CITY OF CRESCENT CITY
PUBLIC WORKS DEPARTMENT

NOTICE INVITING SEALED BIDS, SPECIAL PROVISIONS, PROPOSAL AND CONTRACT

BEACHFRONT PARK IMPROVEMENTS PHASE 1B

CRESCENT CITY, DEL NORTE COUNTY, CALIFORNIA

For Use in Connection with CALTRANS 2024 Standard Specifications and Standard Plans, and Current Labor Surcharge and Equipment Rental Rates.

CONTRACT NUMBER 2026-1056.3

Bids Open: April 13, 2026
Dated: March 18, 2026

****

IMPORTANT
SPECIAL NOTICES

The Bidder's attention is directed to the following:

- There is a Base Bid with 87 bid items listed. A bid must be submitted for **all** bid items. The Contract award will be based on the lowest Base Bid.
    - There is one sets of Plans for this project - Beachfront Park Improvements Phase 1B.
- Beachfront Park Improvements Phase 1A, including the Bike Pump Track and west side park trails, has been completed.
- There are currently two adjoining projects already under contract:
    - Beachfront Park Tolowa Cultural Trail (Phase 1C-partial)
    - Front Street Gateway Improvements (Phase 1C-partial & CDBG)
- There is no federal funding for this project, therefore there are no Section 3 requirements. This project is funded through a Prop 68 grant from the State of California.
- All work is subject to the requirements of the Coastal Development Permit, included within bid documents. The City has a conditional CDP, pending final review of this plan set. A CDP has been granted for the two projects listed above, as well as this project pending a final review of the 100% plan set. The Coastal Commission is currently reviewing these plans. Any changes required by the Coastal Commission to finalize an amended CDP will be addressed with a Change Order post bid award.
- As a part of complying with the amended CDP, the City is providing a SWPPP based on these plan sheets. The implementation of SWPP BMP's, reporting, and updating the SWPPP will be the responsibility of the contractor.
- Please reference Specification Section 11 68 00 and Section 32 18 16 to obtain information regarding specialty playground equipment and surfacing, and Specification Section 32 33 00 for site furnishings.

The above special notices do not relieve the Bidder of his/her responsibility to become fully familiar with the Contract Documents including the Plans and Specifications.

CRESCENT CITY BEACHFRONT PARK IMPROVEMENTS PHASE 1B

SECTION 00 01 10

TABLE OF CONTENTS

Section Title

PART A - BIDDING AND CONTRACT REQUIREMENTS GROUP

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

INTRODUCTORY INFORMATION

00 01 10 Table of Contents

PROCUREMENT REQUIREMENTS

00 10 00 Invitation to Bid
00 20 00 Instructions to Bidders
00 31 46 Permits
00 40 00 Bid
00 41 00 Bidding Schedule
00 43 13 Bid Guaranty Bond
00 43 36 Proposed Subcontractors
00 45 13 Certification of Bidder's Experience and Qualifications
00 45 19 Non-Collusion Affidavit
~~00 45 21 Anti-Lobbying Certification~~

CONTRACTING REQUIREMENTS

00 52 00 Agreement
00 61 05 Faithful Performance Bond
00 61 10 Payment Bond
00 62 00 Certificates and Other Forms
00 72 00 General Conditions

PART B – TECHNICAL SPECIFICATIONS GROUP

GENERAL REQUIREMENTS SUBGROUP

DIVISION 01 – GENERAL REQUIREMENTS

01 03 00 Special Project Procedures
01 11 00 Summary of Work
01 11 05 Contract Time
01 20 00 Measurement and Payment
01 25 00 Substitution Procedures
01 33 00 Submittal Procedures

01 41 00 Regulatory Requirements
01 45 00 Quality Control
01 45 29 Testing Laboratory Services
01 55 26 Temporary Traffic Control
01 56 39 Temporary Tree & Plant Protection
01 57 23 Water Pollution Prevention
01 74 23 Final Cleaning

FACILITY CONSTRUCTION SUBGROUP

DIVISION 02 - EXISTING CONDITIONS

02 00 00 Existing Conditions
02 01 00 Maintenance of Existing Conditions
02 01 20 Protecting Existing Underground Utilities
02 22 10 Trench & Backfill
02 30 00 Earthwork
02 41 00 Demolition
02 41 19 Selective Demolition

DIVISION 03 - CONCRETE

03 10 00 Concrete Formwork
03 20 00 Concrete Reinforcing
03 30 00 Cast in place Concrete

DIVISION 04 – NOT USED

DIVISION 05 – METAL

05 12 00 Structural Steel
05 50 00 Metal Fabrications

DIVISION 06 – 08 – NOT USED

DIVISION 09 – FINISHES

09 97 13 Painting and Industrial Coatings

DIVISION 10 – SPECIALTIES

10 14 53 Traffic Signs
10 45 00 Aluminum Signs

DIVISION 11 – EQUIPMENT

11 68 00 Play Equipment and Structures

DIVISION 12 – 21 – NOT USED

DIVISION 22 – PLUMBING

22 14 00 Storm Drains
22 26 22 PVC Gravity Sewer Pipe

DIVISION 23 – 25 – NOT USED

DIVISION 26 – ELECTRICAL

26 01 00 Electrical General
26 05 00 Common Work Results for Electrical
26 05 19 Low Voltage Electrical Power Conductor & Cables
26 05 26 Grounding & bonding for Electrical Systems
26 05 33.13 Conduits for Electrical Systems
26 05 33.13 Boxes for Electrical Systems
26 05 43 Underground Ducts and Raceways for Electrical Systems
26 05 48 Seismic Protection for Electrical Equipment
26 09 93 Sequence of Operations for Lighting Controls
26 10 00 Basic Materials Methods
26 21 00 Low Voltage Electrical Service Entrance
26 24 16 Panelboards
26 27 13 Electricity Metering
26 27 26 Wiring Devices
26 28 16 Enclosed Switches & Circuit Breakers
26 50 00 Lighting

DIVISION 27-30 – NOT USED

DIVISION 31 - EARTHWORK

31 10 00 Site Clearing
31 20 00 Earth Moving
31 22 00 Grading
31 23 17 Sheeting, Shoring & Bracing
31 23 19 Dewatering
31 23 33 Trenching and Backfilling

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 00 00 Exterior Improvements
32 11 00 Base Courses
32 12 00 Flexible Paving
32 12 13 Concrete Paving
32 12 16 Decorative Concrete Paving
32 17 23 Pavement Markings
32 17 26 Tactile Warning Surfacing
32 31 13 Chain Link Fences & Gates
32 33 00 Site Furnishings
32 84 00 Planting Irrigation
32 91 13 Soil Preparation

32 92 00 Turf & Grasses
32 93 00 Plants
32 93 10 Landscape Maintenance

DIVISION 33 - UTILITIES

33 10 00 Water Utilities
33 12 16 Manual Valves
33 13 00 Chlorination of Water Mains for Disinfection
33 41 00 Storm Drain Drainage Piping

DIVISIONS 34 to 39 - NOT USED

~~DIVISION 40 – PROCESS INTERCONNECTIONS~~

~~40 05 00 General Piping Requirements~~
~~40 05 15 Pressure Testing of Piping~~
~~40 05 20 Manual, Check & Process Valves~~
~~40 07 22 Flexible Pipe Couplings~~
~~40 20 40 Ductile Iron Pipe~~
~~40 20 57 Fusion Bonded Epoxy Lines & Coated Steel Pipe~~
~~40 20 76 Stainless Steel Pipe~~

DIVISION 41-76 – NOT USED
~~DIVISION 77 – CITY STREET LIGHTING~~
~~77 01 00 City Street Lighting~~
~~DIVISION 78 – 85 – NOT USED~~
~~DIVISION 86 – ELECTRICAL WORK~~
~~00 86 00 General Electrical Work~~
~~DIVISION 87 – ELECTRICAL SYSTEMS~~
~~00 87 00 General Electrical Systems~~
PROCESS EQUIPMENT SUBGROUP - NOT USED

ATTACHMENT A – STATE PREVAILING WAGE RATES
https://www.dir.ca.gov/OPRL/DPreWageDetermination.htm

ATTACHMENT B – Plan Set Labeled "BEACHFRONT PARK IMPROVEMENTS PHASE 1B" with a Title Page issue date of Feb. 20, 2026 for Contract 2026-1056.3.

END OF SECTION

SECTION 00 10 00

INVITATION TO BID

BEACHFRONT PARK IMPROVEMENTS PHASE 1B

Sealed bids for the construction of the BEACHFRONT PARK IMPROVEMENTS PHASE 1B will be received by the Owner, the City of Crescent City, at the Crescent City Public Works Department office until **3:00 PM on April 13, 2026**. The bids will be opened publicly and read aloud at 3:00 PM on the same day in the Public Works Office. Bids must be addressed to:

City of Crescent City
Public Works Department
377 J Street
Crescent City, CA 95501

and labeled "Bids for the BEACHFRONT PARK IMPROVEMENTS PHASE 1B."

Contractor must be licensed as an (A) General Engineering Contractor by the California Contractors State License Board to bid on this project.

A mandatory pre-bid conference will be held at the City's Cultural Center located at 1001 Front Street, Crescent City CA 95531 on Friday, April 3rd, 2026 @ 11:00 am.

The work includes the furnishing of the labor, materials, and equipment for improvements to Beachfront Park. The Scope of Work includes site clearing, excavation and drainage improvements, water and sewer infrastructure, the installation of playground facilities and park elements, concrete pedestrian pathways and plazas, electrical infrastructure for site lighting and vendor hookups, asphalt paving, fencing, and irrigation and landscaping all in accordance with the drawings and specifications. The project is located in Beachfront Park south of Front Street between L Street (101 South) and Stamps Way in Crescent City, CA.

The project manual may be inspected at the following locations:

City of Crescent City
Public Works Department
377 J Street
Crescent City CA 95531

Humboldt Builders Exchange
624 C Street
Eureka, CA 95501
(707) 442-3708

Shasta Builders Exchange
2985 Innsbruck Drive
Redding, CA 96003
(530) 221-5556

Medford Builders Exchange
2330 Crater Lake Avenue
Medford, OR 97504
(541) 773-5327

San Francisco Builders Exchange
850 S Van Ness Ave
San Francisco, CA 94110
(925) 324-2727

Placer County Contractors Association
10656 Industrial Ave #160
Roseville, CA 95678
(916) 771-7229

Dodge Data & Analytics
www.construction.com
(800) 393-6343

Construction Bidboard
11622 El Camino Real #100
San Diego, CA 92130
(619) 688-0588

Half-size copies of the project manual may be obtained at City of Crescent City Public Works Department 377 J Street, Crescent City, CA 95531 ((707) 464-9506), upon payment of postage fees. Or plans and specifications may be obtained on-line at CrescentCity.org/Bids.

Bidders must correctly prepare and submit the documents listed in Section 00 40 00, Bid.

Each bid must be accompanied by a bid guaranty bond, or a certified or cashier's check payable to the order of the Owner in an amount not less than ten percent (10%) of the amount of the bid as a guaranty that the bidder will execute the contract if it is awarded in conformity with the bid form. The successful bidder will be required to furnish performance and payment bonds, each in an amount not less than one hundred percent (100%) of the contract price.

At the successful Bidder's option, securities may be substituted for the required retention, in accordance with the provisions of Section 22300 of the State of California Public Contract Code.

The Owner reserves the right to reject any or all bids and to determine which bid is, in the Owner's judgment, the lowest responsive bid of a bidder or group of bidders. The Owner also reserves the right to waive any informalities in any bid and to delete items listed in the bid.

Bids received after the time established for receiving bids will not be considered. Except as provided in paragraph 00 20 10-1.04(A), no bidder may withdraw his bid after the time established for receiving bids or before the award and execution of the contract, unless the award is delayed for a period exceeding ninety (90) calendar days.

Bidders are hereby notified that pursuant to Section 1773 et seq. of the Labor Code of the Statutes of the State of California, the Owner has obtained from the Director of the Department of Industrial Relations the general prevailing rate of wages and employer payments for health and welfare, vacation, pension, and similar purposes for work to be done within Del Norte County, California. Regulations regarding the application of these wage rates are given in paragraph 00 20 00-1.12.

No contractor or subcontractor may be listed on a bid proposal for a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].

No contractor or subcontractor may be awarded a contract for public work on a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

Bidders on this work must comply with all applicable governmental and local agency requirements.

Date: 3-18-2026 By: David Yeager

END OF SECTION

SECTION 00 20 00

INSTRUCTIONS TO BIDDERS

1.01 INSPECTION OF SITE

Bidders are required to inspect the site of the work to satisfy themselves by personal examination or by such other means as they may prefer, of the location of the proposed work, and of the actual conditions of and at the site of work. Bidders can schedule inspection time by special arrangement with the Owner.

Entrance by bidders to the site of the work for purposes of making exploratory excavations shall be by special arrangement with the Owner and under conditions established by the Owner. If, during the course of their examination, a bidder finds facts or conditions which appear to conflict with the letter or spirit of the project manual, they may apply to the Owner, in writing, for additional information and explanation before submitting their bid.

