multi-pole circuit breakers.
 12. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
 13. Provide the following features and accessories where indicated or where required to complete installation:
 - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
 - c. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
 - d. Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
 - e. Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.07 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 26 05 29.
- F. Provide required seismic controls in accordance with Section 26 05 48.
- G. Install panelboards plumb.
- H. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- I. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- J. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
- K. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- L. Provide grounding and bonding in accordance with Section 26 05 26.
 - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
 - 2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.
- M. Install all field-installed branch devices, components, and accessories.
- N. Provide fuses complying with Section 26 28 13 for fusible switches as indicated.
- O. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- P. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- Q. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.

- R. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- S. Provide filler plates to cover unused spaces in panelboards.
- T. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
 - 1. Emergency and night lighting circuits.
 - 2. Fire detection and alarm circuits.
 - 3. Communications equipment circuits.
 - 4. Intrusion detection and access control system circuits.
 - 5. Video surveillance system circuits.
- U. Identify panelboards in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 20 amperes. Tests listed as optional are not required.
- E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
 - 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.
- F. Test GFCI circuit breakers to verify proper operation.
- G. Test AFCI circuit breakers to verify proper operation.
- H. Test shunt trips to verify proper operation.
- I. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.
- J. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 27 13
ELECTRICITY METERING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Equipment for District electricity metering:
 - 1. Single circuit electricity meters.
 - 2. Multi-circuit electricity meters.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 33.16 - Boxes for Electrical Systems: Cabinets and enclosures for metering system components.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Requirements for Utility Company electricity metering.
- F. Section 26 23 00 - Low-Voltage Switchgear: For interface with meters specified in this section.
- G. Section 26 24 13 - Switchboards: For interface with meters specified in this section.
- H. Section 26 24 16 - Panelboards: For interface with meters specified in this section.
- I. Section 26 24 19 - Motor-Control Centers: For interface with meters specified in this section.
- J. Section 26 28 13 - Fuses.
 - 1. Includes requirements for spare fuses and spare fuse cabinets.

1.03 REFERENCE STANDARDS

- A. ANSI C12.1 - Electric Meters - Code for Electricity Metering; 2016.
- B. IEC 62053-21 - Electricity Metering Equipment (A.C.) - Particular Requirements - Part 21: Static Meters for Active Energy (Classes 1 and 2); 2016.
- C. IEC 62053-23 - Electricity Metering Equipment (A.C.) - Particular Requirements - Part 23: Static Meters for Reactive Energy (Classes 2 and 3); 2016.
- D. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate work to provide equipment suitable for interface with electricity metering systems to be provided.
 - 2. Coordinate the work with other installers to provide communication lines required for electricity metering system interface.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Preinstallation Meeting: Conduct meeting with facility representative and other related equipment manufacturers to discuss electricity metering system interface requirements.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for electricity metering systems and associated components and accessories. Include ratings, configurations, standard wiring diagrams, dimensions, service condition requirements, and installed features.
- C. Shop Drawings: Include system interconnection schematic diagrams showing all factory and field connections. Include requirements for interface with other systems.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Field Quality Control Test Reports.
- F. Project Record Documents: Record actual installed locations of meters and final equipment settings.
- G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- H. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Enclosure Keys: Two of each different key.
 - 3. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Electricity Meters:
 - 1. Same as manufacturer of electrical distribution equipment used for this project.
 - a. ABB/GE: www.geindustrial.com/#sle.
 - b. Eaton Corporation: www.eaton.com.
 - c. Schneider Electric; Square D Products: www.schneider-electric.us.
 - d. Siemens Industry, Inc: www.usa.siemens.com.
- B. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.
- C. Source Limitations: Furnish electricity meters produced by a single manufacturer and obtained from a single supplier.

2.02 EQUIPMENT FOR OWNER ELECTRICITY METERING

- A. Provide microprocessor-based digital electricity metering systems including all instrument transformers, wiring, and connections necessary for measurements specified.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide electricity metering systems and associated components compatible with the equipment and associated circuits to be metered.
- D. Service Conditions: Provide electricity meters suitable for operation under the service conditions at the installed location.
- E. Enclosures:
 - 1. Where not furnished by manufacturer, provide required cabinets and enclosures in accordance with Section 26 05 33.16.
 - 2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R or Type 4.
 - 3. Provide lockable door(s) for outdoor locations.
 - 4. Finish: Manufacturer's standard unless otherwise indicated.
- F. Instrument Transformers:

1. Comply with IEEE C57.13, where applicable.
 2. Select suitable ratio, burden, and accuracy as required for connected devices.
 3. Current Transformers: Compatible with connected meters; replace meters damaged by connection of incompatible current transformers. Provide shorting terminal blocks for connection of secondaries where applicable.
 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.
- G. Interface with Other Work:
1. Interface with electrical power monitoring system.

2.03 SINGLE CIRCUIT ELECTRICITY METERS

- A. Single Circuit Electricity Meter:
1. Accuracy:
 - a. Real/Active Power/Energy: Revenue grade; plus/minus 1.0 percent; complying with ANSI C12.1 and/or IEC 62053-21, Class 1.
 - b. Reactive Power/Energy: Plus/minus 2.0 percent, complying with IEC 62053-23, Class 2.
 2. Measured Parameters:
 - a. Voltage (Volts AC); line-to-line and line-to-neutral; per phase.
 - b. Current (Amps); per phase.
 - c. Frequency (Hz).
 - d. Real/active power (kW); per phase and total of all phases.
 - e. Reactive power (kVAR); per phase and total of all phases.
 - f. Apparent power (kVA); per phase and total of all phases.
 - g. Power factor; per phase and total of all phases.
 - h. Real/active energy (kWh).
 - i. Reactive energy (kVARh).
 - j. Apparent energy (kVAh).
 - k. Power demand; real/active, reactive, and apparent; present and maximum.
 - l. Current demand.
 - m. Bi-directional energy measurements; real/active and reactive; imported and exported.
 3. Data logging.
 - a. Storage Capacity: 60 days of readings at 15 minute intervals.
 4. Alarm capability, with configurable setpoints.
 - a. Current over range.
 - b. Voltage over range.
 5. Inputs:
 - a. Pulse Contact Accumulator Input(s): Two; user-configurable to support measurement of other related energy values (gas, water, steam, etc.) using pulse-output transducers.
 6. Outputs:

- a. Pulse Output(s): One.
- 7. Communications: Compatible with connected systems. Provide all accessories necessary for proper interface.
 - a. Serial Communications: RS-485; support for Modbus RTU protocol.
 - b. Ethernet Communications: Support for Modbus TCP protocol.

2.04 MULTI-CIRCUIT ELECTRICITY METERS

- A. Multi-Circuit Electricity Meter:
 - 1. Metering Capacity: As indicated or as required for circuits to be metered.
 - 2. Accuracy:
 - a. Real/Active Power/Energy: Revenue grade; plus/minus 1.0 percent; complying with ANSI C12.1 and/or IEC 62053-21, Class 1.
 - b. Reactive Power/Energy: Plus/minus 2.0 percent, complying with IEC 62053-23, Class 2.
 - 3. Measured Parameters:
 - a. Voltage (Volts AC); line-to-line and line-to-neutral; per phase.
 - b. Current (Amps); per phase.
 - c. Frequency (Hz).
 - d. Real/active power (kW); per phase and total of all phases.
 - e. Reactive power (kVAR); per phase and total of all phases.
 - f. Apparent power (kVA); per phase and total of all phases.
 - g. Power factor; per phase and total of all phases.
 - h. Real/active energy (kWh).
 - i. Reactive energy (kVARh).
 - j. Apparent energy (kVAh).
 - k. Power demand; real/active; present and maximum.
 - l. Current demand.
 - 4. Data logging.
 - a. Storage Capacity: 60 days of readings at 15 minute intervals.
 - 5. Alarm capability, with configurable setpoints.
 - a. Current over and under range.
 - b. Voltage over and under range.
 - 6. Inputs:
 - a. Pulse Contact Accumulator Input(s): Two; user-configurable to support measurement of other related energy values (gas, water, steam, etc.) using pulse-output transducers.
 - 7. Outputs:
 - a. Pulse Output(s): One.
 - 8. Communications: Compatible with connected systems. Provide all accessories necessary for proper interface.
 - a. Serial Communications: RS-485; support for Modbus RTU protocol.

- b. Ethernet Communications: Support for Modbus TCP protocol.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of metering systems and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive meters.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Provide required support and attachment components in accordance with Section 26 05 29.
- D. Provide grounding and bonding in accordance with Section 26 05 26.
- E. Provide fuses complying with Section 26 28 13 as required.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Meters: Perform inspections and tests listed in NETA ATS, Section 7.11.2.
- D. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.
- E. Correct deficiencies and replace damaged or defective metering system components.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 ADJUSTING

- A. Program system parameters according to requirements of District.

3.05 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Training: Train District's personnel on operation, adjustment, and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.

3. Instructor: Manufacturer's authorized representative.
4. Location: At project site.

3.07 PROTECTION

- A. Protect installed system components from subsequent construction operations.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Fan speed controllers.
- D. Receptacles.
- E. Wall plates.
- F. Floor box service fittings.
- G. Poke-through assemblies.
- H. Access floor boxes.

1.02 RELATED REQUIREMENTS

- A. Section 09 69 00 - Access Flooring.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Section 26 05 33.16 - Boxes for Electrical Systems.
- E. Section 26 05 39 - Underfloor Raceways for Electrical Systems.
- F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 26 09 23 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.
- H. Section 26 27 23 - Indoor Service Poles.
- I. Section 26 29 13 - Enclosed Controllers: Manual motor starters and horsepower rated motor-starting switches without overload protection.
- J. Section 27 10 00 - Structured Cabling: Voice and data jacks.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2017h.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); 2017g.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- L. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.
- M. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.
- N. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.
- O. UL 1917 - Solid-State Fan Speed Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
 5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
 6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:
 1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
 1. Wall Dimmers: Include derating information for ganged multiple devices.
 2. Surge Protection Receptacles: Include surge current rating, voltage protection rating (VPR) for each protection mode, and diagnostics information.
- C. Samples: One for each type and color of device and wall plate specified.
- D. Certificates for Surge Protection Receptacles: Manufacturer's documentation of listing for compliance with UL 1449.
- E. Field Quality Control Test Reports.

- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Operation and Maintenance Data:
 - 1. Wall Dimmers: Include information on operation and setting of presets.
 - 2. GFCI Receptacles: Include information on status indicators.
 - 3. Surge Protection Receptacles: Include information on status indicators.
- H. Project Record Documents: Record actual installed locations of wiring devices.
- I. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Screwdrivers for Tamper-Resistant Screws: Two for each type of screw.
 - 3. Extra Keys for Locking Switches: Two of each type.
 - 4. Extra Surge Protection Receptacles: Two of each type.
 - 5. Extra Wall Plates: One of each style, size, and finish.
 - 6. Extra Flush Floor Service Fittings: Two of each type.
 - 7. Extra Poke-Through Core Hole Closure Plugs: Two for each core size.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Products: Listed, classified, and labeled as suitable for the purpose intended.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide tamper resistant receptacles for receptacles installed in dwelling units.
- E. Provide GFCI protection for receptacles installed within 6 feet of sinks.

- F. Provide GFCI protection for receptacles installed in kitchens.
- G. Provide GFCI protection for receptacles serving electric drinking fountains.
- H. Provide isolated ground receptacles for receptacles serving computers.
- I. Unless noted otherwise, do not use combination switch/receptacle devices.
- J. For flush floor service fittings, use tile rings for installations in tile floors.
- K. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.02 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.
- C. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.
- D. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
- E. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.
- F. Isolated Ground Convenience Receptacles: Orange.
- G. Surge Protection Receptacles: Blue.
- H. Wiring Devices Connected to Emergency Power: Red with red nylon wall plate.
- I. Clock Hanger Receptacles: Brown with stainless steel wall plate.
- J. Above-Floor Service Fittings: Gray wiring devices with satin aluminum housing.
- K. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.
- L. Flush Poke-Through Service Fittings: Gray wiring devices with aluminum cover and aluminum flange.
- M. Access Floor Boxes: Gray wiring devices with gray steel cover with insert to match floor covering.

2.03 WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell.com/#sle.
 - 2. Leviton Manufacturing Company, Inc: www.leviton.com.
 - 3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- D. Lighted Wall Switches: Industrial specification grade, 20 A, 120/277 V with illuminated standard toggle type switch actuator and maintained contacts; illuminated with load off;

single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

- E. Pilot Light Wall Switches: Industrial specification grade, 20 A, 120/277 V with red illuminated standard toggle type switch actuator and maintained contacts; illuminated with load on; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- F. Locking Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed switch actuator and maintained contacts; switches keyed alike; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- G. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.
- H. Locking Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed three position switch actuator and momentary contacts; switches keyed alike; single pole double throw, off with switch actuator in center position.

2.04 WALL DIMMERS

- A. Manufacturers:
 - 1. Leviton Manufacturing Company, Inc: www.leviton.com.
 - 2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com/sle.
 - 3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
- C. Control: Slide control type with separate on/off switch.
- D. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:
 - 1. Incandescent: 1000 W.
 - 2. Magnetic Low-Voltage: 1000 VA.
 - 3. Electronic Low-Voltage: 400 VA.
 - 4. Fluorescent: 1000 VA.
- E. Provide locator light, illuminated with load off.
- F. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

2.05 FAN SPEED CONTROLLERS

- A. Manufacturers:
 - 1. Leviton Manufacturing Company, Inc: www.leviton.com.
 - 2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com/#sle.

3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: 120 V AC, solid-state, full-range variable speed, slide control type with separate on/off switch, with integral radio frequency interference filtering, fan noise elimination circuitry, power failure preset memory, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1917.
1. Current Rating: 1.5 A unless otherwise indicated or required to control the load indicated on the drawings.

2.06 RECEPTACLES

- A. Manufacturers:
1. Hubbell Incorporated: www.hubbell.com/#sle.
 2. Leviton Manufacturing Company, Inc: www.leviton.com.
 3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com.
 4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
 5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 2. Automatically Controlled Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.
 3. Isolated Ground Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, with ground contacts isolated from mounting strap; isolated ground triangle mark on device face; single or duplex as indicated on the drawings.
 4. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
 5. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
 6. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type

and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

7. Illuminated Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; illuminated face or indicator light to indicate power is being supplied to receptacle; single or duplex as indicated on the drawings.

D. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

E. USB Charging Devices:

1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
 - a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
 - b. Charging Capacity - Four-Port Devices: 4.2 A, minimum.
2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.
3. USB Charging Noncombination Devices: Four-port (Type A); rectangular decorator style.

F. Surge Protection Receptacles:

1. Surge Protection Receptacles - General Requirements: Listed and labeled as complying with UL 1449, Type 2 or 3.
 - a. Energy Dissipation: Not less than 240 J per mode.
 - b. Protected Modes: L-N, L-G, N-G.
 - c. UL 1449 Voltage Protection Rating (VPR): Not more than 700 V for L-N, L-G modes and 1200 V for N-G mode.
 - d. Diagnostics:
 - 1) Visual Notification: Provide indicator light to report functional status of surge protection.
 - 2) Audible Notification: Provide switchable audible alarm to report that surge protection is not functional.
2. Standard Surge Protection Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Isolated Ground Surge Protection Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, with ground contacts isolated from mounting strap.
- G. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.
 1. Standard Locking Convenience Receptacles: Single, 20A, 125V, NEMA L5-20R.
- H. Clock Hanger Receptacles: Single, 15A, 125V, NEMA 5-15R.

2.07 WALL PLATES

- A. Manufacturers:
 1. Hubbell Incorporated: www.hubbell-wiring.com.
 2. Leviton Manufacturing Company, Inc: www.leviton.com.
 3. Lutron Electronics Company, Inc: www.lutron.com/sle.
 4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
 5. Substitutions: See Section 01 60 00 - Product Requirements.
 6. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.
- B. Wall Plates: Comply with UL 514D.
 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 2. Size: Standard.
 3. Screws: Metal with slotted heads finished to match wall plate finish.
 4. Provide screwless wallplates with concealed mounting hardware where indicated.
- C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- E. Premarked Wall Plates: Factory labeled as indicated; hot stamped for nylon wall plates and engraved for metal wall plates.
- F. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- G. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.08 FLOOR BOX SERVICE FITTINGS

- A. Manufacturers:
 1. Hubbell Incorporated: www.hubbell.com/#sle.
 2. Thomas & Betts Corporation: www.tnb.com.
 3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us

4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Service fittings compatible with floor boxes provided under Section 26 05 33.16 with components, adapters, and trims required for complete installation.
- C. Above-Floor Service Fittings:
 1. Single Service Pedestal Convenience Receptacles:
 - a. Configuration: One standard convenience duplex receptacle.
 2. Single Service Pedestal Communications Outlets:
 - a. Configuration: One 1 inch bushed opening.
 3. Single Service Pedestal Furniture Feed:
 - a. Configuration: One 3/4 inch knockout.
 4. Dual Service Pedestal Combination Outlets:
 - a. Configuration:
 - 1) Power: One standard convenience duplex receptacle.
 - 2) Communications: One 1 inch bushed opening.
 - b. Provide barrier to separate line and low voltage compartments.
- D. Flush Floor Service Fittings:
 1. Single Service Flush Convenience Receptacles:
 - a. Cover: Rectangular.
 - b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
 2. Single Service Flush Communications Outlets:
 - a. Cover: Rectangular.
 3. Single Service Flush Furniture Feed:
 - a. Cover: Rectangular.
 - b. Configuration: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
 4. Dual Service Flush Combination Outlets:
 - a. Cover: Rectangular.
 - b. Configuration:
 - 1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
 5. Dual Service Flush Furniture Feed:
 - a. Cover: Rectangular.
 - b. Configuration:
 - 1) Power: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
 - 2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).
 6. Accessories:
 - a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.