Submission of a bid by the bidder is an acknowledgment that, if awarded the contract, bidder has relied and is relying on bidder's own examination of (1) the site of the work, (2) access to the site, and (3) all other data and matters requisite to the fulfillment of the work and on their own knowledge of existing facilities on and in the vicinity of the site of the work to be constructed under the contract.

The information provided by the Owner is not intended to be a substitute for, or a supplement to the independent verification by the bidder to the extent such independent investigation of site conditions is deemed necessary or desirable by the bidder. Bidder acknowledges that they have not relied upon Owner-furnished information regarding site conditions in preparing and submitting a bid.

1.02 EXAMINATION OF PROJECT MANUAL

Each bidder must thoroughly examine and be familiar with those contract documents contained in the project manual. Submission of a bid constitutes acknowledgment, upon which the Owner may rely, that the bidder has thoroughly examined and is familiar with the project manual. Failure or neglect of a bidder to examine any of the contract documents contained in the project manual in no way relieves bidder from any obligation with respect to their bid or to the contract. No claim for additional compensation will be allowed that is based upon a lack of knowledge of the contract documents or the work.

1.03 INTERPRETATION OF PROJECT MANUAL

Bidders, prospective subcontractors, manufacturers and suppliers may request interpretation of the project manual prior to bid opening. Requests for interpretation must be directed in writing to Public Works Director David Yeager at 377 J. Street, Crescent

City, CA 95531 or dyeager@crescentcity.org. Requests to clarify the source of materials, equipment, suppliers, or any other matter that does not modify, change, increase, or decrease the scope of work, requires no action by the Owner other than a response to the bidder requesting clarification. Requests to clarify possible ambiguous, conflicting or incomplete statements or designs, or any other clarification that modifies, changes, increases or decreases the scope of work, requires issuance of an addendum by the Owner for the interpretation to become effective.

1.04 BID DOCUMENTS

A. BID FORMS:

1. GENERAL: Bids must be made on the blank bid forms prepared and provided by the Owner. Bids must give the prices proposed, both in writing and in figures, must give all other information requested, and must be signed by the bidder or his authorized representative, with his address.

2. BID PRICES: Bid prices must include everything necessary for the completion of the work including but not limited to providing the materials, equipment, tools, plant and other facilities, and management, superintendence, labor and services, and bonds. Bid prices must include allowance for federal, state, and local taxes. Bid prices shall be guaranteed by the Contractor for 90 days.

In the event of a difference between a price quoted in words and a price quoted in figures for the same quotation, the words are the amount bid. In the event that the product of a unit price and an estimated quantity does not equal the extended amount quoted, the unit price governs, and the correct product of the unit price and the estimated quantity is deemed to be the amount bid. If the sum of two or more items in a bidding schedule does not equal the total amounts quoted, the individual item amounts govern, and the correct total is deemed to be the amount bid.

3. BIDDER'S SIGNATURE AND AUTHORITY: If the bid is made by an individual, his name, signature, and post office address must be shown; if made by a firm or partnership, the name and post office address of the firm or partnership, a list of the partners, and the signature of at least one of the general partners must be shown; if made by a corporation, the bid must show the name of the state under the laws of which the corporation is chartered, the name and post office address of the corporation, and the title of the person who signs on behalf of the corporation. If the bid is made by a joint venture, the bid must be signed by a representative of one of the joint venture firms. Additionally, the bid must include a copy of the resolution or agreement empowering the representative to execute the bid and bind the joint venture.

4. BID IRREGULARITIES: Each bid and the information requested, bound in the project manual, shall be enclosed in a sealed envelope and labeled as specified in the Invitation to Bid. Bidders are warned against making erasures or alterations of any kind, and bids containing omissions, erasures, or irregularities of any

kind may be rejected. No oral, telegraphic, or telephonic bids or modifications will be considered.

5. MODIFICATION OF BID: Modification of a bid already received will be considered only if the modification is received prior to the time established for receiving bids. Modifications must be made in writing, executed, and submitted in the same form and manner as the original bid.

6. WITHDRAWAL OF BIDS: Within five days after the opening of bids, a bidder may withdraw his bid, if he establishes to the Owner's satisfaction that a mistake was made in preparing the bid. A bidder who wants to withdraw must give written notice to the Owner, specifying, in detail, how the mistake occurred and how the mistake made the bid materially different than it was intended to be. Withdrawal is not permitted for mistakes resulting from errors in judgment or carelessness in inspecting the site of the work or in reading the project manual.

7. MAJOR EQUIPMENT ITEMS: Certain items of major equipment to be provided under this contract are shown on the plans. The bidder shall provide the name of the manufacturer of the equipment to be provided for all major equipment. Only one manufacturer shall be indicated for each item. By so indicating, the bidder warrants that equipment manufactured and/or supplied by the named manufacturer will be provided on the project unless review of submittal information or performance under tests reveals that the manufacturer is unresponsive to the contract. Failure to indicate a manufacturer for any equipment may render the bid unresponsive to the invitation to bid and may be a basis for rejection of the bid.

The arrangements specified on the drawings are based on a particular manufacturer's equipment. Where the Contractor selects a manufacturer whose equipment arrangement is different than specified, the total amount listed in the bid shall provide for a complete operating installation for each equipment item listed, including any and all changes and additions in structure, piping, buildings, mechanical, electrical and control systems and accessories required to accommodate the listed manufacturer's equipment. The bid shall also include the preparation and submission of detailed drawings, calculations and manufacturer's data to allow evaluation of the proposed equipment and to show all modifications to the work as necessary to accommodate the proposed manufacturer's equipment.

In the event that the Owner, at its sole discretion, determines that the equipment of the manufacturer listed by the Contractor and submitted for review does not meet the requirements of the contract, the Contractor shall select and submit for review equipment of another manufacturer which does meet the contract, and no increase in the total amount of the contract shall be allowed.

B. ALTERNATIVE MATERIALS AND EQUIPMENT:

The bidder may offer a deductive price to the Owner for supplying alternative or substitute equipment or material for items specified or shown in the plans by listing the specification section, item description, manufacturer, and deductive amount as a supplement to the bid. The bid shall be based on supplying equipment or material from manufacturers or suppliers specified or shown on the plans. Alternative or substitute equipment or material will be considered by the Owner after contract award and shall not be used in determining the basis of award. Selection of any offered alternate or substitution shall be at the Owner's sole discretion and will be accomplished by issuing a deductive change order for an amount agreed upon.

Manufacturers or suppliers of materials and equipment may offer an alternative product to the Contractor and request that alternatives to specified products be considered equal. Inclusion of such alternatives in the bid is the responsibility of the Contractor. Inclusion should only be considered if the Contractor believes the offered alternative is equal in quality to the specified product. After award of contract, such offers of alternative products will be reviewed and processed as a substitution provided under paragraph 00 72 00-4.05.

C. BID GUARANTY:

The bid form must be accompanied by a bid guaranty bond provided by a guaranty company authorized to carry on business in the State of California for payment to the Owner in the sum of at least ten (10) percent of the total amount of the bid price, or, alternatively, by a certified or cashier's check, payable to the Owner in the sum of at least ten (10) percent of the total amount of the bid price. The bonds must be executed by a duly licensed surety company, listed in the latest Circular 570 of the United States Treasury Department as being acceptable as surety on federal bonds. The bid guaranty bond must be provided on the form included in Section 00 43 13 of this project manual. The amount payable to the Owner under the bid guaranty bond or the certified or cashier's check, as the case may be, must be forfeited to the Owner as liquidated damages in case of a failure or neglect of the bidder to furnish, execute, and deliver to the Owner the required performance and payment bonds provided respectively in Sections 00 61 05 and 00 61 10, the evidences of insurance, and to enter into, execute, and deliver to the Owner the agreement on the form provided in Section 00 52 00, within ten (10) calendar days after receiving written notice from the Owner that the award has been made and the agreement is ready for execution.

D. LIST OF SUBCONTRACTORS:

Each bidder must have listed, on the form provided in Section 00 43 36, the name, address, and description of the work, of each subcontractor to whom the bidder proposes to sublet portions of the work in excess of 0.5 percent of the total amount of his bid. For purposes of this paragraph, a subcontractor is defined as one who contracts with the Contractor to provide materials and labor, labor only, or who specially fabricates and

installs a portion of the work or improvement according to drawings contained in the project manual. Listings and subsequent substitutions, if any, must be done in conformance with the Subletting and Subcontracting Fair Practices Act, commencing at Section 4100 of the Public Contract Code of the State of California. Failure to list subcontractors may render a bid nonresponsive and may be grounds for rejection of the bid.

1.05 BIDDER'S CERTIFICATIONS

A. QUALIFICATION OF BIDDER:

Bidder must certify that he is, at the time of bidding, and will be, throughout the period of the contract, licensed under the provisions of Chapter 9, Division 3 of the Business and Professions Code of the State of California to do the type of work contemplated in the project manual. Bidder must further certify that he is skilled and regularly engaged in the general class and type of work called for in the project manual.

The bidder must also certify that he is knowledgeable of the unusual and peculiar hazards associated with the general class and type of work required to construct the specified project within the terms given in the project manual. Bidder must be competent and skilled in the protective measures necessary for the safe performance of the construction work with respect to such unusual and peculiar hazards.

B. ADDENDA:

Each bid form must include specific acknowledgment, in the space provided, of receipt of all addenda issued and mailed by the Owner during the bidding period. Failure to so acknowledge may result in the bid being rejected as not responsive.

C. NONCOLLUSION AFFIDAVIT:

Pursuant to Section 7106 of the California Public Contract Code, a noncollusion affidavit is required on any public works contract of a public entity. The noncollusion affidavit must be executed by the bidder and notarized on the form provided in Section 00 45 19 of this project manual.

1.06 POSTPONEMENT OF OPENING

The Owner reserves the right to postpone the date and time for receiving and/or opening of bids at any time prior to the date and time established in the Invitation to Bid. Postponement notices will be transmitted via email or mailing service to bidders in the form of addenda.

1.07 REJECTION OF BIDS

A. IRREGULAR BIDS:

The Owner reserves the right to reject bids which are incomplete, obscure, or irregular; bids which omit a bid on any one or more items for which bids are required; bids which omit unit prices if unit prices are required; bids in which unit prices are unbalanced in the opinion of the Owner; bids accompanied by insufficient or irregular bid security; and bids from bidders who have previously failed to perform properly or to complete on time contracts of any nature.

B. COLLUSION:

If the Owner has reason to believe that collusion exists among bidders, the Owner will reject the bids of the known participants in such collusion and may, at its option, require that all bidders certify under penalty of perjury that no collusion has occurred or exists. The Owner also, at its option, may reject all bids received.

1.08 RETURN OF BID GUARANTIES

Within 15 calendar days after the bids are opened, the Owner will return the bid guaranties accompanying the bids which are not to be considered in making the award. All other bid guaranties will be held until the contract has been fully executed. After that time they will be returned to the respective bidders whose bids they accompanied.

1.09 AWARD OF CONTRACT

Within ninety (90) calendar days after the date of opening bids, the Owner will act either to accept a bid or to reject all bids. Acceptance of a bid will be evidenced by a notice of award of contract in writing, delivered in person, or by certified mail, to the bidder whose bid is accepted. No other act of the Owner constitutes acceptance of a bid. The award of contract obligates the bidder whose bid is accepted to furnish performance and payment bonds and evidence of insurance, and to execute the agreement set forth in the project manual. The Owner will award a contract to the lowest responsive bidder on the basis of lowest total bid.

The Owner may initially Award the Contract for a portion of the work and reserves the right to add or remove any Bid Item or Alternative during the course of the Contract. Items added or deleted after the Award will be completed as Change Orders at the Bid Price.

1.10 BASIS OF AWARD

The award will be made by the Owner to the lowest responsive and responsible bidder. Inclusion of bid items and alternatives in the final contract awarded will be at the Owner's sole discretion.

If, at any time the contract is to be awarded, the total of the lowest acceptable Proposal exceeds the funds then estimated by the Owner as available, the Owner may reject all bids or take such other action as best serves the Owner's interests.

The Owner reserves the right to accept or reject any or all proposals and to waive any informalities and irregularities in said proposals, delete certain items from the proposal and postpone the award decision date to one that is mutually agreeable to the Owner and the low bidder.

1.11 EXECUTION OF CONTRACT

Within 10 calendar days after receiving written notice of the award of the contract, the contract agreement as provided in Section 00 52 00 must be executed in quadruplicate by the successful bidder and returned with the performance and payment bonds and evidences of insurance. After execution by the Owner, one copy of the agreement will be returned to the Contractor.

1.12 LABOR REQUIREMENTS

A. WAGE DETERMINATION:

Wages to be paid laborers and mechanics on this project must be no less than the minimum as determined by the Director of Industrial Relations in accordance with California Labor Code, Part 7, Chapter 1, Article 2, Sections 1770, 1773 and 1773.1. Copies of the applicable prevailing rate of per diem wages must be posted at each job site.

B. SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION:

The Contractor must comply with all applicable state and federal laws and local ordinances and regulations which in any manner affect those engaged or employed in the work.

C. EMPLOYMENT PERMITS:

The Contractor shall provide an employment permit prior to the initiation of any practices, work, method, or operation in accordance with Labor Code Section 6500.

1.14 SHEETING, SHORING AND BRACING

In accordance with the provisions of Section 6707 of the California State Labor Code, each bidder must list, in the bid item indicated, the amount included in the bid for

trench and excavation, adequate sheeting, shoring and bracing, or equivalent method for the protection of life and limb, work which must conform to applicable State of California Construction Safety Orders. By listing this sum in his bid, the bidder warrants that his action does not convey tort liability to the Owner, the Owner's employees, or the Construction Manager.

1.15 OFFER OF ASSIGNMENT OF ANTITRUST ACTIONS

As provided by Sections 4550 and 4552 of the California Government Code, in submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the Owner all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 [commencing with Section 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the bid. Such assignment is made and becomes effective at the time the purchasing body tenders final payment to the bidder.

1.16 SALES AND USE TAX

Bidder shall refer to General Conditions paragraph 00 72 00-2.04 K for sales and use tax requirements for this project.

1.17 BID PROTEST PROCEDURE

Bid protest procedures are contained in Chapter 14.24 of the Crescent City Municipal code:

14.24.0190 Application

The protest procedures contained in this chapter apply to formal sealed bids and competitive proposals only. For purposes of this chapter any person who submitted either a bid or proposal is referred to as a "bidder" and any submitted big or proposal is referred to as a "bid."

14.24.020 Eligibility to protest Only a bidder who has actually submitted a bid is eligible to submit a bid protest against another bidder. Subcontractors are not eligible to submit big protests. A bidder may not rely on the bid protest submitted by another bidder but must timely pursue its own protest.

14.20.030 Bid protest deadline

Any bid protest must be in writing and received by the City before 5:00 p.m. no later than two business days following the bid opening (the "Bid Protest Deadline"). The protesting bidder may submit the bid protest by personal delivery, courier, or facsimile transmission.

14.24.040 Bid protest - contents and procedure

A. Protest contents. The bid protest must contain a complete statement of the basis for the protest and all supporting documentation. Material submitted after the Bid Protest Deadline will not be considered. The protest must refer to the specific portion or portions of the contract documents upon which the protest is based. The protest must include the name, address, email address and telephone number of the person representing the protesting bidder if different from the protesting bidder.

B. Copy to protested bidder. A copy of the protest and all supporting documents must be concurrently transmitted by facsimile transmission or electronic mail (email), before the Bid Protest Deadline, to the protested bidder.

14.24.50 Response to bid protest – contents

A. Response to protest. The protested bidder may submit a written response to the protest, provided the response is received by City before 5:00 p.m., within two business days after the Bid Protest Deadline or after actual receipt of the bid protest, whichever is sooner (the "Response Deadline"). The protested bidder may submit the response to bid protest by personal delivery, courier, or facsimile transmission. The response must include all supporting documentation. Material submitted after the Response Deadline will not be considered. The response must include the name, address, email address, and telephone number of the person representing the protested bidder if different from the protested bidder

B. Copy to protesting bidder. A copy of the response and all supporting documents must be concurrently transmitted by facsimile transmission or electronic mail (email), before the Bid Protest Deadline, to the protesting bidder.

14.24.060 Decision

Within five business days of the Response Deadline, the City Manager will issue a Decision on the bid protest. The decision of the City Manager is final.

14.24.070 Exclusive remedy

The procedure and time limits set forth in this section are mandatory and are the bidder's sole and exclusive remedy in the event of bid protest. A bidder's failure to comply with these procedures will constitute a waiver of any right to further pursue a bid protest, including filing a Government Code claim or initiation of legal proceedings.

END OF SECTION

SECTION 00 31 46

PERMITS

PART 1 – GENERAL

1.01 The following permits for this project must be obtained and paid for by the Contractor:

A. City Business License

PART 2 – Coastal Development Permit

A. This project has a Coastal Development Permit obtained by the Owner. It is included in these contract documents and its project requirements shall be followed by the Contractor as far as they pertain to this Phase 1B project.

B. The Coastal Zone includes all areas south of the backside of the Front Street southern sidewalk.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 00 40 00

BID

City of Crescent City
377 J Street
Crescent City, CA 95531

Date: _____

The undersigned, as bidder, declares that the bidder has received and examined the project manual entitled "Beachfront Park Improvements Phase 1B" and will contract with the Owner, on the form of agreement provided herewith, to do everything required for the fulfillment of the contract for the construction on the project at the prices and on the terms and conditions herein contained.

The bidder agrees that the contract documents include Parts A, B and C of this project manual as well as the referenced federal, state and local agency requirements.

The bidder agrees that the following are part of this bid:

Section	Title
00 40 00	Bid
00 41 00	Bidding Schedule
00 43 13	Bid Guaranty Bond
00 43 36	Proposed Subcontractors
00 45 13	Certification of Bidder's Experience and Qualifications
00 45 19	Non-Collusion Affidavit
~~00 45 21~~	~~Anti-Lobbying Certification~~

The bidder acknowledges that addenda numbers _____ through _____ have been received and have been examined as part of the project manual.

Attached is a bidder' security in the amount of at least ten (10) percent of the total amount of our bid in one of the following acceptable forms: (i) a guaranty bond duly completed by a guaranty company authorized to carry on business in the State of California; (ii) a certified or cashier's check payable to the Owner; or (iii) cash.

If the bid is accepted, the bidder agrees to sign the agreement without qualifications and to furnish the performance and payment bonds and the required evidence of insurance within 10 calendar days after receiving written notice of the award of the contract.

The bidder further agrees, if the bid is accepted and a contract for performance of the work is entered into with the Owner, to so plan work and to prosecute it with such diligence that the work shall be completed within the time stipulated.

The bidder declares that the Contractor's license number and expiration date and representations made therein are true and correct and made under penalty of perjury under the laws of the State of California.

The undersigned declares under penalty of perjury under the laws of the State of California that the undersigned has lawful authority to submit this bid on behalf of the named bidder.

_____
Name of Bidder

_____
Contractor's License No.

_____
License Expiration Date

_____
Signature of Bidder

_____
Title of Signatory

_____
Witness

_____
Address of Bidder

_____
Title of Witness

_____
State of Incorporation

END OF SECTION

SECTION 00 41 00

BIDDING SCHEDULE

PROJECT IDENTIFICATION: Beachfront Park Improvements Phase 1B

THE BID IS SUBMITTED TO: City of Crescent City

BID SCHEDULE

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY.	UNIT PRICE	TOTAL PRICE
1	Mobilization - Front Street	1	LS		
2	SWPPP Updating and Reporting - City to provide initial SWPP plan	1	LS		
3	Water Pollution Prevention BMPs - prebid budget to be negotiated upon City provided SWPPP approval.	1	LS	20,000	20,000
4	Pedestrian and Traffic Control	1	LS		
5	Tree protection fencing installation & removal	400	LF		
6	Sheeting, Shoring, Bracing	1	LS		
7	Quality Control	1	LS		
8	Material Testing	1	LS		
9	Clear, Grub and Tree removal	1	LS		
10	Demolition of Existing Facilities including Monument Salvage	1	LS		
11	Demolition of Existing Concrete	5000	SF		
12	Demolition of Existing Asphalt Concrete	24000	SF		
13	Rough Grading	22250	SY		
14	Rain Garden Excavation	120	CY		
15	Import Soil for Berm Placement and Amphitheater capping	3500	CY		
16	Aggregate Base for asphalt paved section	90	CY		
17	Hot Mix Asphalt Concrete	80	Ton		
18	Pavement Striping and Wheel Stops	1	LS		
19	Crackfill & Sealcoat Playground Parking Lot	17400	SF		
20	Parking and Path of Travel signs	1	LS		
21	Storm Drain 24" HDPE	30	LF		
22	Storm Drain 18" HDPE	20	LF		
23	Storm Drain 12" HDPE	160	LF		
24	Flared End Section	9	EA		
25	Duckbill Outlet	1	EA		
26	Rentention Basin Inlets	9	EA		
27	Install 12"x12" Area Drains	6	EA		
28	Connect to Existing Storm Drain	1	LS		
29	Drainage Inlets – Type GO	1	EA		

30	Adjust Existing Inlets to Grade	1	EA		
31	4" Sanitary Sewer Lateral	363	LF		
32	Sanitary Sewer Clean-out with G-5 Box & Lids	3	EA		
33	1" Water Line	340	LF		
34	Install water meters - Meter & Meter Box supplied by City	3	EA		
35	Reconnect restroom sewer and water	1	LS		
36	Electrical - All labor, equipment, and materials not covered in below items	1	LS		
37	Lighted Bollards	14	EA		
38	Step Lighting	6	EA		
39	Stamps Way Entry Lighting	1	LS		
40	Post Lights	2	EA		
41	Electrical Transformer Vault Install	1	EA		
42	600A MDP Panel	1	EA		
43	400A SDP Panel	1	EA		
44	Food Truck Pedestals - 220v	5	EA		
45	220v Outlets	19	EA		
46	110v Outlets	20	EA		
47	Concrete - Vehicular Paving - 6" section	29500	SF		
48	Concrete - Pedestrian Walks - 4" section	10600	SF		
49	Concrete - Pedestrian Walks - 4" section - Playground	3320	SF		
50	Concrete Decorative Paving - 4" section	500	SF		
51	Concrete Exercise Equipment Pad - 6" section	1100	SF		
52	Grade and Rock for Concrete Paving	45020	SF		
53	ADA Detectable Warning Panels	200	SF		
54	Curb Thru Drain	1	EA		
55	Roll-over curb - includes prep & reinforcement	60	LF		
56	Valley Gutter - includes prep & reinforcement	162	LF		
57	Concrete Stage, Foundation, Ramp and Stairs including prep & reinforcement	140	CY		
58	Concrete Seat Walls - Including prep and reinforcement	66	LF		
59	Concrete mow band x 6" wide	450	LF		
60	Landscape soil import	500	CY		
61	Irrigation – Lawns	136000	SF		
62	Irrigation – Excluding lawns Planting areas including controllers, connections and backflow devices	38000	SF		
63	Seeded lawns - Includes soil application, tilling, grading, and seeding	24000	SF		
64	Plantings – Ground covers and shrubs	6400	SF		
65	Plantings – Rain gardens	14200	SF		
66	Plantings – Berms	17300	SF		

67	Trees – 4'-6' height, B&B	11	EA		
68	Mulch – Bark to 4" depth	130	CY		
69	Landscaping Maintenance	1	LS		
70	Play Surface Type 1	5300	SF		
71	Play Surface Type 2	2500	SF		
72	Playground Equip - Tree	1	LS		
73	Playground Equip - Swing 2 Bay	1	LS		
74	Playground Equip - Boat	1	LS		
75	Playground Equip - Musical	1	LS		
76	Playground Equip - Water Elements	1	LS		
77	Playground Equip - Independent elements	5	EA		
78	Playground Fencing	540	LF		
79	Playground Specialized Fencing	30	LF		
80	Playground Shotcrete Boulders	675	SF		
81	Picnic Tables	2	EA		
82	Standard Concrete Benches	9	EA		
83	Furnish and Install removable bollards	5	EA		
84	Furnish and Install stage rail	70	LF		
85	Purchase and install bike racks	5	EA		
86	Drinking Fountain	1	LS		
87	Fencing - Guardrail	170	LF		
	Total (Items 1-87)				

TOTAL BID AMOUNT _____

_____

($_____).

The cost of all work in the Contract Documents not specifically identified as an item or described as an item shall be included in the items and no additional compensation shall become due the Contractor by nature of compliance with the Contract Documents except as provided for in the provisions relating to extra work or changes in the work.

Bid award will be based on the lowest aggregate of the Total Bid Amount.

Actual contract amount will include all items in accordance with paragraph 00 20 00-1.10.

END OF SECTION

SECTION 00 43 13

BID GUARANTY BOND

KNOW ALL MEN BY THESE PRESENTS:

THAT _____, hereinafter called the Principal, and _____, hereinafter called the Surety, are jointly and severally held and firmly bound unto the City of Crescent City, hereinafter called the Obligee, each in the penal sum of ten (10) percent of the total amount of the bid of the Principal for the work, this sum not to exceed _____ dollars ($_____) of lawful money of the United States for the payment thereof unto the Obligee, the Principal and Surety jointly and severally bind themselves forever firmly by these presents.

WHEREAS, the Principal is herewith submitting its offer for the fulfillment of Obligee's contract for construction of the Beachfront Park Improvements Phase 1B.

NOW, THEREFORE, the condition of this obligation is such that if the Principal is awarded the contract, and if the Principal, within the time specified in the bid for such contract, enters into, executes, and delivers to the Obligee an agreement in the form provided herein complete with evidences of insurance, and if the Principal within the time specified in the bid gives to the Obligee the performance and payment bonds on the form provided herein, then this obligation shall be void; otherwise, the Principal and Surety will pay unto the Obligee the difference in money between the total amount of the bid of the Principal and the amount for which the Obligee legally contracts with another party to fulfill the contract if the latter amount be in excess of the former, but in no event shall the Surety's liability exceed the penal sum hereof.

AND IT IS HEREBY DECLARED AND AGREED that the Surety shall be liable under this obligation as Principal, and that nothing of any kind or nature whatsoever that will not discharge the Principal shall operate as a discharge or a release of liability of the Surety.

IT IS HEREBY FURTHER DECLARED AND AGREED that this obligation shall be binding upon and inure to the benefit of the Principal, the Surety, and the Obligee and their respective heirs, executors, administrators, successors and assigns.

SIGNED AND SEALED this _____ day of _____, 20____.

(SEAL)

_____
Principal

_____
Signature for Principal

_____
Title of Signatory

(SEAL)

_____
Surety

_____
Signature for Surety

_____
Title of Signatory

END OF SECTION

SECTION 00 43 36

PROPOSED SUBCONTRACTORS

The following information gives the name, the location of the place of business, the California contractor license number, and public works contractor registration number issued pursuant to Section 1725.5 of the Labor Code of each subcontractor who will perform work or labor or render service to the prime contractor in or about the construction of the work or improvement, or a subcontractor licensed by the State of California who, under subcontract to the prime contractor, specially fabricates and installs a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half of 1 percent of the prime contractor's total bid or, in the case of bids or offers for the construction of streets or highways, including bridges, in excess of one-half of 1 percent of the prime contractor's total bid or ten thousand dollars ($10,000), whichever is greater. No subcontractor who is not listed may be used without the written approval of the Owner in accordance with the Subletting and Subcontracting Fair Practices Act, commencing with Section 4100 of the Public Contract Code. (Additional supporting data may be attached to this page. Each page must be sequentially numbered, e.g., 00 43 36-2, and headed "Proposed Subcontractors" and shall be signed.)

Contractor shall attach verification sheet from Department of Industrial Relations (DIR) showing that all subcontractors are registered in accordance with Labor Code Section 1725.5.

Name	Location Place of Business	Description of Work	DIR

_____

Signature of Bidder

END OF SECTION

SECTION 00 45 13

CERTIFICATION OF BIDDER'S

EXPERIENCE AND QUALIFICATIONS

The undersigned certifies that the bidder is, when the bid is submitted and will be, throughout the period of the contract will be, licensed by the State of California to do the type of work required under terms of the contract documents. The undersigned further certifies that the bidder is skilled and regularly engaged in the general class and type of work called for in the contract documents.

In accordance with the requirements of paragraph 00 20 00-1.05 A, the undersigned represents that the bidder is competent, knowledgeable and has special skills with respect to the nature, extent, and inherent conditions of the work to be performed. Bidder acknowledges that there are certain peculiar and inherent conditions existent in the construction of the particular facilities he is bidding on that may create, during the construction program, unusual or peculiar unsafe conditions that will be hazardous to persons or property. Bidder expressly acknowledges that bidder is aware of these peculiar risks and that the bidder has the skill and experience to foresee them, assess them, and to adopt protective measures to adequately and safely perform the construction work with respect to the hazards.

Signed this _____ day of _____, 20___.

_____
Name of Bidder

_____
Contractor's License No. and State

_____
Contractor's DUNS Number

_____
Signature of Bidder

_____
Title of Signatory

END OF SECTION

SECTION 00 45 19

NON-COLLUSION AFFIDAVIT

NONCOLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID FOR PUBLIC WORKS

STATE OF CALIFORNIA)
) ss
COUNTY OF_____)

_____being first duly sworn, deposes and says
(name)

that he or she is _____ of
(Position Title)

_____,

(the Bidder)

the party making the foregoing bid; that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

DATED:_____ By_____
(Person signing for Bidder)

Subscribed and sworn to before me on

(Notarial Seal) _____

_____
(Notary Public)

END OF SECTION

SECTION 00 52 00

AGREEMENT

THIS AGREEMENT, made this _____ day of _____, 20____, by and between the City of Crescent City, a California municipal corporation, hereinafter called the "Owner," and _____, hereinafter called the "Contractor."

WITNESSETH:

WHEREAS, the Owner has caused a project manual to be prepared comprised of one volume of bidding and contract requirements and technical specifications and one volume of drawings for the construction of the Crescent City Beachfront Park Improvements Phase 1B as described therein, and

WHEREAS, the Contractor has offered to perform the proposed work in accordance with the terms of the contract as defined in Section 00 72 00 of the specifications.

NOW, THEREFORE, in consideration of the mutual covenants and agreements of the parties contained in the contract and to be performed, the Contractor hereby agrees to complete the work at the price and on the terms and conditions therein contained, and the Owner agrees to pay the Contractor the contract price provided therein for the fulfillment of the work and the performance of the covenants set forth herein.

The further terms, conditions, and covenants of this agreement are set forth in the contract documents, each of which is attached hereto and by this reference made a part hereof:

Volume one containing Part A, Bidding and Contract Requirements (including Addenda numbers _____ through _____); Part B, Technical Specifications; and Part C, a set of drawings consisting of one volume.

IN WITNESS WHEREOF, this agreement has been executed on this _____ day of _____, 20___.

_____
Signature for Owner (City)

_____
Title of Signatory

Attest: _____
Signature

_____
Title of Signatory

_____
Name of Contractor

_____
Signature for Contractor

_____
Title of Signatory

Attest: _____
Signature

_____
Title of Signatory

END OF SECTION

SECTION 00 61 05

FAITHFUL PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, THAT,

WHEREAS, the City of Crescent City hereinafter designated the "Owner," has, on _____ _____, 20____, awarded to _____, hereinafter designated as the "Principal," a contract for the construction of the Crescent City Beachfront Park Improvements Phase 1B; and

WHEREAS, said Principal is required under the terms of said contract to furnish a bond for the faithful performance of said contracts.

NOW, THEREFORE, WE, the Principal, and _____, as Surety, are held and firmly bound unto the Owner the penal sum of _____ dollars ($_____) lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that if the above bounden Principal, his or her or its heirs, executors, administrators, successors, or assigns, shall in all things stand to and abide by, and well and truly keep and faithfully perform the covenants, conditions, and agreements in the said contract and any alterations made as therein provided, on his or her or their part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless, the Owner, its officers and agents as therein stipulated, then this obligation will become null and void; otherwise it will be and remain in full force and virtue and Principal and Surety, in the event suit is brought on this bond, will pay to the Owner such reasonable attorney's fees as fixed by the court.

As a condition precedent to the satisfactory completion of the said contract, the above obligation in the said amount will hold good for a period of one (1) year after the completion and acceptance of the said work, during which time if the above bounden Principal, his or her or its heirs, executors, administrators, successors or assigns shall fail to make full, complete, and satisfactory repair and replacements or totally protect the said Owner from loss or damage made evident during said period of one year from the date of acceptance of said work, and resulting from or caused by defective materials and/or faulty workmanship in the prosecution of the work done, the above obligation in the said amount will remain in full force and effect. However, anything in

this paragraph to the contrary notwithstanding, the obligation of the Surety hereunder will continue so long as any obligation of the Principal remains.

And the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same will, in any way, affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the contract or to the work or to the specifications. Said Surety hereby waives the provisions of Sections 2819 and 2845 of the Civil Code of the State of California.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their seals this _____ day of _____, 20___, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

_____
Principal

(Seal)

_____
Signature for Principal

_____
Title of Signatory

_____
Surety

(Seal)

_____
Signature for Surety

_____
Title of Signatory

END OF SECTION

SECTION 00 61 10

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, THAT,

WHEREAS, the City of Crescent City, hereinafter designated the "Owner," has, on _____ _____, 20____, awarded to _____, hereinafter designated as the "Principal," a contract for the construction of the Crescent City Beachfront Park Improvements Phase 1B; and

WHEREAS, said Principal is required to furnish a bond in connection and with said contract, providing that if said Principal, or any of his or her or its subcontractors, should fail to pay for any materials, provisions, or other supplies used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor done thereon of any kind, the Surety of this bond will pay the same to the extent hereinafter set forth:

NOW, THEREFORE, WE, the Principal, and _____, as Surety, are held and firmly bound unto the Owner the penal sum of _____dollars ($_____) lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that if said Principal, his or its heirs, executors, administrators, successors, or assigns, should fail to pay for any materials, provisions, or other supplies used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor thereon of any kind or for amount due under the Unemployment Insurance Act with respect to such work or labor, or for any amounts due, or to be withheld pursuant to Sections I8806 of the Revenue and Taxation Code of the State of California with respect to such work or labor, as required by the provisions of Chapter III, Division V, Title I, of the Government Code of the State of California, and provided that the persons, companies, or corporations so furnishing said materials, provisions, or other supplies, appliances, or power use, in, upon, for, or about the performance of the work contracted to be executed or performed, or any person who performs work or labor upon same, or any person who supplies both work and materials, thereto,

shall have complied with the provisions of said Government Code, then said surety will pay the same in or to an amount not exceeding the amount hereinabove set forth, and also will pay in case suit is brought upon this bond, such reasonable attorney's fees to the Owner as fixed by the court.

This bond will inure to the benefit of any and all persons, companies, and corporations entitled to file claims under said Government Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

And the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition of the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same will, in any way, affect its obligations of this bond, and it does hereby waive notice of any change, extension of time, alteration, or addition to the terms of the contract or to the work or to the specifications. Said Surety hereby waives the provisions of Sections 2819 and 2845 of the Civil Code of the State of California.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their seals this _____ day of _____, 20__, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

_____
Principal

(Seal)

_____
Signature for Principal Title

_____
Surety

(Seal)

_____
Signature for Surety Title

END OF SECTION

SECTION 00 62 00

CERTIFICATES AND OTHER FORMS

The forms listed below and included in this Section shall be used for this project and may be referenced from other Sections of the project manual:

Form No.	Title
01300-A	Submittal Transmittal Form

Contractor may use electronic versions of these forms.

01300-A. SUBMITTAL TRANSMITTAL FORM:

SUBMITTAL TRANSMITTAL

Submittal Description: _____ Submittal No:[1] _____

Spec Section: _____

	Routing	Sent	Received
OWNER:	Contractor/CM		
PROJECT:	CM/Engineer		
	Engineer/CM		
CONTRACTOR:	CM/Contractor		

We are sending you ☐Attached ☐Under separate cover via _____.
☐Submittals for review and comment
☐Product data for information only

Remarks: _____

Item	Copies	Date	Section No.	Description	Review action[a]	Reviewer initials	Review comments attached

[a]**Note: NET = No exceptions taken; MCN = Make corrections noted; A&R = Amend and resubmit; R = Rejected** Attach additional sheets if necessary.

Contractor

Certify either A or B:

☐A. We have verified that the material or equipment contained in this submittal meets all the requirements, including coordination with all related work, specified (no exceptions).

☐B. We have verified that the material or equipment contained in this submittal meets all the requirements specified except for the attached deviations.

No.	Deviation
_____	_____
_____	_____
_____	_____

Certified by: _____
Contractor's Signature

[1]See paragraph 00 33 00-4.0 A, Transmittal Procedure.

SECTION 00 72 00

GENERAL CONDITIONS

PART 1--GENERAL INFORMATION

1.01 DEFINITIONS OF WORDS AND TERMS

Where used in the project manual, the following words and terms have the meanings indicated. The meanings are applicable to the singular, plural, masculine and feminine forms of the words and terms.

Acceptance. Formal action of the Owner in determining that the Contractor's work has been completed in accordance with the contract and in notifying the Contractor in writing of the acceptability of the work.

Act of God. A cataclysmic phenomenon of nature, such as an earthquake, flood, tsunami or cyclone. Rain, wind, high water, or other natural phenomenon which might reasonably have been anticipated from historical records of the general locality of the work are not be treated as Acts of God.

Addenda. Supplemental written specifications or drawings issued prior to execution of the contract which modify or interpret the project manual by addition, deletion, clarification, or corrections.

Bid. Offer of a bidder submitted on the prescribed form setting forth the price or prices of the work to be performed.

Bidder. Individual, partnership, corporation, or a combination thereof, including joint venturers, offering a bid to perform the work.

City of Crescent City. To be considered the same as "Owner", refer to "Owner".

Construction Manager. The person designated, in writing, by the Owner to act as its representative at the construction site and to perform construction inspection services and administrative functions relating to this contract. Initial contact by the Contractor with the Owner will be through the Construction Manager.

Contract. The writings and drawings embodying the legally binding obligations between the Owner and the Contractor for completion of the work. The contract includes the following documents:

Project Manual
Invitation to Bid
Information for Bidders
Bid Proposal
General Conditions
Supplementary Conditions
Special Conditions
Specifications
Contract Drawings
Addenda
Bonds
Agreement
Notice of Award
Notice to Proceed
Change Orders
Directives
Design Brief

Contract Drawings. The drawings included in the project manual plus those prepared by the Owner and the Contractor pursuant to the terms of the contract. They include:

1. Drawings in Part C of the project manual.

2. Modifying drawings issued by addenda.

3. Drawings submitted by the Contractor during the progress of the work and accepted by the Owner either as attachments to change orders or as non-modifying supplements to drawings in Part C and drawings issued by addenda.