2.09 POKE-THROUGH ASSEMBLIES

- A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/#sle.
 2. Thomas & Betts Corporation: www.tnb.com/#sle.
 3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.
- B. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.
- C. Above-Floor Service Fittings:
1. Single Service Pedestal Convenience Receptacles:
 - a. Configuration: One standard convenience duplex receptacle.
 2. Single Service Pedestal Communications Outlets:
 - a. Configuration: One 1 inch bushed opening.
 - b. Voice and Data Jacks: As specified in Section 27 10 00.
 3. Single Service Pedestal Furniture Feed:
 - a. Configuration: One 3/4 inch knockout.
 4. Dual Service Pedestal Combination Outlets:
 - a. Configuration:
 - 1) Power: One standard convenience duplex receptacle.
 - 2) Communications: One 1 inch bushed opening.
 - 3) Voice and Data Jacks: As specified in Section 27 10 00.
 - b. Provide barrier to separate line and low voltage compartments.
- D. Flush Floor Service Fittings:
1. Single Service Flush Convenience Receptacles:
 - a. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
 2. Single Service Flush Communications Outlets:
 - a. Configuration: _____.
 - b. Voice and Data Jacks: As specified in Section 27 10 00.
 3. Dual Service Flush Combination Outlets:
 - a. Cover: Hinged door(s).
 - b. Configuration:
 - 1) Power: One standard convenience duplex receptacle(s).
 - 2) Communications: _____.
 - 3) Voice and Data Jacks: As specified in Section 27 10 00.
 4. Accessories:
 - a. Closure Plugs: Size and fire rating as required to seal unused core hole and maintain fire rating of floor.

2.10 ACCESS FLOOR BOXES

- A. Manufacturers - Access Floor Boxes:
1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.
 2. Thomas & Betts Corporation: www.tnb.com/#sle.

3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.
- B. Manufacturers - Access Floor Boxes with Pre-wired Connectors for Manufactured Wiring Systems:
 1. AFC Cable Systems Inc: www.afcweb.com/#sle.
 2. RELOC Wiring Solutions, a brand of Acuity Brands, Inc: www.relocwiring.com/#sle.
 3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.
 4. Source Limitations: Provide access floor boxes with pre-wired connectors produced by the same manufacturer as the manufactured wiring system used for this project.
- C. Description: Metallic multi-service box suitable for mounting in access floor system specified in Section 09 69 00.
- D. Access floor boxes with pre-wired connectors for manufactured wiring systems are permitted only where manufactured wiring systems are permitted as specified in Section 26 05 19.
- E. Configuration:
 1. Power: Two standard convenience duplex receptacle(s).
 2. Voice and Data Jacks: As specified in Section 27 10 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.
- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Perform work in a neat and workmanlike manner in accordance with NECA 1, including mounting heights specified in that standard unless otherwise indicated.
- C. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
 1. Mounting Heights: Unless otherwise indicated, as follows:

- a. Wall Switches: 48 inches above finished floor to top of device.
 - b. Wall Dimmers: 48 inches above finished floor to top of device.
 - c. Fan Speed Controllers: 48 inches above finished floor to top of device.
 - d. Receptacles: Minimum 18 inches above finished floor or 6 inches above counter.
2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
 5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- D. Install wiring devices in accordance with manufacturer's instructions.
 - E. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
 - F. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
 - G. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
 - H. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - I. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.
 - J. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
 - K. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
 - L. Install wiring devices plumb and level with mounting yoke held rigidly in place.
 - M. Install wall switches with OFF position down.
 - N. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
 - O. Do not share neutral conductor on branch circuits utilizing wall dimmers.
 - P. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
 - Q. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

- R. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- S. Identify wiring devices in accordance with Section 26 05 53.
- T. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Inspect each surge protection receptacle to verify surge protection is active.
- G. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 28 16.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
 - 1. Includes requirements for the seismic qualification of equipment specified in this section.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- F. Section 26 25 13 - Low-Voltage Busways: Circuit breaker busway plug-in units.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- K. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted enclosed circuit breakers where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.
 1. Include characteristic trip curves for each type and rating of circuit breaker upon request.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 1. Include dimensioned plan and elevation views of enclosed circuit breakers and adjacent equipment with all required clearances indicated.
 2. Include wiring diagrams showing all factory and field connections.
 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 4. Include documentation of listed series ratings upon request.
 5. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.
- E. Field Quality Control Test Reports.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- G. Project Record Documents: Record actual installed locations of enclosed circuit breakers.
- H. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature between 23 degrees F and 104 degrees F during and after installation of enclosed circuit breakers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.geindustrial.com/#sle.
- B. Eaton Corporation: www.eaton.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. Siemens Industry, Inc: www.usa.siemens.com.
- E. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Source Limitations: Furnish enclosed circuit breakers and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED CIRCUIT BREAKERS

- A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Seismic Qualification: Provide enclosed circuit breakers and associated components suitable for application under the seismic design criteria specified in Section 26 05 48 where required. Include certification of compliance with submittals.
- D. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature: Between 23 degrees F and 104 degrees F.
- E. Short Circuit Current Rating:
 - 1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
 - 2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.

3. Label equipment utilizing series ratings as required by NFPA 70.
- F. Enclosed Circuit Breakers Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Provide thermal magnetic circuit breakers unless otherwise indicated.
- I. Provide electronic trip circuit breakers where indicated.
- J. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- K. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.
- L. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
 3. Provide surface-mounted enclosures unless otherwise indicated.
- M. Provide externally operable handle with means for locking in the OFF position.
- N. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
 1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
 2. Where accessory ground fault sensing and relaying equipment is used, equip companion circuit breakers with ground-fault shunt trips.
 - a. Use zero sequence ground fault detection method unless otherwise indicated.
 - b. Provide test panel and field-adjustable ground fault pick-up and delay settings.
 - c. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control ground fault delay functions for system coordination purposes.
- O. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

2.03 MOLDED CASE CIRCUIT BREAKERS

- A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
- B. Interrupting Capacity:
 1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

- a. 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - b. 14,000 rms symmetrical amperes at 480 VAC.
- 2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
- 3. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
- C. Conductor Terminations:
 - 1. Provide mechanical lugs unless otherwise indicated.
 - 2. Provide compression lugs where indicated.
 - 3. Lug Material: Copper, suitable for terminating copper conductors only.
- D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - 1. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
 - 2. Provide interchangeable trip units where indicated.
- E. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
 - 1. Provide the following field-adjustable trip response settings:
 - a. Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
 - b. Long time delay.
 - c. Short time pickup and delay.
 - d. Instantaneous pickup.
 - e. Ground fault pickup and delay where ground fault protection is indicated.
 - 2. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.
 - 3. Provide communication capability where indicated: Compatible with system indicated.
- F. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
- G. Provide the following circuit breaker types where indicated:
 - 1. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - 2. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
 - 3. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
- H. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.

- I. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.
- J. Provide the following features and accessories where indicated or where required to complete installation:
 - 1. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - 2. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
 - 3. Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
 - 4. Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install enclosed circuit breakers plumb.
- F. Install flush-mounted enclosed circuit breakers so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- G. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- H. Provide grounding and bonding in accordance with Section 26 05 26.
- I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- J. Set field-adjustable circuit breaker tripping function settings as indicated.
- K. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- L. Identify enclosed circuit breakers in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers used for service entrance and for circuit breakers larger than 20 amperes. Tests listed as optional are not required.
- D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
 - 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.
- E. Test GFCI circuit breakers to verify proper operation.
- F. Test shunt trips to verify proper operation.
- G. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 28 16.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 05 73 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.
- E. Section 26 25 13 - Low-Voltage Busways: Fusible switch busway plug-in units.
- F. Section 26 28 13 - Fuses.
- G. Section 26 29 13 - Enclosed Controllers: Manual motor controllers.
- H. Section 26 36 00 - Transfer Switches: Automatic and non-automatic switches listed for use as transfer switch equipment.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
 2. Include wiring diagrams showing all factory and field connections.
- D. Field Quality Control Test Reports.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- F. Project Record Documents: Record actual locations of enclosed switches.
- G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- H. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.geindustrial.com/#sle.
- B. Eaton Corporation: www.eaton.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. Siemens Industry, Inc: www.usa.siemens.com.
- E. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
 - 2. Minimum Ratings:
 - a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
 - b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
 - c. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.

- G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- H. Provide with switch blade contact position that is visible when the cover is open.
- I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
 - 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- J. Conductor Terminations: Suitable for use with the conductors to be installed.
- K. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- M. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: As indicated on the drawings.
 - 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- O. Heavy Duty Switches:
 - 1. Comply with NEMA KS 1.
 - 2. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Lug Material: Copper, suitable for terminating copper conductors only.
 - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
 - a. Provide means for locking handle in the ON position where indicated.
- P. Provide the following features and accessories where indicated or where required to complete installation:
 - 1. Hubs: As required for environment type; sized to accept conduits to be installed.
 - 2. Integral fuse pullers.
 - 3. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.
 - 4. Viewing Window: Positioned over switch blades for visual confirmation of contact position with door closed.
 - 5. Interlocked Receptacle: Integral pre-wired three phase, three wire, grounded type receptacle interlocked with switch mechanism to prevent insertion or removal of plug with switch in the ON position and to prevent switch from being placed in the ON position without matching plug inserted. Provide receptacle configuration as required to accept plug as indicated on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 05 26.
- H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- J. Identify enclosed switches in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- B. Section 26 05 33.16 - Boxes for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 09 23 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, time switches, and daylighting controls.
- E. Section 26 27 26 - Wiring Devices: Manual wall switches and wall dimmers.
- F. Section 26 56 00 - Exterior Lighting.

1.03 REFERENCE STANDARDS

- A. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).
- B. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.
- C. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).
- D. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.
- E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- F. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2016.
- G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- K. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
 - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
 - 4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - b. Include IES LM-79 test report upon request.
 - 2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
 - 3. Ballasts: Include wiring diagrams and list of compatible lamp configurations.
 - 4. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
- D. Samples:
 - 1. Provide one sample(s) of each specified luminaire where indicated.
 - 2. Provide one sample(s) of each custom luminaire.
 - 3. Provide one sample(s) of each luminaire proposed for substitution upon request.
 - 4. Provide one sample(s) of each product finish illustrating color and texture upon request.

- E. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.
- F. Field quality control reports.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- I. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
 - 3. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
 - 4. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.
- J. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide three year manufacturer warranty for LED luminaires, including drivers.
- C. Provide five year pro-rata warranty for batteries for emergency lighting units.

- D. Provide ten year pro-rata warranty for batteries for self-powered exit signs.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.
- B. Substitutions: See Section 01 60 00 - Product Requirements, except where individual luminaire types are designated with substitutions not permitted.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
 - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
- H. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 EMERGENCY LIGHTING UNITS

- A. Manufacturers:
 - 1. Acuity Brands, Inc: www.acuitybrands.com.
 - 2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com.
 - 3. Hubbell Lighting, Inc: www.hubbellighting.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- C. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected

lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

- D. Battery:
 - 1. Sealed maintenance-free lead calcium unless otherwise indicated.
 - 2. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- E. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- F. Provide low-voltage disconnect to prevent battery damage from deep discharge.
- G. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.
- H. Where indicated, provide units with integral time delay to maintain emergency illumination for 15 minutes after restoration of normal power source.
- I. Accessories:
 - 1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
 - 2. Provide compatible accessory high impact polycarbonate vandal shields where indicated.
 - 3. Provide compatible accessory wire guards where indicated.
 - 4. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.04 EXIT SIGNS

- A. Manufacturers - Powered and Self-Luminous Signs:
 - 1. Acuity Brands, Inc: www.acuitybrands.com.
 - 2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com.
 - 3. Hubbell Lighting, Inc: www.hubbellighting.com.
 - 4. Philips Lighting North America Corporation; www.lightingproducts.philips.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Manufacturers - Photoluminescent Signs:
 - 1. Ecoglo, Inc: www.us.ecoglo.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
 - 1. Number of Faces: Single or double as indicated or as required for the installed location.
 - 2. Directional Arrows: As indicated or as required for the installed location.
- D. Self-Powered Exit Signs:
 - 1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches

connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

2. Battery: Sealed maintenance-free nickel cadmium unless otherwise indicated.
 3. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
 4. Provide low-voltage disconnect to prevent battery damage from deep discharge.
 5. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.
- E. Self-Luminous Exit Signs: Internally illuminated by tritium gas sealed inside phosphor lined gas tubes, requiring no electrical power to operate, with a service life of 20 years unless otherwise indicated.
- F. Photoluminescent Exit Signs: Powder-coated sheet aluminum with photoluminescent pigmented material.
- G. Accessories:
1. Provide compatible accessory high impact polycarbonate vandal shields where indicated.
 2. Provide compatible accessory wire guards where indicated.

2.05 BALLASTS AND DRIVERS

- A. Manufacturers:
1. Alloy LED; www.alloyled.com/#sle.
 2. General Electric Company/GE Lighting: www.gelighting.com.
 3. Lutron Electronics Company, Inc; www.lutron.com/#sle.
 4. Osram Sylvania: www.sylvania.com.
 5. Philips Lighting North America Corporation; www.usa.lighting.philips.com/#sle.
 6. Substitutions: See Section 01 60 00 - Product Requirements.
 7. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
 8. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.
- B. Ballasts/Drivers - General Requirements:
1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
 3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.
- C. Dimmable LED Drivers:
1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.
 - a. Wall Dimmers: See Section 26 27 26.
 - b. Daylighting Controls: See Section 26 09 23.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Suspended Ceiling Mounted Luminaires:
 1. Do not use ceiling tiles to bear weight of luminaires.
 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
 4. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 5. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
 6. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

- G. Recessed Luminaires:
 - 1. Install trims tight to mounting surface with no visible light leakage.
 - 2. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- H. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- I. Install accessories furnished with each luminaire.
- J. Bond products and metal accessories to branch circuit equipment grounding conductor.
- K. Emergency Lighting Units:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
 - 2. Install lock-on device on branch circuit breaker serving units.
- L. Exit Signs:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
 - 2. Install lock-on device on branch circuit breaker serving units.
- M. Remote Ballasts: Install in accessible location as indicated or as required to complete installation, using conductors per manufacturer's recommendations not exceeding manufacturer's recommended maximum conductor length to luminaire.
- N. Identify luminaires connected to emergency power system in accordance with Section 26 05 53.
- O. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
- C. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior luminaires.
- B. Ballasts.
- C. Lamps.
- D. Luminaire accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 33.16 - Boxes for Electrical Systems.
- D. Section 26 09 19 - Enclosed Contactors: Lighting contactors.
- E. Section 26 09 23 - Lighting Control Devices: Automatic controls for lighting including outdoor motion sensors, time switches, and outdoor photo controls.
- F. Section 26 27 26 - Wiring Devices: Receptacles for installation in poles.
- G. Section 26 51 00 - Interior Lighting.

1.03 REFERENCE STANDARDS

- A. ANSI O5.1 - American National Standard for Wood Poles -- Specifications and Dimensions; 2017.
- B. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).
- C. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.
- D. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.
- G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2016.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
- J. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- K. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
 - 2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
 - 3. Provide structural calculations for each pole proposed for substitution.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - b. Include IES LM-79 test report upon request.
 - 2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
 - 3. Lamps: Include rated life and initial and mean lumen output.
 - 4. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.
- D. Samples:
 - 1. Provide one sample(s) of each specified luminaire where indicated.
 - 2. Provide one sample(s) of each luminaire proposed for substitution upon request.
 - 3. Provide one sample of each product finish illustrating color and texture upon request.
- E. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.
- F. Field Quality Control Reports.
 - 1. Include test report indicating measured illumination levels.

- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- H. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- I. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
- J. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
- C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide three year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.
- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.

- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
- H. Hazardous (Classified) Location Luminaires: Listed and labeled as complying with UL 844 for the classification of the installed location.
- I. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- J. Exposed Hardware: Stainless steel.

2.03 BALLASTS AND DRIVERS

- A. Ballasts/Drivers - General Requirements:
 - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
 - 3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.
- B. Dimmable LED Drivers:
 - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
 - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.04 LAMPS

- A. Lamps - General Requirements:
 - 1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
 - 2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
 - 3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
 - 4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires in accordance with NECA/IESNA 501.
- E. Provide required support and attachment in accordance with Section 26 05 29.
- F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- G. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- H. Install accessories furnished with each luminaire.
- I. Bond products and metal accessories to branch circuit equipment grounding conductor.
- J. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.
- E. Measure illumination levels at night with calibrated meters to verify compliance with performance requirements. Record test results in written report to be included with submittals.

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

3.06 CLEANING

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
- C. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 27 10 00
STRUCTURED CABLING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Communications system design requirements.
- B. Communications pathways.
- C. Copper cable and terminations.
- D. Fiber optic cable and interconnecting devices.
- E. Communications equipment room fittings.
- F. Communications outlets.
- G. Communications grounding and bonding.
- H. Communications identification.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
 - 1. Includes intersystem bonding termination.
 - 2. Includes bonding jumpers for bonding of communications systems and electrical system grounding.
- B. Section 26 05 33.13 - Conduit for Electrical Systems.
- C. Section 26 05 33.16 - Boxes for Electrical Systems.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products.
- E. Section 26 27 26 - Wiring Devices.
- F. Section 33 71 19 - Electrical Underground Ducts, Ductbanks, and Manholes.

1.03 REFERENCE STANDARDS

- A. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; Revision E, 2005.
- B. ICEA S-83-596 - Indoor Optical Fiber Cables; 2016.
- C. ICEA S-90-661 - Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cables (With or Without An Overall Shield) For Use in General Purpose and LAN Communications Wiring Systems Technical Requirements; 2012.
- D. NECA/BICSI 568 - Standard for Installing Commercial Building Telecommunications Cabling; 2006.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 1988a (Reaffirmed 2012).
- G. TIA-492AAAC - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009b.