4. Drawings submitted by the Owner to the Contractor during the progress of the work either as attachments to the change orders or as explanatory supplements to drawings in Part C and drawings issued by addenda.

Contract Price. Amount payable to the Contractor under the terms and conditions of the contract based on the price given on the bidding schedule, with adjustments made in accordance with the contract. The base amount given in the bidding schedule must be either a lump sum bid or the summation of the unit price bids multiplied by the estimated quantities set forth in the bid form.

Contract Time. Number of calendar days stated in the contract for the completion of the work or portions thereof.

Contractor. The individual, partnership, corporation, or combination thereof, including joint venturers who enter into the contract with the Owner for the performance of the work. The term covers subcontractors, equipment and material suppliers, and their employees.

Contractor's Plant and Equipment. Equipment, material, supplies, and all other items, except labor, brought onto the site by the Contractor to carry out the work, but not to be incorporated in the work.

Day. Calendar day.

Department. Department of Housing and Community Development.

Design Professional. Professional Engineer licensed to practice in the State of California retained by the Contractor.

Direct. Action of the Owner or Construction Manager by which the Contractor is ordered to perform or refrain from performing work under the contract.

Directive. Written documentation of the actions of the Owner or Construction Manager in directing the Contractor.

Equipment. Mechanical, electrical, instrumentation, or other device with one or more moving parts, or devices requiring an electrical, pneumatic, electronic, or hydraulic connection.

Furnish. To deliver to the job site or other specified location any item, equipment or material.

Herein. Refers to information presented in the project manual.

Holidays. Legal holidays designated by the state or specifically identified in the supplementary conditions.

Install. Placing, erecting, or constructing complete in place any item, equipment, or material.

May. Refers to permissive actions.

Owner. A public or quasi-public agency or authority, corporation, association, partnership, or individual for whom the work is to be performed. Under this contract, the Owner is identified by name in the agreement.

Owner's Representative. The person other than the Construction Manager designated in writing by the Owner to act as its agent on matters relating to this contract.

Paragraph. For reference or citation purposes, paragraph shall refer to the paragraph, or paragraphs, called out by section number and alphanumeric designator. For example, this definition is found in paragraph 00 72 00-1.01; permits and licenses are discussed in paragraph 00 72 00-1.05 B.

Person. The term, person, includes firms, companies, corporations, partnerships, and joint ventures.

Project. The undertaking to be performed under the provisions of the contract.

Project Manual. Those contract documents prepared for bidding and as amended by addenda.

Provide. Furnish and install, complete in place.

Punch List. List of incomplete items of work and of items of work that are not in conformance with the contract. The list will be prepared by the Construction Manager when the Contractor (1) notifies the Construction Manager in writing that the work has been completed in accordance with the contract and (2) requests in writing that the Owner accept the work.

Shall. Refers to actions by either the Contractor or the Owner and means the Contractor or Owner has entered into a covenant with the other party to do or perform the action.

Shown. Refers to information presented on the drawings, with or without reference to the drawings.

Specifications. That part of the contract documents consisting of written descriptions of the technical features of materials, equipment, construction systems, standards, and workmanship.

Specify. Refers to information described, shown, noted or presented in any manner in any part of the contract.

Submittals. The information which is specified for submission to the Construction Manager in accordance with Division 1 of the project manual.

Substantial Completion. Sufficient completion of the project or the portion thereof to permit utilization of the project, or portion thereof for its intended purpose. Substantial completion requires not only that the work be sufficiently completed to permit utilization, but that the Owner can effectively utilize the substantially completed work. Determination of substantial completion is solely at the discretion of the Owner. Substantial completion does not mean complete in accordance with the contract nor shall substantial completion of all or any part of the project entitle the Contractor to acceptance under the contract.

Substantial Completion Date. Date when the Owner puts into service the project, or that portion of the project that has been determined to be substantially complete.

Will. Refers to actions entered into by the Contractor or the Owner as a covenant with the other party to do or to perform the action.

Work. The labor, materials, equipment, supplies, services, and other items necessary for the execution, completion and fulfillment of the contract.

Working Day. Refers to definition as outlined in Section 8-1.06 of the State of California, Department of Transportation, Standard Specifications, 2006 edition.

1.02 JOINT VENTURE CONTRACTOR

If Contractor is a joint venture of two or more contractors, the grants, covenants, provisos and claims, rights, power, privileges, and liabilities of the contract are joint and several. Any notice, order, direct request, or any communication required to be or that may be given by the Owner or the Construction Manager to the Contractor under this contract, is sufficiently given to all persons in the joint-venture Contractor if it is given to any one or more of such persons. Any notice, request or other communication given by any one of such persons to the Owner or the Construction Manager under this contract is deemed to have been given by and binds all persons in the joint-venture Contractor.

1.03 CONTRACT REQUIREMENTS

A. SUCCESSORS' OBLIGATIONS:

The grants, covenants, provisos and claims, rights, powers, privileges, and liabilities obtained in the contract documents must be read and held as made by and with, and granted to and imposed upon, the Contractor and the Owner and their respective heirs, executors, administrators, successors, and assigns.

B. ASSIGNMENT OF CONTRACT:

The contract must not be assigned in whole or in part without the written consent of the Owner. Involuntary assignment of the contract as caused by the Contractor being adjudged

bankrupt, assignment of the contract for the benefit of Contractor's creditors or appointment of a receiver on account of Contractor's insolvency is considered as failure to comply with the provisions of the contract and subject to the termination provisions contained herein.

C. WAIVER OF RIGHTS:

Except as herein provided, no action or want of action on the part of the Contractor, Owner, Owner's Representative, or Construction Manager at any time with respect to the exercise of any right or remedies conferred upon them under this contract is a waiver on the part of the Contractor and Owner of any of their rights or remedies. No waiver is effective except in writing by the party to be charged. No waiver of one right or remedy acts as a waiver of any other right or remedy or as a subsequent waiver of the same right or remedy.

D. OFFER OF ASSIGNMENT OF ANTITRUST ACTIONS:

As provided by Sections 4550 and 4551 of the Government Code, in entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 [commencing with Section 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment is effective at the time the awarding body tenders final payment to the Contractor, without further acknowledgment by the parties.

E. RUSSIAN SANCTIONS

On March 4, 2022, Governor Gavin Newsom issued Executive Order N-6-22 (EO) regarding sanctions in response to Russian aggression in Ukraine. The EO is located at https://www.gov.ca.gov/wp-content/uploads/2022/03/3.4.22-Russia-Ukraine-Executive-Order.pdf. The EO directs all agencies and departments that are subject to the Governor's authority to take certain immediate steps, including notifying all contractors and grantees of their obligations to comply with existing economic sanctions imposed by the US government in response to Russia's action in Ukraine, as well as any sanctions imposed under State law. The Contractor must comply with the economic sanctions imposed in response to Russia's action in Ukraine, including with respect to, but not limited to, the federal executive orders identified in the EO and the sanctions identified on the US Department of Treasure website: https://home.treasury.gov/policy-issues/financial-sanctions/sanctions-programs-and-country-information/ukraine-russia-related-sanctions.

F. AMENDMENT OF GENERAL CONDITIONS:

These general conditions may be amended only by mutual consent of the Owner and the Contractor in writing.

1.04 LABOR STANDARDS

A. WAGES:

1. GENERAL: The Contractor and each subcontractor engaged in the work must pay each employee an amount not less than the rate established for each trade or occupation listed by the Director of the California Department of Industrial Relations. An employee whose type of work is not covered by any of the classified wage rates must be paid not less than the rate of wage listed for the classification which most nearly corresponds to the type of work to be performed.

2. STATE: The Contractor is directed to the Department of Industrial Relations website for the general prevailing rate of wages in the vicinity of the work to be performed under this contract. The Contractor must forfeit, as penalty, to the Owner twenty-five dollars ($25.00) for each laborer, worker, or mechanic employed for each calendar day or portion thereof such laborer, worker, or mechanic is paid less than the general prevailing rate of wages for any work done under this contract, by him or by a subcontractor under him, in violation of the provisions of the California Labor Code, and, in particular, Sections 1770 and 1780 thereof.

3. APPRENTICES: The Contractor and all subcontractors must comply with California Labor Code §§ 1777.5, 1777.6, 1777.7 concerning the employment and wages of apprentices. The Contractor is responsible for all apprenticeable occupations pursuant to California Labor Code § 1777.5(n).

4. REGISTRATION REQUIRED. The Contractor and all subcontractors must be registered with the DIR and qualified to perform public work pursuant to California Labor Code § 1725.5.

5. REPORTING: The Contractor and all subcontractors must comply with California Labor Code § 1776, which generally requires keeping accurate payroll records, verifying and certifying payroll records, and making them available for inspection. The Contractor and all subcontractors shall furnish records specified in § 1776 on a monthly basis, both to the Owner and directly to the Labor Commissioner in the manner required by California Labor Code § 1771.4. The Contractor must ensure its subcontractors prepare and submit payroll records to the Owner and the DIR as required by this section.

6. COMPLIANCE MONITORING. This project is subject to monitoring and enforcement by the DIR. The Owner must withhold contract payments from the Contractor as directed by the DIR, pursuant to California Labor Code § 1727.

B. PREFERENCE FOR RESIDENT LABOR:

In the employment of labor for performance of the work, the Contractor must give preference to qualified persons residing within the general area of the work.

C. HOURS OF LABOR:

The Contractor and all subcontractors must comply with California Labor Code §§ 1810 through 1815, including but not limited to: (i) restrict working hours on public works contracts to

eight (8) hours per day are compensated at not less than 1.5 times the basic rate of pay; and (ii) specify penalties to be imposed on contractors and subcontractors of $25 per worker per day for each day the worker works more than 8 hours per day and 40 hours per week in violation of California Labor Code §§ 1810 through 1815.

D. OVERTIME WORK:

Overtime and shift work may be established as a regular procedure by the Contractor with reasonable notice and written permission of the Owner. No work other than overtime and shift work established as a regular procedure will be performed between the hours of 6:00 p.m. and 7:00 a.m. nor on Saturdays, Sundays or holidays except such work as is necessary for the proper care and protection of the work already performed or in case of an emergency.

Contractor agrees to pay the costs of overtime inspection except those occurring as a result of overtime and shift work established as a regular procedure. Overtime inspection includes inspection required during holidays, Saturdays, Sundays, and weekdays between the hours of 6:00 p.m. and 7:00 a.m. Costs of overtime inspection will cover engineering, inspection, general supervision, and overhead expenses that are directly chargeable to the overtime work. Contractor agrees that Owner will deduct such charges from payments due the Contractor.

E. TRAVEL AND SUBSISTENCE PAY:

The Contractor and subcontractors under him must comply with the requirements of Section 1773.8 of the Labor Code in the payment of travel and subsistence payments to each workman needed to execute the work, as such travel and subsistence payments are defined in the applicable collective bargaining agreements filed in accordance with Section 1773.8.

1.05 LAWS, REGULATIONS AND PERMITS

A. GENERAL:

The Contractor must give the notices required by law and comply with all laws, ordinances, rules, and regulations pertaining to the conduct of the work. The Contractor is liable for violations of the law in connection with any work provided by the Contractor. If the Contractor observes that the drawings, specifications or other portions of the project manual are at variance with any laws, ordinances, rules, or regulations, he must promptly notify the Construction Manager in writing of such variance. The Owner must promptly review the matter and, if necessary, issue a change order or take any other action necessary to bring about compliance with the law, ordinance, rule, or regulation in question. Contractor agrees not to perform work known to be contrary to any laws, ordinances, rules, or regulations.

B. PERMITS AND LICENSES:

Unless otherwise specified herein, permits and licenses from governmental agencies that are necessary only for and during the prosecution of the work and the subsequent guarantee period must be secured and paid for by the Contractor. Permits and licenses of regulatory agencies that are necessary to be maintained after completion of the guarantee period must be secured and paid for by the Owner.

C. PATENTS AND ROYALTIES:

The costs involved in fees, royalties or claims for any patented invention, article, process, or method that may be used upon or in a manner connected with the work under this contract or with the use of completed work by the Owner, must be paid by the Contractor. The Contractor and his or her sureties must protect and hold the Owner, the design engineer, and the Construction Manager, together with their officers, agents and employees, harmless from any and all loss, defense costs and expenses, including attorney's fees, and against any and all demands made for such fees or claims brought or made by the holder of any invention or patent. Before final payment is made on the account of this contract, the Contractor must, if requested by the Owner, furnish acceptable proof of a valid release from all such fees or claims.