- H. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant; 2015a.
- I. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; 2015c.
- J. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2018.
- K. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2009c, with Addendum (2016).
- L. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2016d.
- M. TIA-569 - Telecommunications Pathways and Spaces; 2015d, with Addendum (2016).
- N. TIA-598 - Optical Fiber Cable Color Coding; 2014d.
- O. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2017c.
- P. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2015c, with Addendum (2017).
- Q. UL 444 - Communications Cables; Current Edition, Including All Revisions.
- R. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
- S. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.
- T. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
 - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
 - 3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Arrange for Communications Service Provider to provide service.
- C. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Communications Service Provider representative.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure

layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

- D. Evidence of qualifications for installer.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
- F. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.
- G. Field Test Reports.
- H. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
 - 1. Record actual locations of outlet boxes and distribution frames.
 - 2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
 - 3. Identify distribution frames and equipment rooms by room number on drawings.
- I. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.06 QUALITY ASSURANCE

- A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.
- C. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
 - 1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
 - 2. Supervisors and installers factory certified by manufacturers of products to be installed.
 - 3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.
- D. Products: Listed, classified, and labeled as suitable for the purpose intended.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep stored products clean and dry.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

- A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
 - 1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
 - 2. Comply with Communications Service Provider requirements.
 - 3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
 - 4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
 - 5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
- B. System Description:
 - 1. Building Entrance Cable: By others.
 - 2. Backbones - Within Building: Fiber optic, _____-fiber.
 - 3. Offices and Work Areas: Provide one voice outlet and one data outlet in each work area.
 - 4. Provide additional outlets where indicated on drawings.
- C. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
 - 1. For the entire campus there is one main distribution frame and for each building there is a building distribution frame (BDF) that functions as the main distribution frame (MDF) for that building.
 - 2. Locate main distribution frame as indicated on the drawings.
 - 3. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.
- D. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
 - 1. Locate intermediate distribution frames as indicated on the drawings.
- E. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.
- F. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.02 PATHWAYS

- A. Conduit: As specified in Section 26 05 33.13; provide pull cords in all conduit.
- B. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

2.03 COPPER CABLE AND TERMINATIONS

- A. Provide cables with lead content less than 300 parts per million.
- B. Copper Backbone Cable:
 - 1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2, ICEA S-90-661, and listed and labeled as complying with UL 444; arranged in 25-pair binder groups.
 - 2. Cable Type: TIA-568.2 Category 3 UTP (unshielded twisted pair); 24 AWG.
 - 3. Cable Capacity: Quantity of pairs as indicated on drawings.
 - 4. Cable Applications:
 - a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
 - b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.
- C. Copper Horizontal Cable:
 - 1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
 - 2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
 - 3. Cable Capacity: 4-pair.
 - 4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
 - 5. Cable Jacket Color - Voice and Data Cable: Blue.
 - 6. Product(s):
- D. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.
- E. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
 - 1. Performance: 500 mating cycles.
 - 2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
 - 3. Product(s):
- F. Copper Patch Cords:
 - 1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
 - 2. Patch Cords for Patch Panels:
 - a. Quantity: One for each pair of patch panel ports.
 - b. Length: _____ feet.
 - 3. Patch Cords for Work Areas:
 - a. Quantity: One for each work area outlet port.
 - b. Length: _____ feet.
 - 4. Product(s):

2.04 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

- A. Provide cables with lead content less than 300 parts per million.
- B. Fiber Optic Backbone Cable:
 - 1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
 - 2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
 - 3. Cable Capacity: Quantity of fibers as indicated on drawings.
 - 4. Cable Applications:
 - a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
 - b. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.
 - 5. Cable Jacket Color:
 - a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.
 - b. Multimode Fiber (OM1/OM2): Orange.
 - c. Single-Mode Fiber (OS1/OS2): Yellow.
- C. Fiber Optic Horizontal Cable:
 - 1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
 - 2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
 - 3. Cable Capacity: 2-fiber.
 - 4. Cable Applications: Use listed NFPA 70 Type OFNP plenum cable unless otherwise indicated.
 - 5. Cable Jacket Color:
 - a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.
 - b. Multimode Fiber (OM1/OM2): Orange.
 - c. Single-Mode Fiber (OS1/OS2): Yellow.
- D. Fiber Optic Interconnecting Devices:
 - 1. Connector Type: Type LC.
 - 2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
 - 3. Maximum Attenuation/Insertion Loss: 0.3 dB.
- E. Fiber Optic Patch Cords:
 - 1. Description: Factory-fabricated 2-fiber cable assemblies with suitable connectors at each end.
 - 2. Patch Cords for Patch Panels:
 - a. Quantity: One for each pair of patch panel ports.
 - b. Length: As indicated on Drawings.
 - 3. Patch Cords for Work Areas:

- a. Quantity: One for each work area outlet port.
- b. Length: As indicated on Drawings.

2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:

1. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
2. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
 - a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
 - b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
 - c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
 - d. Provide incoming cable strain relief and routing guides on back of panel.

B. Fiber Optic Cross-Connection Equipment:

1. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum.
 - a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adapters per standard panel width.
 - b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
 - c. Provide incoming cable strain relief and routing guides on back of panel.
 - d. Provide rear cable management tray at least 8 inches deep with removable cover.
 - e. Provide dust covers for unused adapters.

C. Backboards: Interior grade plywood without voids, 3/4 inch thick; UL-labeled fire-retardant.

1. Size: As indicated on drawings.
2. Do not paint over UL label.

D. Equipment Frames, Racks and Cabinets:

1. Component Racks: EIA/ECA-310 standard 19 inch wide.
2. Wall Mounted Racks: Steel construction, hinged to allow access to back of installed components.
3. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
4. Freestanding Cabinets: Front and rear doors with locks; removable side panels with locks; vented top and rear door; adjustable leveling feet; cable access in roof and base; grounding bar.
5. Wall Mounted Cabinets: Front doors with locks, louvered side panels, top and bottom cable access, and ground lug.
 - a. Cover inside of cabinet back with plywood backboard as specified.

- b. Duplex AC power outlet inside cabinet.
- 6. Cabinets: Steel construction with corrosion resistant finish.
- 7. Locks: Keyed alike.

2.06 COMMUNICATIONS OUTLETS

- A. Outlet Boxes: Comply with Section 26 05 33.16.
 - 1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
 - 2. Minimum Size, Unless Otherwise Indicated:
 - a. Voice Only Outlets: 4 inch by 2 inch by 2-1/8 inch deep (100 by 50 by 54 mm) trade size.
 - b. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.
 - c. Fiber Optic Outlets: 4-11/16 inch square by 2-1/8 inch deep (119 by 54 mm) trade size.
- B. Wall Plates:
 - 1. Comply with system design standards and UL 514C.
 - 2. Accepts modular jacks/inserts.
 - 3. Capacity:
 - 4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified on the drawings.
 - 5. Product(s):

2.07 GROUNDING AND BONDING COMPONENTS

- A. Comply with TIA-607.
- B. Comply with Section 26 05 26.

2.08 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606.
- B. Comply with Section 26 05 53.

2.09 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), NECA/BICSI 568, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
- B. Comply with Communication Service Provider requirements.

- C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

3.02 INSTALLATION OF PATHWAYS

- A. Install pathways with the following minimum clearances:
 - 1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
 - 2. 12 inches from power conduits and cables and panelboards.
 - 3. 5 inches from fluorescent and high frequency lighting fixtures.
 - 4. 6 inches from flues, hot water pipes, and steam pipes.
- B. Conduit, in Addition to Requirements of Section 26 05 33.13:
 - 1. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between pull points.
 - 2. Conduit Bends: Inside radius not less than 10 times conduit internal diameter.
 - 3. Arrange conduit to provide no more than 100 feet between pull points.
 - 4. Do not use conduit bodies.
 - 5. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.
- C. Outlet Boxes:
 - 1. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of telecommunications outlets provided under this section.
 - a. Mounting Heights: Unless otherwise indicated, as follows:
 - 1) Telephone and Data Outlets: 18 inches above finished floor.
 - 2) Telephone Outlets for Side-Reach Wall-Mounted Telephones: 48 inches above finished floor to top of telephone.
 - 3) Telephone Outlets for Forward-Reach Wall-Mounted Telephones: 48 inches above finished floor to top of telephone.
 - b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 - c. Provide minimum of 24 inches horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
 - d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
 - e. Locate outlet boxes so that wall plate does not span different building finishes.
 - f. Locate outlet boxes so that wall plate does not cross masonry joints.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

- A. Cabling:
 - 1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
 - 2. Do not over-cinch or crush cables.
 - 3. Do not exceed manufacturer's recommended cable pull tension.

4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
- B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
 1. At Distribution Frames: 120 inches.
 2. At Outlets - Copper: 12 inches.
 3. At Outlets - Optical Fiber: 39 inches.
- C. Copper Cabling:
 1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
 2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
 3. Use T568B wiring configuration.
- D. Fiber Optic Cabling:
 1. Prepare for pulling by cutting outer jacket for 10 inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
 2. Support vertical cable at intervals as recommended by manufacturer.
- E. Wall-Mounted Racks and Enclosures:
 1. Install to plywood backboards only, unless otherwise indicated.
 2. Mount so height of topmost panel does not exceed 78 inches above floor.
- F. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.
- G. Identification:
 1. Use wire and cable markers to identify cables at each end.
 2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
 3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Comply with inspection and testing requirements of specified installation standards.
- C. Visual Inspection:
 1. Inspect cable jackets for certification markings.
 2. Inspect cable terminations for color coded labels of proper type.
 3. Inspect outlet plates and patch panels for complete labels.
 4. Inspect patch cords for complete labels.
- D. Testing - Copper Cabling and Associated Equipment:
 1. Test backbone cables after termination but before cross-connection.

2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
 3. Test operation of shorting bars in connection blocks.
 4. Category 3 Backbone: Perform attenuation test.
 5. Category 3 Links: Test each pair for short circuit continuity, short to ground, crosses, reversed polarity, operational and ring-back, and dial tone.
 6. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.
 7. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.
- E. Testing - Fiber Optic Cabling:
1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
 2. Multimode Backbone: Perform tests in accordance with TIA-526-14.
 3. Single Mode Backbone: Perform tests in accordance with TIA-526-7.
 4. Links: Perform optical fiber end-to-end attenuation tests and field reel tests.
- F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 28 46 00
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire alarm system design and installation, including all components, wiring, and conduit.
- B. Transmitters for communication with supervising station.
- C. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.
- D. Maintenance of fire alarm system under contract for specified warranty period.

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; current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Proposal Documents: Submit the following with cost/time proposal:
 - 1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
 - 3. Certification by Contractor that the system design will comply with Contract Documents.
 - 4. Proposed maintenance contract.
- C. Drawings must be prepared as indicated in Division 01.
 - 1. District will provide floor plan drawings for Contractor's use; verify all dimensions on District-provided drawings.
- D. Evidence of designer qualifications.
- E. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
 - 1. Copy (if any) of list of data required by authority having jurisdiction.
 - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.

3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
 4. System zone boundaries and interfaces to fire safety systems.
 5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
 6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
 7. List of all devices on each signaling line circuit, with spare capacity indicated.
 8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
 9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
 10. Detailed drawing of graphic annunciator(s).
 11. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
 12. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
 13. Certification by Contractor that the system design complies with Contract Documents.
 14. Do not show existing components to be removed.
- F. Evidence of installer qualifications.
- G. Evidence of maintenance contractor qualifications, if different from installer.
- H. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
 2. Submit documentation of satisfactory inspections and tests.
 3. Submit NFPA 72 "Inspection and Test Form," filled out.
- I. Operating and Maintenance Data: See Section 01 78 00 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Original copy of NFPA 72 with portions that are not relevant to this project neatly crossed out by hand; label with project name and date.
 2. Complete set of specified design documents, as approved by authority having jurisdiction.
 3. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
 4. Contact information for firm that will be providing contract maintenance and trouble call-back service.
 5. List of recommended spare parts, tools, and instruments for testing.
 6. Replacement parts list with current prices, and source of supply.
 7. Detailed troubleshooting guide and large scale input/output matrix.

8. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to District.
 9. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- J. Project Record Documents: See Section 01 78 00 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- K. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
 2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
 3. Certificate of Occupancy.
- L. Maintenance Materials, Tools, and Software: Furnish the following for District's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.
 3. In addition to the items in quantities indicated in PART 2, furnish the following:
 - a. All tools, software, and documentation necessary to modify the fire alarm system using District's personnel; minimum modification capability to include addition and deletion of devices, circuits, and zones, and changes to system description, operation, and evacuation and instructional messages.
 - b. One copy, on CD-ROM, of all software not resident in read-only-memory.
 - c. Extra Fuses: Two for each installed fuse; store inside applicable control cabinet.

1.04 QUALITY ASSURANCE

- A. Copies of Design Criteria Documents: Maintain at the project site for the duration of the project, bound together, an original copy of NFPA 72, the relevant portions of applicable codes, and instructions and guidelines of authorities having jurisdiction; deliver to District upon completion.
- B. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

- C. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
 - 1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
 - 2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
 - 3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
 - 4. Contract maintenance office located within 50 miles of project site.
 - 5. Certified in California as fire alarm installer.
- D. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.
- C. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Alarm Control Units - Distric/Campus Standard: Match Existing.
- B. Initiating Devices and Notification Appliances:
 - 1. Same manufacturer as control units.
 - 2. Provide initiating devices and notification appliances made by the same manufacturer, where possible.
- C. Substitutions: See Section 01 60 00 - Product Requirements.
 - 1. For other acceptable manufacturers of control units specified, submit product data showing equivalent features and compliance with Contract Documents.
 - 2. For substitution of products by manufacturers not listed, submit product data showing features and certification by Contractor that the design will comply with Contract Documents.

2.02 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide modifications and extensions to the existing automatic fire detection and alarm system:
 - 1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
 - 2. Protected Premises: Entire building shown on drawings.
 - 3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
 - a. ADA Standards.
 - b. The requirements of the State Fire Marshal.
 - c. The requirements of the local authority having jurisdiction.
 - d. Applicable local codes.
 - e. Contract Documents (drawings and specifications).
 - f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
 - 4. Evacuation Alarm: Single smoke zone; general evacuation of entire premises.
 - 5. Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
 - 6. Fire Command Center: Location indicated on drawings.
 - 7. Master Fire Alarm Control Unit: Existing, located at supervising station.
 - 8. Combined Systems: Do not combine fire alarm system with other non-fire systems.
- B. Supervising Stations and Fire Department Connections:
 - 1. Public Fire Department Notification: By on-premises supervising station.
 - 2. On-Premises Supervising Station: New proprietary station operated by District, located at location indicated on Drawings.
 - 3. Remote Supervising Station: UL-listed central station under contract to facility.
 - 4. Means of Transmission to On-Premises Supervising Station: Two-way radio frequency (RF) multiplex.
 - 5. Means of Transmission to Remote Supervising Station: Two-way radio frequency (RF) multiplex.
 - 6. Auxiliary Connection Type: Local energy.
- C. Circuits:
 - 1. Initiating Device Circuits (IDC): Class B, Style A.
 - 2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
 - 3. Notification Appliance Circuits (NAC): Class B, Style W.
- D. Spare Capacity:
 - 1. Initiating Device Circuits: Minimum 25 percent spare capacity.
 - 2. Notification Appliance Circuits: Minimum 25 percent spare capacity.

3. Speaker Amplifiers: Minimum 25 percent spare capacity.
 4. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.
- E. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
 2. Secondary: Storage batteries.
 3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
 4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 EXISTING COMPONENTS

- A. On-Premises Supervising Station: Include as part of this work all modifications necessary to existing supervising station to accommodate new fire alarm work.
- B. Clearly label components that are "Not In Service."
- C. Remove unused existing components and materials from site and dispose of properly.

2.04 FIRE SAFETY SYSTEMS INTERFACES

- A. Supervision: Provide supervisory signals in accordance with NFPA 72.

2.05 COMPONENTS

- A. General:
 1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Fire Alarm Control Units: Conventional or addressable type; listed, classified, and labeled as suitable for the purpose intended.
- C. Master Control Unit: As specified for Basis of Design above, or equivalent.
- D. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.
- E. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
 1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.
 2. Initiating Device Circuits, Notification Appliance Circuits, and Communications Circuits: Provide surge protection at each point where circuit exits or enters a building; rated to protect applicable equipment; for 24 V(dc) maximum dc clamping voltage of 36 V(dc), line-to-ground, and 72 V(dc), line-to-line.
 3. Signaling Line Circuits: Provide surge protection at each point where circuit exits or enters a building, rated to protect applicable equipment.
- F. Locks and Keys: Deliver keys to District.
 1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type

- G. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
 - 1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
 - 2. Provide one for each control unit where operations are to be performed.
 - 3. Obtain approval of District prior to mounting; mount in location acceptable to District.
 - 4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain District's approval of locations of devices, before installation.
- D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

- A. Notify District 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
- H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
 - 1. Record all system operations and malfunctions.
 - 2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
 - 3. District will provide attendant operator personnel during diagnostic period; schedule training to allow District personnel to perform normal duties.
 - 4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.03 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to District.
 - 1. Be prepared to conduct any of the required tests.

2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
 3. Have authorized technical representative of control unit manufacturer present during demonstration.
 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
 5. Repeat demonstration until successful.
- B. Occupancy of the project will not occur prior to Substantial Completion.
- C. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
1. Specified diagnostic period without malfunction has been completed.
 2. Approved operating and maintenance data has been delivered.
 3. Spare parts, extra materials, and tools have been delivered.
 4. All aspects of operation have been demonstrated to District.
 5. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
 6. Provide NFPA 72 Record of Completion form to District, local fire official, and DSA.
 7. Occupancy permit has been granted.

3.04 MAINTENANCE

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
 2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
 3. Record keeping required by NFPA 72 and authorities having jurisdiction.
- C. Provide trouble call-back service upon notification by District:
1. Provide on-site response within 2 hours of notification.
 2. Include allowance for call-back service during normal working hours at no extra cost to District.
 3. District will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.
- D. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

- E. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to District's representative upon completion of site visit.
- F. Comply with District's requirements for access to facility and security.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Grubbing of root systems of trees and shrubs, abandoned utility lines and structures and other below grade obstructions and debris.
- C. Removal of existing debris.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. 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.
- D. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- E. Section 02 41 00 - Demolition: Removal of built elements and utilities.
 - 1. Removal of paving and removal if indicated of abandoned utilities.
 - 2. Sitework (Area of Work), removal of designated fences, walls, and other elements; capping and identifying utilities; landscape paving, and removal of concrete foundations.
- F. Section 31 22 00 - Grading: Topsoil removal.
- G. Section 31 22 00 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.
- H. Section 31 23 16 - Excavation: Site preparation for structure and paving.
- I. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Site Plan: Showing:
 - 1. Areas for temporary construction and field offices.

1.04 QUALITY ASSURANCE

- A. Clearing Firm: Company specializing in the type of work required.
 - 1. Minimum of five years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fill Material: As specified in Section 31 23 23 - Fill and Backfill

PART 3 EXECUTION

3.01 SITE CLEARING

- A. Comply with other requirements specified in Section 01 70 00.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 SURVEY STAKING IN UNCLEARED EASEMENTS

- A. Flag centerline of utility lines prior to clearing. Contractor shall set offsets for clearing limits to suit the Work.
- B. When the clearing is completed, survey for utility construction in accordance with requirements specified in Section 01 70 00 - Execution and Closeout Requirements.
- C. Contractor shall replace all controls and stakes damaged or destroyed, at no change in Contract Time or Contract Price.

3.03 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Protect existing structures and other elements that are not to be removed.

3.04 CLEARING

- A. Perform clearing Work within confines of Project area indicated on Drawings or specified elsewhere herein and with strict adherence to the Contract Documents and Geotechnical recommendations.

3.05 VEGETATION

- A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, lawns, and planting beds.
- B. Do not remove or damage vegetation beyond the limits indicated on drawings.
- C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
 - 1. At vegetation removal limits.
- D. Remove only trees within area to be cleared that have been marked for removal. Confirm trees to be removed with District and Architect before beginning removal process.
 - 1. Cut trunks close and parallel to ground.

2. Remove roots where under or within five feet of proposed structures.
 3. Neither remove nor prune trees and shrubbery in public rights-of-way except by written approval of authorities having jurisdiction.
- E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.
- F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
- G. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.
- H. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to District.

3.06 GRUBBING

- A. At pipelines, remove all trees or stumps within five feet of the pipeline.
- B. Perform grubbing where indicated on Drawings or as specified herein. Grubbing shall include removal from the ground of all stumps, roots, buried logs and other vegetation not otherwise indicated to remain, and removal and disposal of resulting refuse.
- C. Completely grub areas where unsuitable surface material is to be removed.

3.07 DAMAGED VEGETATION

- A. Neatly prune damaged branches and severed roots.
- B. Apply wound paint to above-ground cuts and abrasions.
- C. If trees and shrubs indicated to remain are damaged excessively, as determined by Construction Manager, Architect or authorities having jurisdiction, remove and replace damaged plants with comparable plants.

3.08 DEBRIS

- A. Remove debris, junk, and trash from site.
- B. Remove logs, rocks and other debris.
- C. Dispose of Debris resulting from clearing and thoroughly clean rights-of-way.
- D. Leave site in clean condition, ready for subsequent work.
- E. Clean up spillage and wind-blown debris from public and private lands.

3.09 DISPOSAL

- A. Debris Disposal: Dispose of all cleared and grubbed materials in a legal manner off site.
- B. Hazardous Materials:
 - 1. Immediately notify the Construction Manager should hazardous materials or suspected hazardous materials be encountered.
 - 2. Dispose of such materials in accordance with all applicable laws and regulations and as directed by authorities having jurisdiction.
 - 3. Unforeseen conditions will be resolved in accordance with the Conditions of the Contract.
- C. Saleable Materials:
 - 1. Unless otherwise indicated, all felled trees from which merchantable lumber or firewood can be produced shall become the property of the Contractor.
 - 2. Unless otherwise indicated, all metallic debris of salvageable value shall become the property of the Contractor.
 - 3. The Contractor shall remove all saleable materials from the site in a timely manner.
 - 4. Sale of salvaged and merchantable materials shall be done on site only with prior approval of the District.
- D. Stockpiling Vegetation: Only if specified or indicated under landscape work, stockpile vegetation for subsequent mulching.
- E. Burial and Burning: Debris shall not be buried or burned on site.

3.10 DUST CONTROL

- A. Refer to requirements of:
 - 1. Section 01 50 00 - Temporary Construction Facilities and Controls.
 - 2. Section 31 22 00 - Grading.
- B. Minimize dust during clearing and grubbing to protect adjoining property and vehicles parked in the vicinity.
- C. Clean-up: Keep public thoroughfares clear of dust and debris by periodic sweeping and washing down, at least daily at the end of working hours.

END OF SECTION

SECTION 31 22 00
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Coordinate work of this Section to compliment and coordinate with field conditions and Civil Drawing noted specific referenced requirements. Utilize the most stringent requirements.
- B. Removal of topsoil.
- C. Rough grading and consolidation/compaction the site for site structures and building pads.
 - 1. Preparation for excavation, trenching, backfilling and compacting Work.
- D. Excavation of subsoil, stockpiling for later reuse, and removal of excess from the site.
- E. Preparing of subgrade for walks, pavements and site retaining walls.
- F. Excavating, backfilling and compaction for wet utility lines.
- G. Finish grading.

1.02 RELATED REQUIREMENTS

- A. Document 00 31 00 - Available Project Information: Subsurface Investigations.
- B. Section 01 40 00 - Quality Requirements.
- C. Section 01 45 33 - Code Required Special Inspections and Procedures.
- D. Section 01 70 00 - Execution and Closeout Requirements.
- E. Section 31 10 00 - Site Clearing.
- F. Section 31 23 16 - Excavation.
- G. Section 31 23 16.13 - Trenching: Trenching and backfilling for utilities.
- H. Section 31 23 23 - Fill: Filling and compaction.
- I. Section 13 13 - Concrete Paving.

1.03 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.
 - 1. Accurately record location of all changes in finish elevations and gradients which materially affect drainage.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: For conditions not covered in this Section, refer to applicable provisions of the California Building Code (CBC), Chapter 18A - Soils and Foundations, as amended and adopted by authorities having jurisdiction.
- B. Perform Work in accordance with locally adopted SSPWC standards.

1.05 PROTECTION

- A. Dust Control: Comply with requirements specified in Section 01 50 00 - Temporary Facilities and Controls.
- B. Protection:
 - 1. Comply with general requirements specified in Section 01 50 00 - Temporary Facilities and Controls.
 - 2. Provide protection for walks, curbs, drains, and trees and boxing around corners of existing buildings to prevent damage.
 - 3. Keep adjacent roads, streets and drives clear of dirt and debris from earthwork operations.
- C. Underground Utilities:
 - 1. Buried utility lines may exist.
 - 2. If such are encountered, notify Construction Manager, Architect and District and for directions to be followed for preservation, relocation or demolition of utilities.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: See Section 31 23 23.
- B. Shoring and Bracing: Provide all materials and services necessary to properly engineer and construct shoring for excavations. Selection of materials and design of shoring, underpinning and bracing of new and existing structures shall be solely the responsibility of the Contractor.
 - 1. Shoring design shall comply with State of California Trenching and Shoring Manual issued by Offices of Structure Construction; 2011.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Verify the absence of standing or ponding water.
- C. The Drawings do not purport to show all below-grade conditions and objects on the site. Refer to Section 00 31 00 - Available Project Information.
- D. Upon discovery of unknown utility or concealed conditions, discontinue affected Work and notify Construction Manager, Architect and District for direction. Unforeseen conditions shall be resolved in accordance with the General Conditions.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
 - 1. Maintain and protect existing utilities remaining which pass through Project area.

- D. Notify utility company to remove and relocate utilities, as required.
- E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.
- F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
- G. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.
- H. Protect plants, lawns, and other features to remain as a portion of final landscaping.

3.03 ROUGH GRADING

- A. Comply with Geotechnical Report and field directives of geotechnical engineer on-site.
- B. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
 - 1. Coordinate topsoil with Section 31 10 00 - Site Clearing and Grubbing.
- C. Do not remove topsoil when wet.
- D. Remove subsoil from marked areas.
 - 1. See Section 31 23 16 - Excavation.
- E. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- F. When excavating through roots, perform work by hand and cut roots with sharp axe.
- G. See Section 31 23 23 for filling procedures.
- H. All permanent cut or fill slopes shall have a maximum slope of 2:1 (H:V) ratio, horizontal to vertical and shall comply with applicable requirements of the Geotechnical Report and California Building Code (CBC).
- I. Benching Slopes: Horizontally bench existing slopes greater than 5:1 (H:V) to key fill material to slope for firm bearing.
- J. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
- K. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.
- L. Grade top perimeter of excavations to prevent surface water from draining into excavation.
 - 1. Provide dewatering of excavations as required to ensure suitable conditions for concrete and backfilling operations.
- M. Uniformly grade areas as shown on Drawings to tolerances specified in this Section..
 - 1. Evenly grade between points where elevations are shown or between points of Work and existing grades.
- N. Slope rough grade away from building perimeter at gradient indicated.
 - 1. Upaved area slope for a distance of 10 feet from the building: Not less than one unit vertical in 20 units horizontal or 5 percent.
 - a. CBC Section 1804A.4.

2. When supported by soil conditions and climate; slope not less than 1:48 or 2 percent in unpaved areas.
 - a. CBC Section 1804A.4, Exception.
- O. Make grade changes gradual. Blend slopes into level areas.

3.04 SOIL REMOVAL AND STOCKPILING

- A. Stockpile topsoil to be re-used on site; remove remainder from site.
 1. Topsoil and vegetation layers, root zones, and similar surface materials should be stripped and stockpiled for either reuse in landscape surface areas or removed from the site.
- B. Stockpile subsoil on site for backfill, if soil is appropriate.
 1. Stockpile subsoil to depth not exceeding 8 feet.
- C. Remove all lumped subsoil, boulders and rock in excess of 6 inches in greatest dimension.
- D. Stockpile subsoil to be re-used on site; remove remainder from site.
- E. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; cover to protect from erosion.

3.05 FINISH GRADING

- A. Before Finish Grading:
 1. Verify building and trench backfilling have been inspected.
 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
 1. Comply with CBC Section 1804A.3.
- C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 6 inches.
- D. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- E. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.06 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).
- C. Top Surface Under Paving: Plus or minus 0.04 foot (1/2 inch) from required elevation.
- D. Top Surface Under Footings and Foundations: Plus 0, minus 0.2 foot (2.4 inch).
- E. Top Surface Under Slabs on Grade: Plus 0, minus 0.04 foot (1/2 inch).

3.07 REPAIR AND RESTORATION

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

- B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect as to remedy.
- C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.08 FIELD QUALITY CONTROL

- A. See Section 31 23 23 for compaction density testing.
- B. Field Quality Control:
 - 1. Field inspections and testing shall be performed in accordance with requirements specified in Section 01 40 00 and 01 45 33.
 - 2. Make required quality control submittals in accordance with requirements specified.
- C. Non-compliance: Should grade elevations, tests of fill or backfill indicate non-compliance with required elevations or density, Contractor shall over-excavate, recompact and retest until specified grade or density is obtained.
 - 1. Costs and Time associated with remedial Work and retesting shall be in accordance with provisions of the General Conditions.
 - 2. Retesting to demonstrate compliance shall be by a testing laboratory acceptable to District and shall be at Contractor's expense.

3.09 CLEANING

- A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

3.10 PROTECTION

- A. Protect completed grading from erosion from weather and traffic.
- B. Over-excavate and recompact areas damaged by construction activities and weather.

END OF SECTION

SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavating for footings, slabs-on-grade, paving, site structures, and utilities within the building.
- B. Trenching for utilities outside the building to on-site existing utilities.
- C. Temporary excavation support and protection systems.

1.02 RELATED REQUIREMENTS

- A. Document 00 31 00 - Available Project Information: Geotechnical report; bore hole locations and findings of subsurface materials.
- B. Section 01 40 00 - Quality Requirements: Inspection of bearing surfaces.
- C. Section 01 50 00 - Temporary Facilities and Controls: Dewatering excavations and water control.
- D. Section 01 57 13 - Temporary Erosion and Sediment Control: Slope protection and erosion control.
- E. 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. General requirements for dewatering of excavations and water control.
- F. Section 02 41 00 - Demolition: Shoring and underpinning existing structures.
- G. Section 26 05 53 - Identification for Electrical Systems: Underground warning tapes at underground electrical lines.
- H. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal.
- I. Section 31 22 00 - Grading: Grading.
- J. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.
- K. Section 31 23 23 - Fill: Fill materials, backfilling, and compacting.

1.03 REFERENCE STANDARDS

- A. AHRI 560 - U.S. Occupational Safety and Health Standards; current edition.

1.04 REFERENCE STANDARDS

- A. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012, with Editorial Revision (2015).

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Temporary Support and Excavation Protection Plan.

- C. Project Record Documents: Record drawings at project closeout according to 01 70 00 - Execution and Closeout Requirements. Show locations of installed support materials left in place, including referenced locations and depths, on drawings.
- D. Shoring Installer's Qualification Statement.
- E. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.

1.06 QUALITY ASSURANCE

- A. Temporary Support and Excavation Protection Plan:
 - 1. Indicate sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property.
 - 2. Include drawings and calculations for bracing and shoring.
 - 3. Bracing and shoring design to meet requirements of OSHA's Excavation Standard, AHRI 560, Subpart P.
- B. Designer Qualifications: For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in California.
- C. Shoring Installer Qualifications: Company specializing in performing the shoring and bracing work of this section with minimum five years of documented experience.

1.07 COORDINATION OF SPECIFICATION REQUIREMENTS

- A. Coordinate these Specification Section requirements with specifications included on Drawings. Comply with more stringent requirements and with those requirements of authorities having jurisdiction.
- B. Comply in full with the direction (recommendations) given in the Geotechnical Report.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Bedding and Fill to Correct Over-Excavation:
 - 1. See Section 31 23 23 for bedding and corrective fill materials at general excavations.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the work are as indicated.
- B. Survey existing adjacent structures and improvements and establish exact elevations at fixed points to act as benchmarks.
 - 1. Resurvey benchmarks during installation of excavation support and protection systems and notify District if any changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.
- C. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with

perimeter drains routed to sump pumps, or as directed by Architect. If the proposed excavation extends more than 1 foot into the prevailing groundwater, control groundwater intrusion with a comprehensive dewatering procedures, or as directed by Geotechnical Engineer.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 31 10 00 for clearing, grubbing, and removal of existing debris.
- C. Locate, identify, and protect utilities that remain and protect from damage.
- D. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect.
- F. See Sections 01 70 00 and 02 41 00 for underpinning and shoring of adjacent structures that could be damaged by excavating work.

3.03 TEMPORARY EXCAVATION SUPPORT AND PROTECTION

- A. Excavation Safety: Comply with OSHA's Excavation Standard, AHRI 560, Subpart P.
 - 1. Excavations in stable rock or in less than 5 feet in depth in ground judged as having no cave-in potential do not require excavation support and protection systems.
 - 2. Depending upon excavation depth, time that excavation is open, soil classification, configuration and slope of excavation sidewalls, design and provide an excavation support and protection system that meets the requirements of AHRI 560, Subpart P:
 - a. Sloping and benching systems.
 - b. Support systems, shield systems, and other protective systems.
- B. Shoring Design: Comply with State of California Trenching and Shoring Manual issued by Offices of Structure Construction; 2011.
 - 1. Provide all materials and services necessary to properly engineer and construct shoring for excavations. Selection of materials and design of shoring, underpinning and bracing of new and existing structures shall be solely the responsibility of the Contractor.
- C. Underpin adjacent structures that could be damaged by excavating work, including utilities and pipe chases.
- D. Protect excavations from cave-in and from loose soil and other matter from falling in.
- E. Leave excavation support and protection systems, used as formwork or within 10 feet of existing foundations, permanently in place, unless otherwise noted.
 - 1. Cut off top 4 feet below grade, abandon remainder.
- F. Excavation support and protection systems not required to remain in place may be removed subject to approval of District or District's Representative.
 - 1. Remove temporary shoring and bracing in a manner to avoid harmful disturbance to underlying soils and damage to buildings, structures, pavements, facilities and utilities.

3.04 EXCAVATING

- A. Excavate to accommodate new structures, construction operations, and paving/site structures.
 - 1. Excavate to the specified elevations.
 - 2. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.
 - 3. Cut utility trenches wide enough to allow inspection of installed utilities.
 - 4. Hand trim excavations. Remove loose matter.
 - 5. Excavate subsoil from areas to be filled with topsoil, to construct foundations, footings, slabs on grade, paving and to achieve final finish grades.
 - 6. Over-excavate to working elevations for backfilling and compaction operations.
 - 7. Specific Site / Geotech requirements:
 - a. Building Footprint:
 - 1) Within the footprint of proposed buildings, pier footings and site wall near the entry gates, remove/over-excavate and recompact the upper soils 2.5 feet below bottom of footings/slab-on-grade, whichever is deeper.
 - (a) Scarify an additional 6 inches, moisture condition, and recompact.
 - 2) Extend over-excavation and recompaction a minimum horizontal distance of 5 feet from perimeter edges of proposed footings.
 - 3) Localized areas of deeper removals/over-excavation may be required depending on the actual conditions encountered pending verification by the geotechnical engineer during grading to confirm suitable bottom.
 - b. Flatwork/Hardscape/Pavement
 - 1) In areas of proposed concrete flatwork or pavement, provide a minimum over-excavation and recompaction of 1.5 feet below existing grade or 18 inches below proposed subgrade elevation, whichever is deeper.
 - (a) Scarify an additional 6 inches, moisture condition, and recompact.
 - 2) Extend over-excavation and recompaction a minimum horizontal distance of 2 feet from outside hardscape limits.
 - 3) Proof-roll the bottom of the removal with heavy equipment to identify yielding subgrade conditions (for additional removal, if necessary) under the observation of the geotechnical consultant.
 - c. After completion of the removal of existing fill soils and prior to fill placement, scarify the exposed surface to a minimum depth of 6 inches, moisture condition as necessary to near optimum moisture content and recompact using heavy compaction equipment to an unyielding condition.
 - d. Compact all structural fill within the building footprints throughout to 90 percent of the ASTM D1557 laboratory maximum density, at or slightly above optimum moisture.
 - 8. Where excavations are made to a depth greater than that indicated, such additional depth shall be filled with concrete having the same compressive strength as specified for the footing.