Should the Contractor, his or her agent, employee or any of them be enjoined from furnishing or using any invention, article, material or plans supplied or required to be supplied or used under this contract, the Contractor must promptly pay such royalties and secure the requisite licenses; or, subject to acceptance by the Owner, substitute other articles, materials or appliances in lieu thereof which are of equal efficiency, quality, finish, suitability, and market value to those planned or required under the contract. Descriptive information of these substitutions must be submitted to the Construction Manager for determination of general conformance to the design concept and the construction contract. Should the Owner elect to refuse the substitution, the Contractor agrees to pay such royalties and secure such valid licenses as may be requisite for the Owner, his or her officers, agents, and employees or any of them, to use such invention, article, material, or appliance without being disturbed or in any way interfered with by any proceeding in law or equity arising from that use.

1.06 HEADINGS

Headings to parts, divisions, sections, paragraphs, subparagraphs, and forms are inserted for convenience of reference only and do not affect the interpretation of the contract documents.

1.07 SUBCONTRACTS

The Contractor must perform with his or her own organization not less than one-half of the work and must not sublet to one subcontractor more than one-third of the work without the prior written consent of the Owner.

1.08 CONFLICT OF INTEREST

A. GENERAL:

If Contractor violates any provisions of the following Sections, such actions by the Contractor will render this Agreement void. (Public Contracts Code Section 10420).

B. CURRENT STATE EMPLOYEES: (Public Contracts Code Section10410)

1. No officer or employee shall engage in any employment, activity or enterprise from which the officer or employee receives compensation or has a financial interest, and which is sponsored or funded by any state agency, unless the employment, activity or enterprise is required as a condition of regular State employment.

2. No officer or employee shall contract on his or her own behalf as an independent contractor with any State agency to provide goods or services.

C. FORMER STATE EMPLOYEES: (Public Contracts Code Section 10411)

1. For the two-year period from the date he or she left State employment, no former state officer or employee may enter into a contract in which he or she engaged in any of the negotiations, transactions, planning, arrangements or any part of the decision-making process relevant to the contract while employed in any capacity by any State agency.

2. For the twelve-month period from the date he or she left State employment, no former State officer or employee may enter into a contract with any State agency if he or she was employed by the State agency in a policy-making position in the same general subject area as the proposed contract within the 12-month period prior to his or her leaving State service.

1.09 NON-DISCRIMINATION

Contractor, subcontractors, manufacturers and suppliers shall not unlawfully discriminate, harass, or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, physical disability (including HIV and AIDS, mental disability, medical condition (cancer), age (over 40), marital status, or request for pregnancy disability or family care leave. Contractor, subcontractors, manufacturers, and suppliers shall ensure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment. Contractor, subcontractor, manufacturers, and suppliers shall comply with the provisions of the Fair Employment and Housing Act (Government Code Section 12990 (a-f) et seq.) and the applicable regulations promulgated thereunder (California Code of Regulations, Title 2, Section 7285 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code Section 12990 (a-f), set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulations, are incorporated into this Agreement by reference and made a part hereof as if set forth in full.

Contractor, subcontractors, manufacturers, and suppliers shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement and post in conspicuous places, available to all employees and applications for employment, notice that the Contractor will provide an atmosphere for employees, clients, and volunteers that this free from harassment or discrimination on the bases set forth above.

Contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the Agreement.

1.10 EQUAL OPPORTUNITY

A. The Civil Rights, Housing and Community Development, and Age Discrimination Act Assurances:

The Contractor, subcontractor, manufacturers and suppliers assures that no otherwise qualified person shall be excluded from participation or employment, denied program benefits, or be subjected to discrimination based on race, color,

national origin, sex, age, handicap, religion, familial status, or religious preference, under any grant activity funded by this Agreement, as required by Title VI of the Civil Rights Act of 1964, Title I of the Housing and Community Development Act of 1974, as amended, the Age Discrimination Act of 1975, the Fair Housing Amendment Act of 1988, and all implementing regulations.

B. Rehabilitation Act of 1973 and the "504 Coordinator":

The Contractor, subcontractors, manufacturers and suppliers further agrees to implement the Rehabilitation Act of 1973, as amended, and its regulations, 24 CFR Part 8, including, but not limited to, for Contractors, subcontractors, manufacturers and suppliers with fifteen (15) or more permanent full or part time employees, the local designation for a specific person charged with local enforcement of this Act, as the "504 Coordinator."

PART 2--OWNER-CONTRACTOR RELATIONS

2.01 AUTHORITY OF OWNER

A. GENERAL:

The Owner, acting through the Owner's Representative and the Construction Manager, has the authority to act as the sole judge of the work and materials with respect to both quantity and quality as set forth in the contract. It is expressly stipulated that the drawings, specifications, and other contract documents establish the requirements as to the nature of the completed work and, except in those instances where the nature of the completed work is dependent on the method of performance, do not purport to control the method of performing work.

B. AUTHORITY OF OWNER'S REPRESENTATIVE:

1. GENERAL: Except for those decisions expressly reserved to the City Council of the City of Crescent City, the Owner's Representative has the authority to act on behalf of the Owner on change orders, progress payments, contract decisions, and acceptability of the Contractor's work.

2. CHANGE ORDERS: Up to an aggregate limit of 10% of the Contract price, the Owner's Representative has the authority to accept or reject change orders proposed by either the Construction Manager or the Contractor.

3. PROGRESS PAYMENTS: The Owner's Representative has the authority to accept or reject requests for progress payments which have been submitted by the Contractor and recommended by the Construction Manager.

4. CONTRACT DECISIONS: Should the Contractor disagree with the Construction Manager's decision with respect to the contract, the Contractor may request that the Owner's Representative review the Construction Manager's decision and make a determination on behalf of the Owner in the manner provided under paragraph 00 72 00-2.05 F.2.

5. ACCEPTABILITY OF WORK: The Owner's Representative has the authority to make the initial determination of the acceptability of the work as provided under paragraph 00 72 00-7.05. The Owner's Representative also has the authority to accept or reject initially the Construction Manager's recommendations regarding retention of defective work as provided in paragraph 00 72 00-4.09 B. Each of these determinations is made subject to the authority of the City Council of the City of Crescent City.

6. EARLY POSSESSION: The Owner's Representative has the authority to take early possession in accordance with paragraph 00 72 00-7.06.

C. AUTHORITY OF CONSTRUCTION MANAGER:

1. GENERAL: The Construction Manager is the construction site representative of the Owner, employed to act as advisor and consultant to the Owner in construction matters related to the contract. The Owner has delegated his authority to the Construction Manager to make initial decisions regarding questions which may arise as to the quality or acceptability of materials furnished and work performed and as to the manner of

performance and rate of progress of the work under the contract. The Construction Manager interprets the intent and meaning of the contract and makes initial decisions with respect to the Contractor's fulfillment of the contract and the Contractor's entitlement to compensation. The Contractor must look initially to the Construction Manager in matters relating to the contract. The Construction Manager's decisions are subject to review by the Owner's Representative in accordance with paragraph 00 72 00-2.05 F.2.

2. INSPECTION OF CONSTRUCTION: The Construction Manager has access to the work and to the site of the work and to the places where work is being prepared or where materials, equipment, and machinery are being obtained for the work. If requested by the Construction Manager, the Contractor must provide the assistance necessary for obtaining such access and must provide information related to the inspection of construction.

3. CHANGE ORDERS: The Construction Manager has the authority to initiate or recommend change orders. Change orders are subject to review and approval by the Owner.

D. USE OF CONTRACTOR'S PLANT AND EQUIPMENT:

Contractor agrees to make available to the Owner his plant and equipment for the performance of work at the project site. The Owner agrees that the use of such plant and equipment is extra work and will be paid for accordingly.

2.02 RESPONSIBILITIES OF OWNER

A. ATTENTION TO WORK:

The Owner will notify the Contractor in writing of the name of the Owner's Representative and of the Construction Manager. The Construction Manager normally will be at the site of the work. During his absences, the Contractor may contact a previously designated representative of the Construction Manager.

B. OWNER'S EMPLOYEES:

The Owner is responsible for the adequacy, efficiency, and sufficiency of his employees and of any consultant, supplier or subcontractor employed by the Owner.

2.03 AUTHORITY OF CONTRACTOR

A. CONTRACTOR'S REPRESENTATIVE:

The Contractor must notify the Owner in writing of the name of the person who will act as the Contractor's representative and will have the authority to act in matters relating to this contract. This person must have authority to carry out the provisions of the contract and to supply materials, equipment, tools, and labor without delay for the performance of the work.

B. CONSTRUCTION PROCEDURES:

The Contractor will supervise and direct the work. He has the authority to determine the means, methods, techniques, sequences, and procedures of construction, except in those

instances where the Owner, to define the quality of an item of work, specifies in the contract, a means, method, technique, sequence or procedure for construction of that item of work.

C. SUBCONTRACTORS:

Subcontractors do not have a direct relationship with the Owner. The persons engaged in the work, including employees of subcontractors and suppliers, are considered employees of the Contractor and their work is subject to the provisions of the contract. References in the project manual to actions required of subcontractors, manufacturers, suppliers, or any person other than the Contractor, the Owner or the Construction Manager require the Contractor in turn to require that subcontractor, manufacturer, supplier or person to perform the specified action.

2.04 RESPONSIBILITIES OF CONTRACTOR

A. SUBCONTRACTORS, MANUFACTURERS AND SUPPLIERS:

The Contractor is responsible for the adequacy, efficiency and sufficiency of subcontractors, manufacturers, suppliers, and their employees. The Contractor shall perform, with Contractor's own organization, contract work amounting to not less than 50 percent of the original total contract price.

B. CONTRACTOR'S EMPLOYEES:

The Contractor is responsible for the adequacy, efficiency, and sufficiency of his employees. Workers must have sufficient knowledge, skill, and experience to perform properly the work assigned to them.

C. PAYMENT FOR LABOR AND MATERIALS:

The Contractor must pay and require his subcontractors to pay any and all accounts for labor including Workers Compensation premiums, State Unemployment and Federal Social Security payments and other wage and salary deductions required by law. The Contractor also must pay and require his or her subcontractors to pay any and all accounts for services, equipment, and materials used by him and by his subcontractors during the performance of work under this contract. These accounts must be paid as they become due and payable. If requested by the Owner, the Contractor must furnish to the Owner proof of payment of these accounts.

D. ATTENTION TO WORK:

The Contractor, acting through his or her representative, must give personal attention to and manage the work so that it is prosecuted faithfully. When his or her representative is not personally present at the project site, his designated alternate must be available and have the authority to act on the contract.

E. EMPLOYEE SAFETY:

The Contractor alone is responsible for the safety of his or her own employees and his or her subcontractor's employees. The Contractor must maintain the project site and perform the work in a manner that meets the Owner's responsibility under statutory and common law for the provision of a safe place to work.

F. PUBLIC SAFETY AND CONVENIENCE:

The Contractor must conduct his or her work so as to insure the least possible obstruction to traffic and inconvenience to the general public and the residents in the vicinity of the work. Work will be performed so as to insure the protection of persons and property. No road or street will be closed to the public except with the permission of the Construction Manager and the proper governmental authority. Fire hydrants on or adjacent to the work must be accessible to firefighting equipment. Temporary provisions must be made by the Contractor to insure the use of sidewalks, private and public driveways and proper functioning of gutters, sewer inlets, drainage ditches and culverts, irrigation ditches, and natural water courses.

G. COOPERATION WITH CONSTRUCTION MANAGER:

The Contractor, when requested, must assist the Construction Manager in obtaining access to work which is to be inspected. The Contractor must provide the Construction Manager with information requested in connection with the inspection of the work.

H. RECORDS RETENTION

The Contractor shall retain all books, records, accounts, documentation, and all other materials relevant to this Agreement for a period of five (5) years from date of termination of this Agreement, or five (5) years from the conclusion or resolution of any and all audits or litigation relevant to this Agreement and any amendments, whichever is later.

I. WORK SITE SECURITY

The Owner has limited security at the area the work is to take place; therefore the Contractor shall not rely upon the Owner's security to protect the work site from theft or vandalism. The Contractor is responsible for providing necessary security measures to prevent theft or vandalism of material and equipment stored on site, work that has been completed, and work that is in the process of being completed. The Contractor shall repair or replace any damage or theft that occurs throughout the course of the work at no additional cost to the Owner.

J. CONTRACTOR AND SUBCONTRACTORS DAILY WORK REPORTS

The Contractor shall submit a daily report to the Construction Manager at the end of each shift worked. Daily reports shall include the following:

1. List all personnel working on the project and their classification,
2. Equipment utilized,
3. Shift and hours worked,
4. Accident report(s) if applicable,
5. Material/Equipment deliveries,
6. Production report covering day's activities.

K. SALES AND USE TAX REQUIREMENTS

During the performance of this Agreement, Contractor, for itself, its assignees and successors in interest, must:

1. USE TAX DIRECT PAYMENT PERMIT: For all leases and purchases of materials, equipment, supplies, or other tangible property used to perform the Contract and shipped from outside California, the Contractor and any subcontractor leasing or purchasing the materials, equipment, supplies, or other tangible personal property must obtain a Use Tax Direct Payment Permit from the California State Board of Equalization (SBE) in accordance with the applicable SBE criteria and requirements.