- a. Correct unauthorized and erroneous excavation at no change in Contract Time or Contract Sum.
- B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored, per CalOSHA requirements for Type C Soil.
 - 1. Machine slope banks of excavations to minimum 1 to 1 ratio horizontal to vertical or angle of repose, if less, until shored.
 - a. Exception: If authorized in writing by Geotechnical Engineer.
 - b. Slope must comply with local codes, ordinances and requirements of agencies having jurisdiction.
 - c. See Section 00 31 00 - Available Project Information.
- D. Do not interfere with 45 degree influence line of bearing splay of foundations.
 - 1. Avoid interference at footings by providing additional width, depth, and other provisions.
- E. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.
- F. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.05 SUBGRADE PREPARATION

- A. See Section 31 23 23 for subgrade preparation at general excavations.
- B. See Section 31 23 16.13 for subgrade preparation at utility trenches.

3.06 FILLING AND BACKFILLING

- A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.
- B. Install underground warning tape at buried utilities according to Sections 26 05 53.
- C. See Section 31 23 23 for fill, backfill, and compaction requirements at general excavations.
- D. See Section 31 23 16.13 for fill, backfill, and compaction requirements at utility trenches.
- E. See Section 31 22 00 for rough and final grading and topsoil replacement requirements.

3.07 REPAIR

- A. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23 at no additional cost.

3.08 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Provide for visual inspection of load-bearing excavated surfaces by Architect before placement of foundations.

- C. Scarification, over excavation and all other excavations will be subject to the approval of the Soils Engineer.

3.09 CLEANING

- A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 22 00.
- B. Remove excavated material that is unsuitable for re-use from site.
- C. Remove excess excavated material from site.
 - 1. Geotechnical engineer or other consultant as selected by District to test soils prior to export for disposition.

3.10 PROTECTION

- A. Divert surface flow from rains or water discharges from the excavation.
- B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.
- D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 31 23 16.13
TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Backfilling and compacting for utilities from 5 FEET outside the building to connection point on-site, where indicated on Drawings.

1.02 RELATED REQUIREMENTS

- A. 00 31 00 - Available Project Information: Geotechnical report; bore hole locations and findings of subsurface materials.
- B. Section 01 41 00 - Regulatory Requirements: Code Compliance.
- C. Section 31 22 00 - Grading: Site grading.
- D. Section 31 23 16 - Excavation: Building and foundation excavating.
- E. Section 31 23 23 - Fill: Backfilling at building and foundations.

1.03 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: Indicated on drawings.

1.04 REFERENCES

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2018.
- B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
- C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012, with Editorial Revision (2015).
- D. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).
- E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012, with Editorial Revision (2015).
- F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- G. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Comply with the requirements listed in Section 31 23 23 - Fill.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

- D. Compaction Density Test Reports.

1.06 COORDINATION OF SPECIFICATION REQUIREMENTS

- A. Coordinate these Specification Section requirements with specifications included on Drawings. Comply with more stringent requirements and with those requirements of the authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where designated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill: Subsoil excavated on-site.
- B. Structural Fill: Subsoil excavated on-site.
 - 1. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
- C. Concrete for Fill: Lean concrete.
- D. Granular Fill - Gravel: Pit run washed stone; free of shale, clay, friable material and debris.
 - 1. Graded in accordance with ASTM C136/C136M, within the following limits:
 - a. 3/4 inch sieve: 95 to 100 percent passing.
- E. Topsoil: Topsoil excavated on-site.
 - 1. Select.
 - 2. Graded.
 - 3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
 - 4. Acidity range (pH) of 5.5 to 7.5.
 - 5. Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.
 - 6. Complying with ASTM D2487 Group Symbol OH.

2.02 ACCESSORIES

- A. Geotextile Fabric: Non-biodegradable, woven; 140N manufactured by Mirafi.

2.03 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.

- D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect utilities that remain and protect from damage.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- D. Protect plants, lawns, and other features to remain.
- E. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect.

3.03 TRENCHING

- A. Excavate subsoil required for conduits, storm drain, sanitary sewer, water and gas piping to municipal utilities.
- B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
- D. Trenches Parallel to Footings: Do not place the trench below a 1 vertical to 2 horizontal from 9 inches above the bottom edge of the footing and no closer than 18 inches from the face of footing. CBC Section 1809A.14.
- E. Do not interfere with 45 degree bearing splay of foundations.
- F. Cut trenches wide enough to allow inspection of installed utilities.
- G. Hand trim excavations. Remove loose matter.
 - 1. Hand trim for bell and spigot pipe joints.
- H. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.
- I. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume.
- J. Remove excavated material that is unsuitable for re-use from site.
- K. Stockpile excavated material to be re-used in area designated in Section 31 22 00.
- L. Remove excess excavated material from site.
- M. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- N. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect.

3.04 PREPARATION FOR UTILITY PLACEMENT

- A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.
- D. Support pipe and conduit during placement and compaction of bedding fill.

3.05 BACKFILLING

- A. Backfill to contours and elevations indicated using unfrozen materials.
- B. Fill up to subgrade elevations unless otherwise indicated.
- C. Employ a placement method that does not disturb or damage installed piping and conduits, or other work.
- D. Systematically fill and compact as as to achieve 90 percent relative compaction without damaging conduit or pipe. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
- G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth or as directed by the Geotechnical Report.
- H. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- I. Correct areas that are over-excavated.
 - 1. Thrust bearing surfaces: Fill with concrete.
 - 2. Other areas: Use general fill, flush to required elevation, compacted to minimum 90 or 95 percent of maximum dry density as applicable for the fill area.
- J. Compaction Density Unless Otherwise Specified or Indicated:
 - 1. Under paving and similar construction: 95 percent of maximum dry density.
 - 2. At other locations: 90 percent of maximum dry density.
- K. Reshape and re-compact fills subjected to vehicular traffic.

3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.
- B. Utility Piping, Conduits, and Duct Bank:
 - 1. Bedding: Use Fill Type SP or SW (ASTM D2487) or SM with sand equivalent of 30 or greater per ASTM D2419, 3 inches thick, compacted to 90 percent..
 - 2. Cover with Fill Type SP, SW, SM, GM per ASTM D2487.
 - 3. Fill up to subgrade elevation.
 - 4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.
 - 5. Gas Piping: As required by the Gas Company.

3.07 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 1.2 inch from required elevations.
- B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1.2 inch from required elevations.

3.08 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Control, for general requirements for field inspection and testing.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556 or ASTM D6938.
- C. See Section 31 23 23 for compaction density testing.
- D. Correct unauthorized excavation at no cost to District.
- E. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").
- F. If tests indicate work does not meet specified requirements, remove work, replace and retest at no additional cost to District.
- G. Correct areas over excavated by error in accordance with Section 31 23 23 - Fill.
- H. Frequency of Tests: See Section 31 22 00 - Grading.

3.09 CLEANING

- A. Leave unused materials in a neat, compact stockpile.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

3.10 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01 50 00 - Temporary Construction Facilities and Controls.
- B. Recompact fills subjected to vehicular traffic.

END OF SECTION

SECTION 31 23 23

FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Filling, backfilling, and compacting for footings, paving, and site structures.
- B. Backfilling and compacting for utilities outside the building to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

- A. Section 00 31 00 - Available Project Information: Geotechnical report; bore hole locations and findings of subsurface materials.
- B. Section 03 30 00 - Cast-in-Place Concrete.
- C. Section 31 22 00 - Grading: Removal and handling of soil to be re-used.
- D. Section 31 22 00 - Grading: Site grading.
- E. Section 31 23 16 - Excavation: Removal and handling of soil to be re-used.

1.03 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2018.
- B. ASTM D4829 - Standard Test Method for Expansion Index of Soils; 2011.
- C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).
- D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012, with Editorial Revision (2015).
- E. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- F. DTSC-Clean Fill - California Department of Toxic Substances Control - Clean Imported Fill Material; Current.
- G. Greenbook - Greenbook: Standard Specifications for Public Works Construction; latest adopted edition.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Soil Samples: 10 pounds sample of each type of fill; submit in air-tight containers to testing laboratory.

1. Submit samples directly to Geotechnical Engineer for testing and analysis copy transmittals to Architect and District.
- C. Materials Sources: Submit name of imported materials source.
- D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
- E. Compaction Density Test Reports.
- F. Manufacturer's Instructions.
- G. Manufacturer's Qualification Statement.
- H. Specimen Warranty.
- I. Provide proof that all imported materials conform to the requirements of DTSC-Clean Fill Imported Fill Materials for School Sites by proper documentation for the imported materials.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.
- B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- C. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where agreed to.
 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 2. Prevent contamination.
 3. Protect stockpiles from erosion and deterioration of materials.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill: Subsoil excavated on-site.
 1. Graded.
 2. Free of lumps larger than 3 inches, rocks larger than 4 inches, and debris.
 3. Complying with ASTM D2487 Group Symbol CL.
- B. Structural Fill: Subsoil excavated on-site.
 1. Graded.

2. Free of organic matter, debris, and oversize particles (e.g., cobbles, rubble, etc. that are larger than 3 inches, rocks larger than 4 inches. Fill shall contain at least fifty percent of material smaller than 1/4 inch in size.
3. Imported fill materials: The soil shall be tested for potential contamination in accordance with DTSC-Clean Fill protocols. Submit to Geotechnical Engineer.
 - a. Import sandy soil shall be free of organics, debris and oversize particles (e.g., cobbles, rubble, etc. that are greater than 3 inches in the largest dimension).
 - b. Additionally, import soils shall not have any corrosion impacts to buried concrete; and be non-expansive (Expansion Index less than 50 per ASTM D4829).
 - c. Prior to import, geotechnical consultant shall evaluate and test the import soils in order to confirm the quality of the material.
4. On-site soils should only be used as specified in the Soils Report.
5. Complying with ASTM D2487 Group Symbol CL.
- C. Concrete for Fill: As specified in Section 03 30 00; compressive strength of 2500 psi.
 1. Exception: Concrete used under footings and foundations to correct over-excavation shall be same as for footings and foundation.
- D. Granular Fill - Fill Type GM, GW: Coarse aggregate, conforming to Uniform Standard Specifications for Public Works Construction Off-Site Improvements standard.
- E. Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter.
 1. Grade in accordance with ASTM D2487 Group Symbol SP or SW.
- F. Topsoil: Topsoil excavated on-site.
 1. Unclassified.
 - a. The soil shall be tested for potential contamination in accordance with DTSC-Clean Fill protocols.
 2. Graded.
 3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
 4. Acidity range (pH) of 5.5 to 7.5.
 5. Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.
 6. Complying with ASTM D2487 Group Symbol OH.
 7. Limit decaying matter to 5 percent of total content by volume.
- G. Type F - Subsoil: Reused, free of rocks larger than 3 inch size, and debris.
 1. Existing fill and alluvium or older alluvium may be considered suitable for re-use as compacted fills provided the recommendations of the geotechnical report and observations of the geotechnical engineer are followed.
 2. Expansive soils (EI>51) are not be placed with the upper 3 feet of subgrade soils

2.02 ACCESSORIES

- A. Geotextile Fabric: Non-biodegradable, non-woven; Geotex 801 manufactured by Propex Geotextile Systems, geotextile.com.

2.03 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.
- E. Comply with EPA/DTSC-Clean Fill requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify structural or other backfill materials to be reused or imported are acceptable to the satisfaction of the Geotechnical Engineer. Approval shall be obtained in advance of re-use or importation onto the site.
 - 1. The soil shall be tested for potential contamination in accordance with DTSC-Clean Fill protocols.
 - 2. Provide imported fill materials compatible with on-site soils in addition to being suitable for its intended use with the following criterion, as allowed by the Geotechnical Engineer.
 - a. Predominantly granular in nature.
 - b. Containing no rocks larger than 6 inch maximum dimension.
 - c. Free of organic material (loss on ignition less-than 2 percent).
 - d. Very low expansion potential (with an Expansion Index less than 21).
 - e. Low corrosion impact to the proposed improvements.
- B. Verify that survey bench marks and intended elevations for the Work are as indicated.
- C. Identify required lines, levels, contours, and datum locations.
- D. See Section 31 22 00 for additional requirements.
- E. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
- F. Verify structural ability of unsupported walls to support imposed loads by the fill.
- G. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

- A. Scarify and proof roll subgrade surface to a depth of 8 inches to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Greenbook, Type II or concrete fill and compact to density equal to or greater than requirements for subsequent backfill material.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Prior to placement of aggregate base course material at paved areas, compact subsoil to 95 percent of its maximum dry density in accordance with ASTM D1557.

- E. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Fill up to subgrade elevations unless otherwise indicated.
 - 1. Place fill soils compacted in horizontal lifts to a relative compaction of 90 percent or more in general accordance with ASTM D1557.
 - 2. Lift thickness for fill soils will vary depending on the type of compaction equipment used but should generally be placed in horizontal lifts not exceeding 8 inches in loose thickness.
 - 3. Place fill soils at slightly above optimum moisture content as evaluated by ASTM D1557.
 - 4. Avoid damage to wet and dry utility lines when compacting fill and subgrade materials.
- C. Employ a placement method that does not disturb or damage other work.
 - 1. Do not disturb or damage foundation perimeter drainage and foundation waterproofing and protective cover utilities in trenches.
- D. Systematically fill and compact per geotechnical report. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
- G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
 - 1. Expansive soils (EI>20) are not be placed with the upper 3 feet of subgrade soils. CBC Section 1803.5.3.
- H. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- I. Correct areas that are over-excavated.
 - 1. Load-bearing foundation surfaces: Fill with concrete.
 - 2. Other areas: Use general fill, flush to required elevation, compacted to minimum 90 or 95 percent of maximum dry density in subgrade zone.
- J. Compaction Density Unless Otherwise Specified or Indicated:
 - 1. Under paving, slabs-on-grade, and similar construction: 90 percent of maximum dry density.
 - 2. At other locations: 90 percent of maximum dry density.
- K. Reshape and re-compact fills subjected to vehicular traffic.
- L. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- M. Remove surplus fill and backfill materials from site.

3.04 FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.
- B. Structural Fill:
 - 1. Use structural fill.
 - 2. Fill up to subgrade elevations.
 - 3. Maximum depth per lift: 6 inches, compacted.
 - 4. Compact to minimum 90 percent of maximum dry density.
- C. At Footings:
 - 1. Use general fill.
 - 2. Fill up to subgrade elevation.
 - 3. Compact each lift to 90 percent of maximum dry density.
 - 4. Do not backfill against unsupported foundation walls.
 - 5. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
- D. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches:
 - 1. Bedding: Use general fill.
 - 2. Cover with general fill.
 - 3. Fill up to subgrade elevation.
 - 4. Compact in maximum 8 inch lifts to 90 percent of maximum dry density. Compact to 95 percent in subgrade zone.
- E. Under Monolithic Paving :
 - 1. Compact subsoil to 90 percent of its maximum dry density before placing fill.
 - 2. Use general fill.
 - 3. Fill up to subgrade elevation.
 - 4. Compact to 90 percent of maximum dry density.
 - 5. See Section 32 11 23 for aggregate base course placed over fill.

3.05 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.
- B. Top Surface of Filling Under Paved Areas: Plus or minus 1/2 inch from required elevations.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
 - 1. Laboratory Tests and Analyses: Where backfill is required to be compacted to a specified density, tests for compliance shall be made in accordance with requirements specified in Section 01 40 00 - Quality Requirements.

- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556 or ASTM D6938.
 - 1. Field inspections and testing shall be performed and submitted in accordance with requirements specified in Section 01 40 00 - Quality Requirements.
 - 2. Allow testing service to inspect and approve each subgrade and fill layer before further fill, backfill or construction Work is performed.
 - 3. Alternate Density Test Method:
 - a. Field density tests may also be performed by the nuclear method in accordance with ASTM D6938, providing that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D1556/D1556M.
 - b. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gages in accordance with ASTM D6938.
 - c. If field 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 Architect or District's testing and inspection agency.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 1557 ("modified Proctor") or AASHTO T 180.
- D. Non-compliance: If tests indicate work does not meet specified requirements, remove work, replace and retest.
 - 1. Should tests of fill or backfill indicate non-compliance with required density, Contractor shall over-excavate, recompact and retest until specified density is obtained.
 - 2. Costs and Time associated with remedial Work and retesting shall be in accordance with provisions of the General Conditions.
 - 3. Retesting to demonstrate compliance shall be by a testing laboratory acceptable to District and shall be at Contractor's expense.
- E. Frequency of Tests:
 - 1. Footing Subgrade Testing:
 - a. For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities.
 - b. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Geotechnical Engineer.
 - 2. Paved Areas and Building Slab Subgrade Testing:
 - a. Perform at least one field density test of subgrade for every 2,000 sf of paved area or building slab, but in no case fewer than three tests.
 - b. In each compacted fill layer, perform one field density test for every 2,000 sf of overlaying building slab or paved area, but in no case fewer than three tests.
 - 3. Foundation Wall Backfill Testing: Perform at least two field density tests at locations and elevations as directed.
- F. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

3.07 CLEANING

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aggregate base course.
- B. Paving aggregates.
- C. Soil sterilization.

1.02 RELATED REQUIREMENTS

- A. Section 31 22 00 - Grading: Preparation of site for base course.
- B. Section 31 23 16.13 - Trenching: Compacted fill over utility trenches under base course.
- C. Section 32 12 16 - Asphalt Paving: Finish and binder asphalt courses.
- D. Section 32 13 13 - Concrete Paving: Finish concrete surface course.