2. SELLER'S PERMIT: Contractor and any construction subcontractor whose subcontract is for $5,000,000 or more must elect to allocate the local sales and use tax derived from the Contract directly to the local jurisdiction (Del Norte County) where the jobsite is located. For this purpose, the Contractor and such subcontractors must obtain a seller's permit or a sub-permit of their seller's permit for the specific jobsite and allocate the local tax to the jobsite on Schedule C of their sales and use tax return.

2.05 OWNER-CONTRACTOR COORDINATION

A. SERVICE OF NOTICE:

Notice, order, direction, request or other communication given by the Construction Manager or Owner to the Contractor is well and sufficiently given to the Contractor if left at any office used by the Contractor or delivered to any of his officers, clerks or employees or posted at the site of the work or mailed to the Contractor at the address given in the contract document or mailed to the Contractor's last known place of business. If mailed by first-class mail, any form of communication is deemed to have been given to and received by the Contractor a day after the day of mailing.

B. SUGGESTIONS TO CONTRACTOR:

A plan or method of work suggested by the Owner or the Construction Manager to the Contractor but not specified or required, if adopted or followed by the Contractor in whole or in part, is used at the risk and responsibility of the Contractor. The Owner and the Construction Manager assume no responsibility for the decision to use that plan or method of work and they are not liable for any defects in the work that result from or are caused by use of such plan or method of work.

C. COOPERATION:

The Contractor agrees to permit entry to the site of the work by the Owner or other contractors performing work on behalf of the Owner. The Contractor must afford to the Owner and other contractors and their employees, reasonable facilities and cooperation and must arrange his or her work and dispose of his or her materials so as not to interfere with the activities of the Owner or of others upon the site of the work. The Contractor must promptly make good any injury or damage that may be sustained by other contractors or employees of the Owner at his or her hands. The Contractor must join his work to that of others and perform his work in proper sequence in relation to that of others.

If requested by the Contractor, the Owner will arrange meetings with other contractors performing work on behalf of the Owner to plan coordination of construction activities. The Owner must keep the Contractor informed of the planned activities of other contractors.

Differences or conflicts arising between the Contractor and other contractors employed by the Owner or between the Contractor and the workers of the Owner with regard to their work must

be submitted to the Construction Manager for his decision in the matter. If the work of the Contractor is affected or delayed because of any act or omission of other contractors or of the Owner, the Contractor may submit for the Owner's consideration, a documented request for a change order.

D. DEVIATION FROM CONTRACT:

Neither the Contractor nor the Owner may make an alteration or variation in, addition to, or deviation or omission from the terms of this contract without the written consent of the other party.

E. DIFFERING SITE CONDITIONS:

Pursuant to Public Contract Code Section 7104, the Contractor shall promptly, and before such conditions are disturbed, notify the Owner in writing of:

1. Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code , that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

2. Subsurface or latent physical conditions at the site differing from those indicated by information about the site made available to bidders prior to the deadline for submitting bids.

3. Unknown physical conditions at the site of an unusual nature, differing materially from those both ordinarily encountered and generally recognized as inhering in work of the character provided for in this contract.

The Owner shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the contractor's cost of, or the time required for, performance of any part of the work under this contract, whether or not the work is changed as a result of such conditions, an equitable adjustment will be made and the contract modified in writing accordingly.

In the event that a dispute arises between the Owner and the Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the contractor's cost of, or time required for, performance of any part of the work, the contractor shall not be excused from any scheduled completion date provided for by the contract, but shall proceed with all work to be performed under the contract. The contractor shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

No claim by the Contractor under this clause is allowed unless the Contractor has given the notice required, except that the Owner may extend the prescribed time.

No claim by the Contractor for an equitable adjustment under this clause will be allowed if it is asserted after final payment under this contract.

F. CLAIMS:

1. DETERMINATION BY CONSTRUCTION MANAGER: Questions regarding the meaning and intent of the contract documents must be referred by the Contractor in writing to the Construction Manager for his decision. The Construction Manager must respond to the Contractor in writing with his decision. If the Contractor disagrees with the Construction Manager's decision or considers that the decision requires extra work, he must, within five calendar days, notify the Construction Manager in writing of the disagreement or of the claimed extra work involved and of the estimated cost of said work.

2. APPEALS TO THE OWNER'S REPRESENTATIVE: In the event the Contractor disagrees with any determination or decision of the Construction Manager, the Contractor may, within 15 calendar days of the date of such determination or decision, appeal the determination or decision to the Owner's Representative. The Owner's Representative must review the appeal and transmit his decision in writing to the Contractor within 30 calendar days from the receipt of the appeal. Any failure of the Contractor to appeal the decision or the determination of the Construction Manager within the 15-day period is a waiver of the Contractor's right thereafter to assert a claim resulting from such determination or decision.

3. ARBITRATION: All claims, counterclaims, disputes and other matters in question between the Owner and the Contractor that are not resolved between the Owner's Representative and the Contractor will be decided by arbitration if the parties mutually agree, or in a court of competent jurisdiction within the state in which the Owner is located.

PART 3--SPECIFICATIONS AND DRAWINGS

3.01 INTERPRETATION OF SPECIFICATIONS AND DRAWINGS

A. GENERAL:

The specifications and drawings are intended to be explanatory of each other. Work specified on the drawings and not in the specifications, or vice versa, must be executed as if it were specified in both.

B. REQUEST FOR CLARIFICATION:

In the event the work to be done or matters related to the work are not sufficiently detailed or explained in the contract documents, the Contractor must apply to the Construction Manager for further explanations as may be necessary and must conform thereto so far as may be consistent with the terms of the contract. In the event of doubt or question arising respecting the true meaning of the specifications or drawings, reference must be made to the Construction Manager for his decision. Should the Contractor disagree with the Construction Manager's decision, he may appeal to the Owner's Representative in accordance with paragraph 00 72 00-2.05 F.2.

3.02 DIVISION OF SPECIFICATIONS AND DRAWINGS

Specifications and drawings are divided into groups for the convenience of the Owner and Construction Manager. These divisions are not for the purpose of apportioning work or responsibility for work among subcontractors, suppliers, and manufacturers.

3.03 DISCREPANCIES IN SPECIFICATIONS AND DRAWINGS

A. ERRORS AND OMISSIONS:

If the Contractor, in the course of the work, becomes aware of any claimed errors or omissions in the contract documents or in the Owner's field work, he must immediately inform the Construction Manager in writing. The Construction Manager must promptly review the matter and if he finds an error or omission has been made, he must determine the corrective actions and advise the Contractor accordingly. If the corrective work associated with an error or omission increases or decreases the amount of work called for in the contract, the Owner must issue an appropriate change order. After discovery of an error or omission by the Contractor, related work performed by the Contractor is done at his risk unless authorized by the Construction Manager. In the event the Contractor disagrees with the determination of the Construction Manager under this provision, he may appeal to the Owner's Representative in accordance with paragraph 00 72 00-2.05 F.2.

B. CONFLICTING PROVISIONS:

In cases of conflict between the specifications and drawings, the more stringent governs. Figure dimensions on drawings govern over scale dimensions and detail drawings govern over general drawings. In the event an item of work is described differently in two or more locations on the drawings and in the specifications, the Contractor must request a clarification from the Construction Manager.

C. UTILITIES:

The Owner has endeavored to determine the existence of utilities at the site of the work from the records of the owners of known utilities in the vicinity of the work. The positions of these utilities as derived from such records are shown on the drawings. No excavations were made to verify the locations shown for underground utilities. The service connections to these utilities are not shown on the drawings. It is the responsibility of the Contractor to determine the exact location of utilities and service connections thereto. The Contractor must make his own investigations, including exploratory excavations, to determine the locations and type of existing utilities, including service connections, prior to commencing any work that could result in damage to those utilities. The Contractor must immediately notify the Construction Manager as to any utility discovered by him in a different position than shown on the drawings or that is not shown on the drawings.

Work on utilities must be performed and paid for as follows:

1. Known utilities. The Contractor must provide all labor, equipment, materials, and services necessary to remove, relocate or maintain utilities specified on the drawings. The work on each utility must be performed in a manner satisfactory to the utility owner. The utility owner has the option of doing such work with his own forces at the Contractor's expense or permitting the work to be performed by the Contractor.

2. Service connections. Locations of service connections are not specified on the drawings. The Contractor must provide all labor, equipment, and material to remove, relocate or maintain service connections. The work on service connections must be performed in a manner satisfactory to the service connection owner. The service connection owner has the option of doing such work with his own forces at the Contractor's expense or permitting the work to be performed by the Contractor.

3. Unknown utilities. When a utility is not specified on the drawings, or it is located in a position different from that specified on the drawings, and interferes with the work, a change order based on changed site conditions will be issued in accordance with paragraph 00 72 00-7.02. Interference with the work is defined as a utility that crosses or projects into the plane of the work at an elevation between the top and bottom of the work. If it is necessary to remove, relocate, or temporarily maintain the utility, that work shall be included in the change order. The utility owner has the option of doing such work at the Contractor's expense or permitting the work to be performed by the Contractor. In either case, the cost of the work will be included in the change order.

No representations are made that the obligations to move or temporarily maintain the utility and to pay the cost thereof is or is not required to be borne by the owner of such utility, and it is the responsibility of the Contractor to investigate to find out whether or not the cost is required to be borne by the owner of the utility.

The right is reserved to governmental agencies and to owners of utilities to enter upon streets, alleys, rights-of-way or easements for the purpose of making changes in their property

made necessary by the work and for the purpose of maintaining and making repairs to their property.

3.04 SUBMITTALS

Where required by the specifications, the Contractor must submit specified information that will enable the Construction Manager to advise the Owner whether the Contractor's proposed materials, equipment or methods of work are in general conformance to the design concept and in compliance with the drawings and specifications. The requirements for submittals are specified in Part B.

3.05 CONTRACTOR'S COPIES OF PROJECT MANUALS

Within 10 days after notice to proceed, the Owner will furnish to the Contractor 4 sets of project manuals including half-size drawings, and 2 sets of full-size drawings. The Contractor is advised that revisions incorporating changes by addenda will not be incorporated into the reduced or full-size drawings furnished under the provisions of this paragraph. Additional copies of the project manual, if required by the Contractor, will be furnished by the Owner at cost. The Contractor must keep at the construction site at least one set of the project manual and one set of full-size drawings.

PART 4--MATERIAL, EQUIPMENT AND WORKMANSHIP

4.01 GENERAL

Unless otherwise specifically stated in the contract documents, the Contractor must provide and pay for materials, labor, tools, equipment, water, light, power, transportation, supervision, and temporary construction of any nature, and other services, and facilities of any nature, to execute, complete and deliver the work within the specified time. Material and equipment must be new and of a quality at least equal to that specified. Equipment offered must be current modifications which have been in successful regular operation under comparable conditions. This requirement does not apply to minor details, nor to thoroughly demonstrated improvements in design or in materials of construction. All construction work must be executed in conformity with the standard practice of the relevant trade.

4.02 PRODUCT DATA

Where required by the specifications, the Contractor must provide product data, which is a submittal furnished for information only. The information and data furnished is required by the Owner for inspecting, testing, operating, and maintaining parts of the work. The requirements for product data are specified in Part B.

4.03 QUALITY

Where the contract requires that materials or equipment be provided or that construction work be performed, and detailed specifications of such materials, equipment or construction work are not set forth, the Contractor must perform the work using materials and equipment of the best grade in quality and workmanship obtainable in the market, from firms of established good reputations, and must follow standard practices in the performance of construction work. The work performed must be in conformity and harmony with the intent to secure the highest standard of construction and equipment of work as a whole and in part.

4.04 MATERIAL AND EQUIPMENT SPECIFIED BY NAME

When material or equipment is specified by reference to two or more patents, brand names, or catalog numbers, it is understood that this is referenced for the purpose of defining the performance or other salient requirements, and that other materials or equipment, of equal capacities, quality and function will be considered by the Owner upon the Contractor's request for substitution. Requests for substitution must be made in accordance with paragraph 00 72 00-4.05.

4.05 REQUESTS FOR SUBSTITUTION

The Contractor may offer material or equipment of equal or better quality and performance in substitution for those specified. The Owner will consider offers for substitution only from the Contractor and will not acknowledge or consider such offers from suppliers, distributors, manufacturers, or subcontractors. The Contractor's offers of substitution must be made in writing to the Construction Manager and must include sufficient data to enable the Construction Manager to assess the acceptability of the material or equipment for the particular application and requirements.

If the offered substitution necessitates changes to or coordination with other portions of the work, the data submitted must include drawings and details showing such changes. Contractor agrees to perform these changes as part of the substitution of material or equipment at no additional cost to the Owner. Within 30 calendar days after receipt of the offer of substitution, the Construction Manager will review the material submitted by the Contractor and advise the Contractor of objections, if any, to the proposed substitution or if further information is required. Upon notification by the Construction Manager, the Contractor must either provide material or equipment that complies with project specifications or if requested, furnish additional information. Although the Construction Manager may not take any objections to the proposed substitution, that will not relieve the Contractor from responsibility for the efficiency, sufficiency, quality and performance of the substitute material or equipment, in the same manner and degree as the material and equipment specified by name. Any cost difference associated with a substitution must be reflected in the offer and the contract documents must be modified by a change order.