1.03 REFERENCE STANDARDS

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2018.
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012, with Editorial Revision (2015).
- C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).
- D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012, with Editorial Revision (2015).
- E. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- F. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017.
- G. SSPWC - Greenbook: Standard Specifications for Public Works Construction; latest adopted edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Samples: 10 lb sample of each type of aggregate; submit in air-tight containers to testing laboratory.
- C. Materials Sources: Submit name of imported materials source.
- D. Certificates of Conformance: Aggregate and sterilant materials.
- E. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- F. Compaction Density Test Reports.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: Where reference is made to Standard Specifications, the following shall apply.
 - 1. Perform off-site Work in public rights-of-way in accordance with requirements of authorities having jurisdiction, including ASTM D3763. For conditions not indicated otherwise on Contract Drawings, conform to Standard Details adopted by authorities having jurisdiction.
 - 2. Perform on-site Work as indicated and referenced on Contract Drawings and as specified herein.
- B. The quantity of volatile organic compounds (VOC) used in weed killer, tack coat, primer and other materials shall not exceed limits permitted under current regulations of:
 - 1. South Coast Air Quality Management District (AQMD).
- C. Source Quality Control: Obtain materials from one source throughout.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When aggregate materials need to be stored on site, locate where directed by District.
- C. Aggregate Storage, General:
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sub-Base Material: Existing or imported materials as recommended in geotechnical report. Refer to Document 00 31 00 - Available Project Information.
- B. Aggregate Type Class II: Coarse or crushed aggregate, conforming to Municipality, SSPWC Section 200-2.2.
- C. Coarse Aggregate: Pit run washed stone; free of shale, clay, friable material and debris.
 - 1. Graded in accordance with ASTM D2487 Group Symbol GW.
- D. Herbicide: Comply with all applicable environmental protection and hazardous materials laws and regulations .
 - 1. Comply with current EPA acceptable standard and the California Department of Pesticide Regulations for soils sterilant.
 - 2. Comply with the "Healthy Schools Act" as amended in 2014.
 - 3. Obtain product approval from District, prior to purchase and use.
 - 4. Sterilant: Selected as appropriate for the environment in which is it to be placed.
 - 5. Contractor shall be licensed with the State of California to apply sterilant.
 - 6. Sterilant: Commercial grade for commercial application.

7. Payment for soil sterilization: Include full compensation for application and all materials and incidental work required.
8. Application Rate: Follow manufacturer recommendations.
9. Acceptable Manufacturers:
 - a. Dow AgroSciences; Spike 80DF: www.dowagro.com.
 - b. Pro-Serve Inc.; Bare-Spot Monobor-Chlorate: www.pro-serveinc.com.
 - c. Casoron 50W by Uniroyal Chemical Co., Inc.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.
- B. Where aggregate materials are specified using ASTM D2487 classification, testing of samples for compliance shall be provided before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Establishment of Grades
 1. Set grade stakes per Section 01 70 00 - Execution and Closeout Requirements.
 2. All work shall conform to the lines, elevations, and grades shown on the Drawings.
 - a. Use three consecutive points set on the same slope together so that any variation from a straight grade can be detected.
 - b. Report any such variation to the Architect. Contractor shall be responsible for any error in the grade of the finished work.
 3. Grade or location stakes lost or disturbed, shall be reset by the Surveyor at no additional expense to District.
 4. Areas having drainage gradients of 2 percent or more, provide elevation stakes, set with instrument, at grid intervals of 25 feet.
 - a. Intermediate stakes may be set by using a tightly-drawn string line over the tops of adjacent stakes.
 - b. Grade stakes must be set at all grade breaks, grade changes, etc.
 5. Areas having drainage gradients of less than 2 percent; provide elevation stakes, set with instrument, at 10 foot intervals.
 - a. Grade stakes must be set at all grade breaks, grade changes, etc.
- B. Verify that survey bench marks and intended elevations for the work are as indicated.
- C. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

- A. Stockpiling:
 - 1. Clear and level storage sites prior to stockpiling of material.
 - 2. Stockpile all materials, including approved material available from excavation and grading, in the manner and at the locations designated.
 - 3. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Construction Manager to prevent segregation.
 - 4. Materials obtained from different sources shall be stockpiled separately.
- B. Soil Sterilant:
 - 1. Sterilize soil areas to receive paving.
 - 2. Apply soil sterilant in accordance with manufacturer's instructions and applicable environmental regulations.
 - 3. Take care to confine application to the areas to be paved. Sterilant shall not be applied within 2 feet of planting areas.
- C. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- D. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

- A. Place and compact aggregate base material in accordance with SSPWC, Subsection 301-2. Place aggregate base below curbs and gutters and paving also, compacted to 95 percent at vehicular traffic and at pedestrian-only traffic.
- B. Application of Base Course:
 - 1. After preparing the subgrade, Avoid all vehicular or machine traffic on the subgrade.
 - a. Should it be necessary to haul over the prepared subgrade, drag and roll the traveled way as frequently as may be necessary to remove ruts, cuts, and breaks in the surface.
 - b. Rake and hand tamp all cuts, ruts, and breaks in the surface of the subgrade that are not removed by the above operations.
 - c. Equip with pneumatic tires all equipment used for transporting materials over the prepared subgrade.
 - 2. Do not permit continued use of sections of prepared subgrade for hauling, so as to cut up or deform it from the true cross-section. Protect the prepared subgrade from all traffic.
 - 3. Maintain the surface in its finished condition until the succeeding layer is placed.
- C. Under Bituminous Concrete Paving:
 - 1. It is required that areas of exterior asphalt pavement be underlain by a layer of aggregate base material which meets the requirements, Thickness of base layer is as shown on the Drawings and varies per the Usage Type area.

- a. It is required that the upper 12 inches of soils below asphalt pavement base material be over-excavated and consist predominantly of satisfactory soil materials and/or approved imported fill.
 - 1) Engineered Fill: See Section 31 23 23 - Fill.
- b. It is required that the exposed bottom surface soils, below overexcavation, be scarified to the recommended depth of 8 inches, moisture conditioned to achieve optimum moisture content, but not higher than 2 percent above optimum, and then re-compacted to a minimum 90 percent relative compaction before any fill materials are placed.
- 2. The above subgrade preparation recommendations are based on the assumption that soils encountered during field exploration are representative of soils throughout the site.
 - a. 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.
- 3. Provide grade stakes and elevations by a California Licensed Surveyor (LS) for the Geotechnical Engineer.
 - a. Verify that the over-excavation depths, shown on the construction drawings for asphalt concrete pavement structural sections, have been achieved prior to re-compaction.
- 4. Correct irregularities by dressing down or filling as may be required, to bring areas to true subgrade elevations.
- 5. Where filling is required, scarify the subgrade to bond the new material to the in place material; use additional material as required at no additional cost. Subject to the approval of the Architect.
- 6. Remove excess material from the site to a legal disposal area.
- D. Under Portland Cement Concrete Paving:
 - 1. Compact to 95 percent of maximum dry density.
- E. Place aggregate in maximum 4 inch layers and roller compact to specified density.
- F. Level and contour surfaces to elevations and gradients indicated.
- G. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- H. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- I. Use mechanical tamping equipment in areas inaccessible to compaction equipment.
- J. Apply herbicide to finished surface.

3.04 TOLERANCES

- A. Subgrade Tolerances:
 - 1. Subgrade for Pavement: Do not vary more than 0.02 ft..
 - 2. Subgrade for Subbase or Base Material: Do not vary more than 0.04 ft..

- 3. Variations within the above specified tolerances shall be compensating so that the average grade and cross section specified are met.
- B. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- C. Scheduled Compacted Thickness: Within 1/4 inch.
- D. Variation From Design Elevation: Within 1/2 inch.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Compaction density testing shall be performed on compacted aggregate base course in accordance with ASTM D1556 or ASTM D6938.
- C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D698 ("standard Proctor"), or ASTM D1557 ("modified Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Proof roll compacted aggregate at surfaces that are under slabs-on-grade and paving.

3.06 CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete sidewalks.

1.02 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories.
- B. Section 03 20 00 - Concrete Reinforcing.
- C. Section 03 30 00 - Cast-in-Place Concrete.
- D. Section 31 22 00 - Grading: Preparation of site for paving and base.
- E. Section 32 11 23 - Aggregate Base Courses: Typical base course.

1.03 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- D. ACI 305R - Guide to Hot Weather Concreting; 2010.
- E. ACI 306R - Guide to Cold Weather Concreting; 2016.
- F. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).
- G. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- H. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018.
- I. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
- J. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine; 2011.
- K. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2011.
- L. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.
- M. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- N. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2018.
- O. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- P. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

- Q. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.
- R. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.
- S. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2018.
- T. SSPWC - Greenbook: Standard Specifications for Public Works Construction; latest adopted edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Mix Design: Design mixes for each concrete mix.
- C. Product Data: Provide data on joint filler, admixtures, and curing compound.
 - 1. Material Certificates signed by manufacturers for each of the following:
 - a. Cementitious materials and aggregates.
 - b. Steel reinforcement and reinforcement accessories.
 - c. Admixtures.
 - d. Curing compounds.
 - e. Joint fillers.
- D. Shop drawings: For pattern layout and verification.

1.05 QUALITY ASSURANCE

- A. Industry Standard: Perform concrete paving Work in accordance with ACI 301.
- B. Regulatory Requirements: Where reference is made to Standard Specifications, the following shall apply.
 - 1. Where reference is made to Standard Specifications, the following shall apply:
 - a. Perform off-site Work in public rights-of-way as indicated on the Contract Drawings and in accordance with requirements of authorities having jurisdiction, including SSPWC.
 - 1) For conditions not indicated otherwise on Contract Drawings, conform to Standard Details adopted by authorities having jurisdiction, including SSPWC.
 - b. Perform on-site Work as indicated and referenced on the Contract Drawings and as specified herein.
 - 2. Conform to California Code of Regulations (CCR), Volume 2, Part 2, Chapters 18 and 19.
 - 3. Conform to California Building Code (CBC), Chapter 11B and ADAAG for accessibility requirements.
 - a. Portland cement concrete paving shall be stable, firm, and slip resistant and shall comply with CBC Sections 11B-302 and 11B-403.
 - b. Concrete paving and concrete finishes along accessible routes of travel shall be at least as slip-resistant as that described as a medium salted finish for slopes of less than 6%, and slip resistant at slopes of 6% or greater; CBC 11B-403.2.
 - c. Continuous surfaces, including walks and sidewalks, shall have a continuous common surface, not interrupted by steps or by abrupt changes in level exceeding

1/4 inch vertical (CBC 11B-303.2), or beveled at 1:2 slope to a maximum height of 1/2 inch (CBC 11B-303.3) and shall have a minimum width of 48 inches; CBC 11B-403.5.1.

4. Comply with OSHA and Cal-OSHA requirements.
 5. Surface cross slopes shall not exceed 2 percent on any accessible path of travel.
- C. Source Quality Control: Obtain like materials from one source throughout.
- D. Lines and Levels: Established by State of California licensed Surveyor or registered Civil Engineer. Costs of surveying services shall be included in the Contract Sum.
- E. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.
1. The Installer shall provide a qualified foreman or supervisor who has a minimum of three years experience with imprinted and textured concrete, and who has successfully completed at least five similar installations of high quality and similar in scope to that required.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Delivery, Storage and Handling: Comply with requirements specified for regular concrete in Section 03 30 00 - Cast in Place Concrete.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

- A. Comply with applicable requirements of ACI 301.
- B. Concrete Sidewalks: 3,500 psi 28 day concrete, thickness as indicated on Drawings, minimum 4.5 inches, natural grey color Portland cement.
- C. Curbing, gutters, related drainage components: 3,500 psi, 28 day concrete.

2.02 FORM MATERIALS

- A. Wood form material, profiled to suit conditions.
- B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).
1. Thickness: 1/2 inch.

2.03 REINFORCEMENT

- A. General: As indicated on Drawings and specified following. Reinforcement for portland cement concrete paving in public rights-of-way shall comply with all applicable requirements in the Standard Specifications for Public Works Construction and Standard Details, as adopted by local authorities having jurisdiction.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) yield strength; deformed billet steel bars; unfinished.
1. Unless detailed otherwise on Drawings, provide number 4 reinforcing bars at 24 inches on center, each way.
- C. Tie Wires: 18 gage minimum, black annealed steel.

D. Construction Joint Reinforcing:

1. Dowels: ASTM A615/A615M, Grade 60 - 60,000 psi yield strength; deformed billet steel bars; unfinished finish.

2.04 PERFORMANCE REQUIREMENTS

- A. Albedo reflectance of finish concrete shall be minimum 0.30.

2.05 CONCRETE MATERIALS

- A. Obtain cementitious materials from same source throughout.
- B. Cement: ASTM C150/C150M, Sulfate Resistant - Type V Portland cement, gray color.
- C. Fine and Coarse Mix Aggregates: ASTM C33/C33M Table 3 Class 4M, Non-reactive.
1. Class C per SSPWC Section 201-1.3.2 // Section 73 and 90.
- D. Water: Clean, and not detrimental to concrete.
- E. Chemical Admixtures: ASTM C494/C494M, Type A - Water Reducing, Type B - Retarding, Type D - Water Reducing and Retarding, Type F - Water Reducing, High Range, and Type G - Water Reducing, High Range and Retarding.
1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.06 ACCESSORIES

- A. Curing Compound: ASTM C309, Type 1, Class A.
1. Comply with all applicable air pollution requirements.
- B. Liquid Surface Sealer:.
1. High solids, acrylic curing and sealing compound: Minimum 30% non-yellowing, acrylic solids curing compound; shall conform to ASTM C309 and ASTM C1315, Type I, Class A, VOC compliant.
 - a. Acceptable Products:
 - 1) L&M Construction Chemicals, Inc.; Dress & Seal WB: www.lmcc.com.
 - 2) L.M. Scofield Company; Cureseal-W: www.scofield.com.
 - 3) W. R. Meadows Company; Decra-Seal W/B: www.wrmeadows.com.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.
- C. Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, I, M and A; single component.
1. Color: Gray.
 2. Applications: Use for:
 - a. Joints in sidewalks and vehicular paving.
 3. Products:
 - a. Pecora Corporation; NR-201 Self-Leveling Traffic and Loop Sealant: www.pecora.com.
 - b. Sherwin-Williams Company; Stampede 1SL Polyurethane Sealant: www.sherwin-williams.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

- D. Soil Sterilant: As specified in Standard Specifications for Public Works Construction. Soil sterilant shall comply with all applicable environmental protection and hazardous materials laws and regulations.
 - 1. See Section 32 11 23 - Aggregate Base Course for product.
- E. Headers and Stakes: Pressure preservative treated douglas fir, 2 x 6 inch nominal size except at curves provide laminated 1 x 6 inch. Use hot dipped galvanized nails only.
- F. Expansion Joint Filler: ASTM D1751, premolded, compressible 1/2 inch thick non-extruding bituminous type resilient filler, compatible with joint backing and sealing products.

2.07 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Mix for Pedestrian (Sidewalk) Pavements and exterior slab on grade, Natural Color, unless indicated otherwise: SSPWC, Section 201-1.1.2, minimum compressive strength of 3,500 psi at 28 days, with slump of 4 inches.
- C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
 - 1. Use accelerating admixtures in cold weather or set retarding admixtures in hot weather only when approved by Architect. Do not use calcium chloride.
- E. Concrete Properties:
 - 1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; As indicated on drawings.
 - 2. Water-Cement Ratio: Maximum 0.5 at point of placement, or according to indicated concrete strength.
 - 3. Maximum Slump: 4 inches.

2.08 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted stabilized soil is acceptable and ready to support paving and imposed loads.
- B. Fine grading, checking, shaping, and compacting of subgrade shall be complete before start of concrete paving Work.
- C. Verify gradients and elevations of base are correct.

3.02 SUBBASE

- A. See Section 32 11 23 Aggregate Base Course for construction of base course for work of this Section.
- B. Aggregate base is required under Portland cement concrete paving subject only to pedestrian traffic in normal use. See Civil Drawings for details.

3.03 PREPARATION

- A. Project Conditions:
 - 1. Water and Dust Control: Maintain control of concrete dust and water at all times. Do not allow adjacent planting areas to be contaminated.
 - 2. Do not place pavement when base surface or ambient temperature is less than 40 degrees F or if base surface is wet or frozen.
 - 3. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Moisten base to minimize absorption of water from fresh concrete. Do not place concrete on standing water.
- C. Notify Architect minimum 24 hours prior to commencement of concreting operations.
- D. Curbs and Gutters: Schedule portland cement concrete curbs and gutters to be in place and cured prior to start of adjoining asphaltic concrete and portland cement concrete paving Work.

3.04 COORDINATION WITH EXISTING CONSTRUCTION

- A. Connection to Existing Construction: Where new concrete is doweled to existing construction, drill holes in existing concrete, insert steel dowels and pack with non-shrinking grout.
- B. Preparation of Existing Concrete: Prepare previously placed concrete by cleaning with steel brush and apply bonding agent in accordance with manufacturer's instructions.

3.05 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
 - 1. Surfaces and Edges: Except where special finishes and tooled edges are indicated, provide all exposed finish surfaces of dense concrete with sharp arises and outside corners.
 - 2. Recesses and Openings: As indicated on Drawings or as directed.
- B. See Section 03 10 00 - Concrete Forming and Accessories.
- C. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
 - 1. Remove side forms for sidewalks, gutter depressions, island paving and driveways, not less than 12 hours after the finishing has been completed.
- D. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.06 REINFORCEMENT

- A. Place reinforcement at midheight of slabs-on-grade.
- B. Reinforcement Placement, General: Locate reinforcement as indicated on Drawings or in Standard Specifications, whichever is more stringent.
 - 1. Locate reinforcement to provide required cover by concrete. If not otherwise indicated on Drawings or in Standard Specifications, provide concrete cover in compliance with ACI 318, Article 20.6.1.3.
 - 2. Place, support and secure reinforcement against displacement.
- C. Reinforcement Spacing: Space reinforcement as indicated on Drawings or in Standard Specifications, whichever is more stringent. If not indicated, maintain clear spacing of two times bar diameter but not less than 1-1/2 inch nor less than 1-1/3 times maximum size aggregate.
- D. Coordination: Locate reinforcement to accommodate embedded products and formed openings and recesses.
- E. Reinforcement Supports: Provide load bearing pads under supports or provide precast concrete block bar supports.
- F. Interrupt reinforcement at contraction and expansion joints.
- G. Place dowels to achieve pavement and curb alignment as detailed.
 - 1. Secure tie dowels in place before depositing concrete. Provide No. 3 bars, 18 inch long at 24 inches O.C. for securing dowels where no other reinforcement is provided.

3.07 COLD AND HOT WEATHER CONCRETING

- A. Follow recommendations of ACI 305R when concreting during hot weather.
- B. Follow recommendations of ACI 306R when concreting during cold weather.
- C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.08 PLACING CONCRETE

- A. Mixing: If batch plant is within travel time not exceeding maximum limits, transit mix concrete in accordance with ASTM C94/C94M. If travel time exceeds limits, provide alternative means for mixing and submit for review and approval.
- B. Place concrete in accordance with ACI 304R.
- C. Do not place concrete when base surface is wet.
- D. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.
- E. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- F. Use internal vibration to consolidate concrete around reinforcing per industry guidelines.

3.09 JOINTS

- A. Align curb, gutter, and sidewalk joints.

- B. Place 1/2 inch wide expansion joints as indicated on Drawings and to separate paving from vertical surfaces and other components and in pattern indicated.
 - 1. Place in all concrete walks, other exterior flatwork and concrete curbs and gutters.
 - 2. If expansion joints are not indicated, comply with standard details and specifications of authorities having jurisdiction, including Standard Details for Public Works Construction and Standard Specification for Public Works Construction, as applicable.
 - 3. Place expansion control filler to correct elevation and profile. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
 - 4. Secure to resist movement by wet concrete.
 - 5. Coordinate locations of joints for walkways to align expansion joints in adjoining concrete walks, curbs, gutters and other exterior flatwork.
 - 6. Provide expansion joints also at beginning and end of all curved segments at sidewalks.
 - 7. Provide expansion joints also at intersections of concrete curbs and gutters and building footing.
 - 8. Provide expansion joints also at intersections of concrete paving and building footing.
 - 9. Lay out expansion joint locations to occur where possible at penetrations such as handrail posts and columns.
 - 10. Place expansion control filler to correct elevation and profile.
- C. Provide scored joints:
 - 1. As indicated on Drawings. If not indicated, locate joints in compliance with Standard Details and as indicated below.
 - 2. Evenly spaced at maximum 5 feet intervals for vehicular paving and 5 feet for pedestrian paving.
 - 3. Between sidewalks and curbs.
 - 4. Between curbs and pavement.
 - 5. Lay out control joint locations to occur at penetrations such as handrail posts and columns and where shown on Drawings.
 - 6. Refer to Architectural, Landscape and Civil Drawings for additional information and joint locations.
- D. Provide keyed joints as indicated.
- E. Saw cut contraction joints 1/8 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.10 FINISHING

- A. Sidewalk Paving: As indicated on Drawings, minimum equal to Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.
 - 1. Broomed: Pull broom across freshly floated concrete to produce medium texture in straight lines perpendicular to main line of traffic. Do not dampen brooms.
 - 2. Tooled Joints: 1-inch deep by 3/16-inch wide tooled joints with 1/8-inch radius corners.
- B. Specific Finishes: Where indicated on Drawings.

1. Concrete Paving Finish: ACI 301, two-step trowel finish, followed after surface has achieved initial set by flooding of surface and light rubbing with bristle brush so that concrete fines are exposed slightly.
 - a. Finish surface less than 6 percent shall receive medium broom finish resembling medium grit sandpaper. CBC 11B-403 and 11B-302.1.
 - b. Finish surface greater than 6 percent shall receive heavy broom finish. CBC 11B-403 and 11B-302.1.
 - c. Surfaces shall have static coefficients of friction of 1.3 to 1.6 (dry) and 1.2 to 1.4 (wet) when field tested in accordance with ASTM D2047.
- C. Curing and Sealing:
 1. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.
 2. Precautions shall be taken in hot weather to prevent plastic cracking resulting from excessively rapid drying at surface as described in CIP 5 Plastic Shrinkage Cracking published by the National Ready Mixed Concrete Association.
 3. Do not cover concrete with plastic sheeting.

3.11 TOLERANCES

- A. ACI 301, Class B, except paving in public rights-of-way shall comply with the Standard Specifications.
- B. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- C. Maximum Variation From True Position: 1/4 inch.
- D. Control-joint grooves and other conspicuous lines:
 1. 1/4 inch maximum in any 20 feet.
 2. 1/2 inch maximum in any 40 feet.
- E. Variation in Cross-Sectional Thickness of Slabs:
 1. Minus 1/4 inch.
 2. Plus 1/2 inch.
- F. Variation in Radii
 1. In radii of less than 10 feet:
 - a. 1/8 inch in any 5 feet.
 - b. 1/4 inch in any 10 feet.
 2. In radii of 20 feet:
 - a. 1/4 inch in any 10 feet.
 - b. 3/8 inch in any 20 feet
 3. In radii of 30 feet or more:
 - a. 1/2 inch in any 20 feet.
 - b. 1 inch in any 30 feet.
- G. Coefficient of Friction for Finish Surface:

1. Pedestrian Vehicular Finish Surface: Minimum 0.6 static coefficient of friction is required for all concrete paving finish surface. All concrete paving surfaces to be broom finish.
2. Ramps: Minimum 0.8 static coefficient of friction is required for all concrete paving finish surfaces on ramps. All concrete paving surfaces on ramps to be broom finish.

3.12 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
 1. Provide free access to concrete operations at project site and cooperate with appointed firm.
 2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
 3. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- B. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 75 cu yd or less of each class of concrete placed each day.
 1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
 2. Perform one slump test for each set of test cylinders taken.
- C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.13 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit pedestrian traffic over pavement until 75 percent design strength of concrete has been achieved.

END OF SECTION

SECTION 33 05 43
CORROSION PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Protection of underground utilities from corrosion.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures, reports, coordination.
- B. Section 33 14 16 - Site Water Utility Distribution Piping.
- C. Section 33 31 13 - Site Sanitary Sewerage Gravity Piping.
- D. Section 33 41 00 - Subdrainage.
- E. Section 33 42 11 - Stormwater Gravity Piping.
- F. Section 33 52 16 - Gas Hydrocarbon Piping.

1.03 REFERENCE STANDARDS

- A. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2018.
- B. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.
- C. AWWA C200 - Steel Water Pipe, 6 In. (150 mm) and Larger; 2017.
- D. AWWA C222 - Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings; 2008 (Including Addendum C222A-09).
- E. AWWA C215 - Extruded Polyolefin Coatings for Steel Pipe; 2016.
- F. AWWA C214 - Tape Coating Systems for the Exterior of Steel Water Pipelines; 2007.
- G. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipe; 2015.
- H. AWWA C213 - Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings; 2015.
- I. AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe, 4 in. (100 mm) and Larger - Shop Applied; 2012.
- J. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.
- K. AWWA C217 - Microcrystalline Wax and Petrolatum Tape Coating Systems for Steel Water Pipe and Fittings; 2016.
- L. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).
- M. NACE SP0169 - Control of External Corrosion on Underground or Submerged Metallic Piping Systems; 2013.
- N. NACE SP0286 - Electric Isolation of Cathodically Protected Pipelines; 1997 (Reaffirmed 2007).
- O. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of corrosion protection with size, location and installation of service utilities.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's product literature, component dimensions, describe components within assembly, anchorage and fasteners, and special installation requirements.
- C. Test Reports: Indicate electrical continuity.
- D. Manufacturer's Field Reports: Indicate procedures followed and supplementary instructions given.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- D. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in unopened packaging until ready for installation.
- B. Store components under a dry covered area and elevated above grade.

1.08 WARRANTY

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

PART 2 PRODUCTS

2.01 APPLICATIONS / SYSTEM DESCRIPTION

- A. Steel Pipe or Valve Assemblies:
 - 1. Implement all the following measures:
 - a. Underground steel pipe with rubber gasketed, mechanical, grooved end, or other nonconductive type joints should be bonded for electrical continuity. Electrical continuity is necessary for corrosion monitoring and cathodic protection.

- b. To prevent dissimilar metal corrosion cells and to facilitate the application of cathodic protection, electrically isolate each buried steel pipeline per NACE SP0286 from:
 - 1) Dissimilar metals.
 - 2) Dissimilar coated piping (cement-mortar vs. dielectric).
 - 3) Above ground steel pipe.
 - 4) All existing piping.
 - c. Choose one of the following corrosion control options:
 - OPTION 1
 - 1) Apply a suitable dielectric coating intended for underground use such as:
 - (a) Polyurethane per AWWA C222; or
 - (b) Extruded polyethylene per AWWA C215; or
 - (c) A tape coating system per AWWA C214; or
 - (d) Hot applied coal tar enamel per AWWA C203; or
 - (e) Fusion bonded epoxy per AWWA C213.
 - 2) Apply cathodic protection to steel piping as per NACE SP0169.
 - OPTION 2
 - 3) As an alternative to dielectric coating and cathodic protection, apply a 3 inch cement mortar coating per AWWA C205 or encase in concrete 3 inches thick, using any type of cement. Joint bonds, test stations, and insulated joints are still required for these alternatives.
2. NOTE: Some steel piping systems, such as for oil, gas, and high-pressure piping systems, have special corrosion and cathodic protection requirements that must be evaluated for each specific application.
- B. Iron Pipe or Valve Assemblies:
- 1. Implement all the following measures:
 - a. Choose one of the following corrosion control options:
 - OPTION 1
 - 1) Apply a suitable coating intended for underground use such as:
 - (a) Polyethylene encasement per AWWA C105/A21.5; or
 - (b) Epoxy coating; or
 - (c) Polyurethane; or
 - (d) Wax tape.
 - 2) NOTE: The thin factory-applied asphaltic coating applied to ductile iron pipe for transportation and aesthetic purposes does not constitute a corrosion control coating.
 - 3) Apply cathodic protection to cast and ductile iron piping as per NACE SP0169.
 - OPTION 2
 - 4) As an alternative to coating systems described in Option 1 and cathodic protection, concrete encase all buried portions of metallic piping so that there is a minimum of 3 inches of concrete cover provided over and around surfaces of pipe, fittings, and valves using any type of cement.
- C. Copper Tubing:
- 1. Protect buried copper tubing by one of the following measures:

- a. Installation of a factory-coated copper pipe with a minimum 25-mil thickness. The coating must be continuous with no cuts or defects.
- b. Installation of 12-mil polyethylene pipe wrapping tape with butyl rubber mastic over a suitable primer. Protect wrapped copper tubing by applying cathodic protection per NACE SP0169.

2.02 MATERIALS

- A. Factory Coated Potable Water Copper Piping:
 - 1. Coating: Polyethylene.
 - 2. Thickness: 25 mils on 5/8 inch pipe.
 - 3. Copper Pipe: Type as indicated in Division 22 and 33.
 - 4. Manufacturers:
 - a. Kamco Products Limited; Aqua Shield™;: www.kamcoproducts.com.
 - b. Mueller Industries; Streamline Protec™: www.muellerindustries.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Factory Coated Natural Gas and LP Gas Copper Piping:
 - 1. Coating: Linear Low Density Polyethylene LLDPE Extrusion Resin.
 - a. Additional Outer Sleeve Option: Black HDPE Outer Sleeve.
 - 2. Thickness: 25 mils on 5/8 inch pipe.
 - 3. Copper Pipe: Type as indicated in Division 22, 23, and 33.
 - a. Type L, ASTM B88.
 - b. REF Type, ASTM B280.
 - 4. Manufacturers:
 - a. Kamco Products Limited; Gas-Tec™: www.kamcoproducts.com.
 - b. Mueller Industries; Streamline Protec™: www.muellerindustries.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Tape Coating System:
 - 1. Basis of Design: Polyken manufacture by Berry Plastics Corporation, www.berryplastics.com or approved equal..
 - 2. Provide straight pipe sections with a four layer polyethylene tape system, where not factory coated:
 - a. Products:

1) Primer:	1027 Butyl Liquid Adhesive and Primer
2) Filler tape:	939
3) Weld stripping tape:	933-25 black
4) Inner layer tape:	989-20 black
5) Middle layer tape:	955-30 gray
6) Outer layer tape:	956-30 white
 - b. Primer layer.
 - c. Filler tape, extruded butyl rubber compound compatible with the primer and tape.
 - d. Weld stripping tape, if required (25 mils).

- e. Inner layer, corrosion protection tape (20 mils).
 - f. Middle layer, mechanical protection tape (30 mils).
 - g. Outer layer, mechanical protection tape (30 mils) with ultraviolet light stabilizers.
 - h. Total system thickness shall be at least 80 mils.
 - i. Provide coating materials supplied by a single manufacturer, and shall have a successful application and service history on pipe fabricated in accordance with AWWA C200.
3. Provide fittings, specials, and field joints with a three layer polyethylene tape system:
- a. Products:
 - 1) Primer: 1027 Butyl Liquid Adhesive and Primer
 - 2) Filler tape: 939
 - 3) Inner layer tape: 930-50 black
 - 4) Outer layer tape: 955-30 white
 - b. Primer layer
 - c. Filler tape, extruded butyl rubber compound compatible with the primer and tape.
 - d. Inner layer, corrosion protection tape (50 mils).
 - e. Outer layer, mechanical and ultraviolet light protection tape (30 mils).
 - f. Total system thickness shall be at least 80 mils.
 - g. The coating materials shall be supplied by the same manufacturer as the materials for straight pipe.
4. Storage of Materials: Store materials within the temperature ranges specified for application, using heated storage areas if necessary. Tape shall be stored at a minimum temperature of 70 degrees F
- D. Mortar Coating:
- 1. Thickness: 1 inch thick reinforced mortar coating over the tape coat system.
 - 2. Mortar Coating: Comply with AWWA C205.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that piping is installed correctly and tested.

3.02 CORROSION PROTECTIVE COATING APPLICATION

- A. Comply with NACE SP0169.
- B. Steel Pipe or Valve Assemblies:
 - 1. Implement all the following measures:
 - a. Install corrosion monitoring test stations to facilitate corrosion monitoring and the application of cathodic protection:
 - 1) At each end of the pipeline.
 - 2) At each end of all casings.
 - 3) Other locations as necessary so the interval between test stations does not exceed 1,200 feet.

- b. To prevent dissimilar metal corrosion cells and to facilitate the application of cathodic protection, electrically isolate each buried steel pipeline per NACE SP0286 from:
 - 1) Dissimilar metals.
 - 2) Dissimilar coated piping (cement-mortar vs. dielectric).
 - 3) Above ground steel pipe.
 - 4) All existing piping.
- C. Iron Pipe or Valve Assemblies:
 - 1. Implement all the following measures:
 - a. Electrically insulate underground iron pipe from dissimilar metals and from above ground iron pipe with insulating joints per NACE SP0286. (e.g.; Flange Isolation Joint Kits. This is especially important for fire risers.)
 - b. Bond all nonconductive type joints for electrical continuity. Electrical continuity is necessary for corrosion monitoring and cathodic protection.
 - c. Install corrosion monitoring test stations to facilitate corrosion monitoring and the application of cathodic protection:
 - 1) At each end of the pipeline.
 - 2) At each end of any casings.
 - 3) Other locations as necessary so the interval between test stations does not exceed 1,200 feet.
- D. Copper Tubing:
 - 1. Protect buried copper tubing by one of the following measures:
 - a. Prevention of soil contact. Soil contact may be prevented by placing the tubing above ground or encasing the tubing using PVC pipe with solvent-welded joints.
 - b. Installation of a factory-coated copper pipe with a minimum 25-mil thickness. The coating must be continuous with no cuts or defects.
 - c. Installation of 12-mil polyethylene pipe wrapping tape with butyl rubber mastic over a suitable primer. Protect wrapped copper tubing by applying cathodic protection per NACE SP0169.
- E. Plastic and Vitrified Clay Pipe
 - 1. No special precautions are required for plastic and vitrified clay piping placed underground from a corrosion viewpoint.
 - 2. Protect all metallic fittings and valves with wax tape per AWWA C217 or epoxy.
- F. All Pipe or Valve Assemblies:
 - 1. On all pipes, appurtenances, and fittings not protected by cathodic protection, coat bare metal such as valves, bolts, flange joints, joint harnesses, and flexible couplings with wax tape per AWWA C217 after assembly.
 - 2. Where metallic pipelines penetrate concrete structures such as building floors, vault walls, and thrust blocks use plastic sleeves, rubber seals, or other dielectric material to prevent pipe contact with the concrete and reinforcing steel.
- G. Concrete

1. From a corrosion standpoint, any type of cement may be used for concrete structures and pipe because the sulfate concentration is negligible, 0 to 0.1 percent. (American Concrete Institute (ACI 318) Table 4.3.1)
2. Standard concrete cover over reinforcing steel may be used for concrete structures and pipe in contact with these soils due to the low chloride concentration found on-site. (Design Manual 303: Concrete Cylinder Pipe. Ameron. p.65)

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Tape Application:
 1. Tape coating materials shall be applied in accordance with this Section, the product application instructions of the tape manufacturer, and the field technical support instructions from the manufacturer.
 2. Weld Surface Preparation:
 - a. To provide for an effective, long-term bond between the tape coating system and the substrate, the following pipe weld surface preparation shall be provided.
 - 1) Weld surfaces with a reinforcement greater than 1/32-inch and all longitudinal and coil splice welds shall be ground to provide a smooth surface with a reinforcement not exceeding 1/32-inch. The resulting weld surface shall have a cross-section shape that is free of discontinuities, abrupt changes in curvature, with no ridges or valleys that may promote bridging or disbondment of the tape from the substrate.
 - b. Weld Stripping Tape: Provide weld stripping tape, 6 inches wide, if any of the following conditions are present. Apply tape with the center of the tape at the weld.
 - 1) If elected to use stripping tape in lieu of grinding or part of the grinding required above. In such a case, the weld reinforcement is not to exceed 3/32-inch, and the weld surface shall have a cross-section shape that is free of discontinuities, abrupt changes in curvature, with no ridges or valleys that may promote bridging or disbondment of the tape from the substrate.
 - 2) If the initial pipe sections taped have indications that the inner tape layer is not bonding completely to the pipe at the welds.
 - 3) If the tape bond to the welds or adjacent surfaces is less than the tape bond to the pipe surface away from the welds.
 - c. Welds that have been prepared with a reinforcement not exceeding 1/32-inch, and a cross-section slope that is free of discontinuities, abrupt changes in curvature, with no ridges or valleys that may promote bridging or disbondment of the tape from the substrate require no additional preparation.
 3. Pipe Surface Preparation:
 - a. Detergent clean surfaces to be coated in accordance with SSPC-SP1 prior to abrasive blasting.
 - b. Remove all burrs, sharp edges, and weld splatter prior to abrasive blasting.
 - c. Abrasive blast immediately before application of the primer.
 - 1) Use sand, metallurgical slag, or a combination of steel grit and shot to produce a surface in conformance with SSPC-SP 6.

- 2) Steel grit shall comprise at least 60 percent of the working mix of abrasive, if a centrifugal wheel abrasive blaster is used.
- 3) The prepared surface shall have a surface profile not exceeding 2 mils.
- d. Apply abrasive blasting and primer application when the substrate surface is at least 5 degrees F above the dew point.
 - 1) Provide abrasive blasting, priming, and inner layer tape application during the same working day for each pipe section.
- 4. Pipe End Preparation:
 - a. Coating cut-backs at the pipe ends: 6 inches, with the cuts parallel to the pipe ends.
 - 1) Protect exposed substrate surfaces with a storage primer applied immediately after taping and before flash rusting of the surface.
 - b. Spiral or longitudinal pipe welds within two feet of the pipe ends shall be ground flush prior to abrasive blast cleaning.
 - c. Pipe ends that will be connected with sleeve-type couplings shall be epoxy coated for immersion service.
 - 1) Cut-Backs: Minimum 6 inches at couplings to provide clearance between the coupling and tape.
 - 2) Epoxy Coating: Extend minimum 6 inches beyond each side of the sleeve coupling on the outside surface of the pipe.
- 5. Application of Tape:
 - a. Maintain pipe shell temperature within a range of 45 degrees F to 100 degrees F during application of the tape system.
 - b. Maintain inner layer tapes a minimum temperature of 70 degrees F during application.
 - 1) Maintain middle and outer layer tapes at a minimum temperature of 90 degrees F during application.
 - c. Tape Application Tension: Maintained at a value that produces a tape width reduction equal to 1.0 to 2.0 percent of the tape width during application, as recommended by the tape manufacturer. Maintain width reduction simultaneously with the minimum tape temperature.
 - d. At the point of tape application, all tape, including weld stripping tape, press onto the pipe with a pressure roller that maintains a constant pressure. Use enough pressure to fully bond the tape at all welds.
 - e. Filler tape shall be used at lap joints, weld step-downs, and other discontinuities.
 - f. The tape application equipment and materials shall result in a fully bonded tape coating system, without blisters, voids, wrinkles or any areas that have a lack of bond to the pipe.
 - g. Succeeding layers of tape shall be applied so that the laps are staggered by at least two inches.
 - h. Before tape application, the primer shall be dried sufficiently so that the primer is in a tacky to dry condition.
 - i. Primer: Apply while it is in a temperature range of 50 degrees F to 80 degrees F, using airless spray equipment and a drum agitator. Application shall be of uniform thickness on all pipe surfaces.

6. Repair Patches
 - a. Repair patches shall be applied by wrapping tape completely around the pipe, using the tape system for joints.
7. Tape Application to Fittings, Specials:
 - a. Filler tape shall be used to fill voids on fittings, specials, welds, and pipe joints.
 - b. All bell and spigot joints, lap joints, and other locations where voids will otherwise exist: Provide specially shaped, filler tape applied after priming.
 - c. Field pipe joints shall be prepared as required by the paragraph entitled "Pipe Surface Preparation," except that shop blasted surfaces that have been coated with a storage primer or an epoxy coating may be power tool cleaned instead of abrasive blast cleaned. The power tool cleaning shall be done in accordance with SSPC-SP2. Pipe ends not effectively protected with a storage primer shall be abrasive blasted to SSPC-SP6.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Test for electrical continuity in accordance with NACE SP0286.

3.05 CLOSEOUT ACTIVITIES

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

3.06 PROTECTION

- A. Protect installed coatings from subsequent construction operations.

END OF SECTION

SECTION 33 42 11
STORMWATER GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Storm drainage piping, fittings, and accessories.
- B. Connection of drainage system to on-site system.
- C. Catch basins, Paved area drainage, and Site surface drainage.

1.02 RELATED REQUIREMENTS

- A. Section 00 31 00 - Available Project Information : Subsurface Investigations.
- B. Section 03 30 00 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.
- C. Section 31 23 16 - Excavation: Excavating of trenches.
- D. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.
- E. Section 31 23 23 - Fill: Bedding and backfilling.

1.03 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2018.
- C. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016.
- D. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete; 2017.
- E. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction; 2000.
- F. SSPWC - Greenbook: Standard Specifications for Public Works Construction; latest adopted edition.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of storm drainage with size, location and installation of service utilities.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.06 SUBMITTALS

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

- B. Product Data: Provide data indicating pipe, pipe accessories.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- E. Field Quality Control Submittals: Document results of field quality control testing.
- F. Project Record Documents:
 - 1. Submit documents under provisions of Section 01 78 00 - Closeout Submittals.
 - 2. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.
 - 3. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.07 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that storm drainage system piping may be installed in compliance with original design and referenced standards.
 - 1. Locate existing storm drainage system piping and structures that are to be abandoned and closed.

1.08 SEQUENCING AND SCHEDULING

- A. Coordinate connection to public storm sewer with utility company.
- B. Coordinate with interior building storm drainage piping.
- C. Coordinate with other utility work.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Comply with applicable code for materials and installation of the Work of this section.
 - 1. Conform to requirements of California Plumbing Code and Authorities Having Jurisdiction.
- B. Utility Compliance: Comply with local utility regulations and standards pertaining to storm drainage systems.
- C. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to storm drainage systems.

2.02 DRAINAGE PIPE MATERIALS

- A. Provide products that comply with applicable code(s).
- B. Plastic Pipe: ASTM D3034, Type PSM, Poly Vinyl Chloride (PVC) material; inside nominal diameter of 4 to 15 inches, bell and spigot style solvent sealed joint end.
 - 1. SDR 35, unless indicated otherwise on Drawings.
 - 2. Maximum pipe length 20 feet.
- C. Refer to Drawings for additional information.

2.03 PIPE ACCESSORIES

- A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.
- B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required wyes, bends, cleanouts, reducers, traps and other configurations required.
- C. Filter Fabric: Non-biodegradable, woven . Provide 315ST manufactured by Advanced Drainage Systems, Inc.: www.ads-pipe.com.
- D. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Storm Drain " in large letters.

2.04 CATCH BASIN, TRENCH DRAIN, CLEANOUT, AND AREA DRAIN COMPONENTS

- A. Catch Basin:
 - 1. Basis of Design Product: CBXXXX Series as manufactured by J&R Concrete Products; www.jrconcreteproducts.com, or approved equal.
 - 2. Precast Structural Concrete Units: Comply with , PCI MNL-120, PCI MNL-135, and applicable codes.
 - a. Design components to withstand dead loads and design loads in the configuration indicated on the drawings.
- B. Reinforced cast-in-place concrete, nominal dimension as indicated on Drawings.
- C. Lids and Drain Covers: Cast iron; extra heavy duty proof load; lockable; hinged.
 - 1. Basis of Design Product: CBXXXX Series as manufactured by J&R Concrete Products; www.jrconcreteproducts.com, or approved equal.
 - 2. At pedestrian areas provide ADA compliant grates with maximum 1/2 inch wide openings. Place linear openings perpendicular to path of travel.
 - 3. Catch Basin:
 - a. Lid Design: Linear grate.
 - 1) At vehicle traffic areas provide AASHTO H-20 load rating.
 - b. Nominal Lid and Frame Size: As indicated on Drawings.
 - 4. Cleanout:
 - a. Lid Design: Checkerboard grate.
 - b. Nominal Lid and Frame Size: As indicated on Drawings.
 - 5. Area Drain:
 - a. Lid Design: Linear grate.
 - b. Nominal Lid and Frame Size: As indicated on Drawings.

2.05 GEOTEXTILE FILTER FABRIC

- A. Non-biodegradable, non-woven, AASHTO M288 Class 2. Provide Geosynthetics 601T manufactured by ADS Advanced Drainage Systems, Inc.; www.ads-pipe.com.

2.06 BEDDING AND COVER MATERIALS

- A. Bedding: As specified in Section 31 23 16.13.
- B. Cover: As specified in Section 31 23 23.

PART 3 EXECUTION

3.01 TRENCHING

- A. Hand trim excavation for accurate placement of pipe to elevations indicated.
 - 1. Correct over excavation in accordance with Section 31 22 00 - Grading.
 - 2. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.
- C. Bedding:
 - 1. Excavate pipe trench in accordance with Section 31 23 16.13 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
 - 2. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inch compacted depth, compact to 90 percent.
 - 3. Maintain optimum moisture content of bedding material to attain required compaction density.

3.02 EXAMINATION

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.

3.03 CLOSING ABANDONED STORM DRAINAGE SYSTEM

- A. Abandoned Piping: Close open ends of abandoned underground piping that is indicated to remain in place. Provide sufficiently strong closures to withstand hydrostatic or earth pressure that may result after ends of abandoned utilities have been closed.
 - 1. Close open ends of concrete or masonry utilities with not less than 8 inch thick brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Wood plugs are not acceptable.
- B. Abandoned Structures: Remove structure and close open ends of the remaining piping, or remove top of structure down to not less than 3 feet below final grade; fill structure with stone, rubble, gravel, or compacted dirt, to within 1 foot of top of structure remaining and fill concrete.

3.04 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground drainage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.
 - 1. Install in accordance with SSPWC, local standards and soils report.

2. Install pipe, fittings and accessories in accordance with ASTM D3034 and manufacturer's instructions. Seal joints watertight.
- B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements.
- C. Use fittings for branch connections, except where direct tap into existing sewer or manhole is indicated.
- D. Use proper size increasers and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.
- E. Install piping pitched down in direction of flow, at minimum slope of 2 percent, except where indicated otherwise.
 1. Place bell ends of piping facing upstream.
- F. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.

3.05 INSTALLATION - PIPE

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
 1. Plastic Pipe: Also comply with ASTM D2321.
- C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- D. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system.
- E. Make connections through walls through sleeved openings, where provided.
- F. Install continuous trace wire 6 inches above top of pipe; coordinate with Division 31 - Earthwork.

3.06 INSTALLATION - CATCH BASINS, TRENCH DRAINS AND CLEANOUTS

- A. Install cleanouts and extension from storm sewer drain pipe to cleanout at grade as indicated. Set cleanout frame and cover in concrete block 18 by 18 by 12 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with grade when installing in paving.
 1. Provide as shown on plans or as required by Plumbing Code.
- B. Form bottom of excavation clean and smooth to correct elevation.
- C. Form and place cast-in-place concrete base pad, with provision for drainage pipe end sections.
- D. Level top surface of base pad; sleeve concrete shaft sections to receive drainage pipe sections.
- E. Establish elevations and pipe inverts for inlets and outlets as indicated.
- F. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.07 TAP CONNECTIONS

- A. Make connections to existing piping and underground structures so that finished work will conform as nearly as practicable to the requirements specified for new work.
- B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6 inch overlap, with not less than 6 inches of 3000 psi 28-day compressive-strength concrete.
- C. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material that may accumulate.

3.08 CLEANING

- A. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
 - 1. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
 - 2. Flush piping between manholes, if required by local authority, to remove collected debris.

3.09 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 40 00 - Quality Requirements.
 - 1. Perform testing of completed site piping in accordance with the Uniform Plumbing Code using water or air pressure test.
- B. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.
 - 1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
 - 2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects correct such defects, and reinspect.
 - 3. Perform video inspection of all piping prior to final acceptance of work.
 - a. All video operations shall be recorded digitally for playback if required.
 - b. All video inspections will include a detailed narrative identifying exact locations of the installed lines and limits of areas to be re-installed.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to District.

3.10 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 71 19
ELECTRICAL UNDERGROUND DUCTS, DUCTBANKS, AND MANHOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Conduit and duct:
 - 1. Galvanized steel rigid metal conduit (RMC).
 - 2. Rigid polyvinyl chloride (PVC) conduit.
 - 3. Polyvinyl chloride (PVC) plastic utilities duct.
 - 4. High density polyethylene (HDPE) conduit.
 - 5. Reinforced thermosetting resin conduit (RTRC).
- B. Accessories:
 - 1. Underground warning tape.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
- B. ASTM F512 - Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation; 2012 (Reapproved 2017).
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
- E. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2016.
- F. NEMA TC 6&8 - Polyvinyl Chloride (PVC) Plastic Utilities for Underground Installations; 2013.
- G. NEMA TC 7 - Smooth-Wall Coilable Electrical Polyethylene Conduit; 2016.
- H. NEMA TC 9 - Fittings for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation; 2004 (Reaffirmed 2012).
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- K. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- L. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- M. UL 651A - Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit; Current Edition, Including All Revisions.

- N. UL 2420 - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.
- O. UL 2515 - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for metallic conduit, nonmetallic conduit, and manhole accessories.
- C. Shop Drawings: Indicate dimensions, reinforcement, size and locations of openings, and accessory locations for precast manholes.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual routing and elevations of underground conduit and duct, and locations and sizes of manholes.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of CEC.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 CONDUIT AND DUCT

- A. Galvanized Steel Rigid Metal Conduit (RMC): NFPA 70, Type RMC; comply with ANSI C80.1 and list and label as complying with UL 6.
 - 1. Manufacturers:
 - a. Allied Tube & Conduit: www.alliedeg.com/#sle.
 - b. Republic Conduit: www.republic-conduit.com/#sle.
 - c. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Fittings: Comply with NEMA FB 1 and list and label as complying with UL 514B; steel or malleable iron, threaded type.
 - a. Manufacturers:
 - 1) Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - 2) O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - 3) Thomas & Betts Corporation: www.tnb.com/#sle.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.
- B. Rigid Polyvinyl Chloride (PVC) Conduit: NFPA 70, Type PVC; comply with NEMA TC 2 and list and label as complying with UL 651; Schedule 40 unless otherwise indicated; rated for use with conductors rated 90 degrees C.
 - 1. Manufacturers:

- a. Cantex Inc: www.cantexinc.com/#sle.
 - b. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
 - c. JM Eagle: www.jmeagle.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Fittings: Comply with NEMA TC 3 and list and label as complying with UL 651.
- a. Manufacturer: Same as manufacturer of conduit to be connected.
- C. Polyvinyl Chloride (PVC) Plastic Utilities Duct: Comply with NEMA TC 6&8 and ASTM F512; Type EB-20 listed and labeled as complying with UL 651, suitable for burial with concrete encasement.
1. Manufacturers:
- a. Cantex Inc: www.cantexinc.com/#sle.
 - b. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
 - c. JM Eagle: www.jmeagle.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Fittings: Comply with NEMA TC 9.
- a. Manufacturer: Same as manufacturer of duct to be connected.
- D. High Density Polyethylene (HDPE) Conduit: NFPA 70, Type HDPE; comply with NEMA TC 7 and list and label as complying with UL 651A; Schedule 40 unless otherwise indicated.
1. Manufacturers:
- a. Blue Diamond Industries, LLC: www.bdiky.com/#sle.
 - b. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
 - c. Dura-Line: www.duraline.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Reinforced Thermosetting Resin Conduit (RTRC) and Fittings: NFPA 70, Type RTRC; list and label as complying with UL 2420 or UL 2515.
1. Manufacturers:
- a. Champion Fiberglass, Inc: www.championfiberglass.com/#sle.
 - b. FRE Composites USA, Inc: www.frecomposites.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

- A. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for the conduit/duct arrangement to be installed.
1. Products:
- a. Advance Products & Systems, LLC; Duct Bank Spacers: www.apsonline.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Underground Warning Tape: Polyethylene tape suitable for direct burial.
1. Manufacturers:
- a. Brady Corporation: www.bradyid.com/#sle.
 - b. Brimar Industries, Inc: www.brimar.com/#sle.

- c. Seton Identification Products: www.seton.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.
 3. Legend: Type of service, continuously repeated over full length of tape.
 4. Color:
 - a. Tape for Buried Power Lines: Black text on red background.
 - b. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.03 SOURCE QUALITY CONTROL

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

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify routing and termination locations of duct bank prior to excavation for rough-in.
- C. Duct bank routing is shown in approximate locations unless dimensions are indicated. Route as required to complete duct system.

3.02 DUCT BANK INSTALLATION

- A. Install duct to locate top of ductbank at depths as indicated on drawings.
- B. Install duct with minimum slope of 4 inches per 100 feet (0.33 percent). Slope duct away from building entrances.
- C. Cut duct square using saw or pipe cutter; de-burr cut ends.
- D. Insert duct to shoulder of fittings; fasten securely.
- E. Join nonmetallic duct using adhesive as recommended by manufacturer.
- F. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- G. Install no more than equivalent of three 90-degree bends between pull points.
- H. Provide suitable fittings to accommodate expansion and deflection where required.
- I. Stagger duct joints vertically in concrete encasement 6 inches minimum.
- J. Use suitable separators and chairs installed not greater than 4 feet on centers.
- K. Band ducts together before backfilling.
- L. Securely anchor duct to prevent movement during concrete placement.
- M. Place concrete under provisions of Section 03 30 00. Use mineral pigment to color concrete red.
- N. Provide minimum 3 inch concrete cover at bottom, top, and sides of ductbank.
- O. Provide two No. 4 steel reinforcing bars in top of bank under paved areas.

- P. Provide suitable pull string in each empty duct except sleeves and nipples.
- Q. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.
- R. Interface installation of underground warning tape with backfilling. Install tape 6 inches below finished surface.

END OF SECTION