4.06 DEMONSTRATION OF COMPLIANCE WITH CONTRACT REQUIREMENTS

A. INSPECTION:

To demonstrate his or her compliance with the contract requirements, the Contractor must assist the Construction Manager in his or her performance of inspection work. The Contractor must grant the Construction Manager access to the work and to the site of the work, and to the places where work is being prepared, or whence materials, equipment or machinery are being obtained for the work. The Contractor must provide information requested by the Construction Manager in connection with inspection work.

If the contract documents, laws, ordinances, or any public regulatory authority require parts of the work to be specially inspected, tested or approved, the Contractor will give the Construction Manager adequate prior written notice of the availability of the subject work for examination.

If parts of the work are covered in contravention of the Construction Manager's directive, the cost of exposing the work for inspection and closing must be borne by the Contractor regardless of whether or not the work is found to be in compliance with the contract.

If any work is covered in the absence of the Construction Manager's directive to the contrary, the Contractor must, if directed to do so by the Construction Manager, uncover, expose, or otherwise make available for inspection, portions of covered work. If it is found that such work is defective, the Contractor must bear the expense of uncovering and reconstructing. If the work is found to be in compliance with the contract, the Contractor will be allowed an increase in the contract price, or an extension in the contract time, or both. A change order will be issued to document the increase, extension, or both.

B. SAMPLES OF MATERIALS:

In cases where compliance with contract requirements for materials to be incorporated in the work requires laboratory examination or special testing, the Contractor must provide samples or specimens as requested by the Construction Manager. Such samples or specimens must be provided in ample time to permit making proper test analysis and examinations before incorporating the material into the work. Tests of material will be conducted in accordance with the technical specifications. In the absence of a specific test requirement, the Construction Manager will determine the appropriate standard test to be used.

C. CERTIFICATION:

In cases where compliance of materials or equipment to contract requirements is not readily determinable through inspection and tests, the Construction Manager will request that the Contractor provide properly authenticated documents, certificates, or other satisfactory proof of compliance. These documents, certifications, and proofs must include performance characteristics, materials of construction and the physical or chemical characteristics of materials.

D. INSPECTION AT POINT OF MANUFACTURING:

If Owner's inspection and testing of materials or equipment in the vicinity of the work is not practicable, the specifications may require that the inspection and testing or witnessing of tests take place at the point of manufacture. In this case and in the event the remote inspection and testing is not specified and is requested by the Owner, the required travel, subsistence, and labor expenses will be paid by the Owner. If the Contractor requests the Owner to inspect and test material or equipment at the point of manufacture, then the additional cost to the Owner for travel, subsistence, and labor expenses must be paid by the Contractor.

4.07 STORAGE OF MATERIALS AND EQUIPMENT

Materials and equipment must be stored so as to insure the preservation of their quality and fitness for the work. Stored equipment and materials must be located so as to facilitate inspection. The Contractor is responsible for damages that occur in connection with the care and protection of materials and equipment until final acceptance of the work.

4.08 MANUFACTURER'S DIRECTIONS

Manufactured articles and materials and equipment must be applied, installed, connected, erected, adjusted, tested, operated, and maintained as recommended by the manufacturer, unless otherwise specified. Manufacturer's installation instructions and procedures must be provided or obtained prior to installation of the manufactured articles, material, and equipment.

4.09 DEFECTIVE WORK

A. CORRECTION OF DEFECTIVE WORK:

When, and as often as the Construction Manager determines through his or her inspection procedures to be the case, material, equipment or workmanship incorporated in the project do not meet the requirements of the contract, the Construction Manager will give written notice of the noncompliance to the Contractor. Within five days from the receipt of the notice, the Contractor must undertake the work necessary to correct the deficiencies, and to comply with the contract. If the Contractor disagrees with the Construction Manager's determination and believes that the corrective work should be covered by a change order, he or she must immediately notify the Owner's Representative, in writing, setting forth his position. Within five days after receipt of the Contractor's notification, the Owner's Representative will review the matter and notify the Contractor, in writing, of his determination. If the Owner's Representative determines that the corrective work is required to comply with the contract, the Contractor must proceed with that work. As a condition precedent to the Contractor's request for either additional compensation or time extension, or both, resulting from the performance of the corrective work, the Contractor must, within 15 calendar days after receipt of the Owner's Representative's determination, notify the

Owner's Representative in writing of his intent to claim additional compensation, time or both. The Contractor must document the cost information associated with the corrective work with daily records in accordance with paragraph 00 72 00-7.02 F and provide that information to the Construction Manager monthly. Receipt of the cost data by the Construction Manager will not be construed to be an acceptance of the corrective work, or an authorization for a change order to cover the corrective work.

B. RETENTION OF DEFECTIVE WORK:

Prior to acceptance of the project, the Owner may, at his option, retain work which is not in compliance with the contract if the Owner determines that such defective work is not of sufficient magnitude or importance to make the work dangerous or undesirable. The Owner also may retain defective work, if, in the opinion of the Construction Manager, and with concurrence of the Owner's Representative, removal of that work is impractical or will create conditions that are dangerous or undesirable. Just and reasonable value for such defective work will be judged by the Owner and appropriate deductions will be made in the payments due, or to become due to the Contractor. Final acceptance does not act as a waiver of the Owner's right to recover from the Contractor an amount representing the deduction for retention of defective work.

4.10 GUARANTEE

The guarantee period is 365 days from the Notice of Completion. During the guarantee period, the Contractor must, upon the receipt of notice in writing from the Owner, promptly make all repairs arising out of defective materials, workmanship, or equipment. The Owner is hereby authorized to make such repairs, if ten days after giving of such notice to the Contractor, the Contractor has failed to make or undertake the repairs with due diligence. In case of an emergency where, in the opinion of the Owner, delay could cause serious loss or damage, repairs may be made without notice to the Contractor and the expenses in connection with those repairs are chargeable to the Contractor.

For the purpose of this paragraph, "acceptance of the work" means the acceptance of the project by the Owner, in accordance with paragraph 00 72 00-7.07. "Acceptance of the work" does not extinguish any covenant or agreement on the part of the Contractor to be performed or fulfilled under this contract that has not, in fact, been performed or fulfilled at the time of such acceptance. All covenants and agreements continue to be binding on the Contractor until they have been fulfilled.

The Owner and the Contractor agree that guarantee on the equipment possessed and used by the Owner in accordance with paragraph 00 72 00-7.06 will commence on the date that the Owner takes possession of the equipment and so notifies the Contractor in writing. Owner and Contractor further agree that such taking possession and use may not be deemed as substantial completion or acceptance of any part of the work. Takeover of equipment will be at the Owner's option and will not be made until the equipment can be put into routine service on a permanent basis.

PART 5--LIABILITY AND INSURANCE

5.01 LIABILITY OF CONTRACTOR

The Contractor is liable for any and all losses or damages from whatever cause that, prior to final acceptance, may occur on or to any part of the work. The Contractor is not liable for losses or damages caused solely by the act of the Owner.

The Contractor is liable for damages and injury to persons owning property, on or in the vicinity of the work, or which occur to a person, persons, or any property whatsoever, arising out of the Contractor's performance of this contract. The Contractor's liability is not dependent upon whether or not such damage or injury be caused by the negligence of the Contractor, and whether or not such damage or injury is caused by the inherent nature of the work as specified.

The Contractor must indemnify and hold the Owner, the Construction Manager, the design engineer, and their officers, principals, agents, subcontractors, and employees, harmless from any and all loss, defense cost, expense, claims, demand or liability whatsoever, arising from allegations of injuries to persons or damage to property related to the performance of this contract, regardless of concurrent negligence on the part of such indemnitees. This indemnification obligation is not limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workers compensation acts, disability benefit acts, or another employee benefit act.

In case any suit or legal proceeding is brought against the Owner, the Construction Manager, the design engineer, or their officers, principals, agents, subcontractors, or employees, on account of loss or damage sustained by a person, or persons, or property, as a result of the performance of the work covered by this contract, the Contractor agrees to assume the cost of defense of that action, and to pay the expenses connected therewith, and the judgments that may be obtained against the Owner, the Construction Manager, the design engineer, or their officers, principals, agents, subcontractors, or employees, in such suits. In the event that a lien is placed against the property of the Owner, the Construction Manager, the design engineer, or their officers, principals, agents, subcontractors, or employees, as a result of such suits, the Contractor agrees immediately to cause the same to be dissolved and discharged by giving bond or otherwise. This agreement to defend and to pay the related expenses exists whether or not the alleged injuries or damage are due to the negligence of the Contractor, and whether or not the alleged injuries or damage are caused by the inherent nature of the work, as specified.

The mention of specific duties or liabilities imposed on the Contractor are not a limitation or restriction of general duties or liabilities imposed upon the Contractor by the contract. Reference to specific duties or liabilities is made herein, merely for the purpose of explanation.

5.02 BONDS

The Contractor must provide two bonds, each in the amount of 100 percent of the contract price. One bond will serve as security for the faithful performance of the work and the other as security for the faithful payment and satisfaction of the persons furnishing materials and performing labor on the work. The bonds must be issued by a corporation duly and legally licensed to transact surety business in the State of California. The two bonds must remain in force throughout the period required to complete the work, and thereafter for a period of 365 calendar days after final acceptance of the work. The bonds must be executed by a duly licensed surety company that is

listed in the latest Circular 570 of the United States Treasury Department as being acceptable as surety on federal bonds. No surety's liability on the bonds may exceed the underwriting limitations for the respective surety specified in Circular 570. The scope of the bonds or the forms thereof prescribed in these contract documents in Sections 00 61 05 and 00 61 10 in no way affect or alter the liabilities of the Contractor to the Owner.

5.03 INSURANCE

A. GENERAL:

1. EVIDENCE OF INSURANCE: Prior to execution of the contract, the Contractor must file, with the Owner, evidences of insurance from the insurer, certifying to the coverage of the insurance required herein. The evidences of insurance must be certified by a properly authorized officer, agent, general agent or qualified representative of the insurer, and must certify the names of the insured, the type and amount of insurance, the location and operations to which the insurance applies, and the expiration date. The evidences must include the agreement of the insurer to give, by registered mail, notice to the Owner at least 30 calendar days prior to the effective date of cancellation, lapse, or material change in the policy.

This Certificate of Insurance is not an insurance policy and does not amend, extend or alter the coverage afforded by the policies listed herein. Notwithstanding any requirement, term, or condition of the contract with respect to which this certificate is issued, the insurance afforded by the policies described herein is subject to the terms, exclusions, and conditions of such policies.

2. CANCELLATION OF INSURANCE: The Contractor must deliver to the Owner policies of insurance and the receipts for payment of premiums thereon. Should the Contractor neglect to obtain and maintain in force such insurance and deliver such policy or policies and receipts to the Owner, then Owner may obtain and maintain such insurance. The Contractor hereby appoints the Owner his true and lawful attorney, to do the things necessary for this purpose. Money expended by the Owner under the provisions of this paragraph for insurance premiums will be charged to the Contractor. Failure of the Owner to obtain such insurance in no way relieves the Contractor of his responsibilities under this contract.

B. PUBLIC LIABILITY:

The Contractor must provide public liability insurance covering bodily injury, in an amount of not less than a combined single limit of four million dollars ($4,000,000) for one or more persons injured in each occurrence. This insurance must cover bodily injuries or death suffered, or alleged to have been suffered by any person or persons by reason of or in the course of operations under this contract, whether occurring by reason of acts or omissions of the Contractor, or any subcontractor, or both. The required insurance must be maintained until final acceptance of the work and must include completed-operations and products-liability insurance, with aggregate limit in the amount specified above, and must continue for a period of 365 calendar days after final acceptance of the work.

The Contractor must provide property damage insurance in an amount of not less than a combined single limit of one million dollars ($1,000,000) for property damaged in each occurrence. The insurance must cover damages to property suffered or alleged to have been suffered, by person, or persons, by reason of, or in the course of, the operations under the contract, whether occurring by reason of acts or omissions of the Contractor or any subcontractor or both. The

required insurance must be maintained until final acceptance of the work, and must include completed operations and products liability insurance, and must continue for a period of 365 calendar days after the final acceptance of the work.

The required liability insurance must indemnify the Contractor and his subcontractors against loss from liability, imposed by law upon or assumed under contract by the Contractor or his subcontractors, for damages on account of bodily injury and property damage. The insurance must also indemnify the Contractor and his subcontractors against losses related to completed operations and products. The insurance must be contained in a comprehensive, broad-form, occurrence, bodily injury, and property damage liability policy written by licensed underwriters. The policies must cover operations, owned- and nonowned-vehicles and equipment, contractors' protective coverage blanket, contractual liability, and completed operations liability. The liability insurance must not exclude explosion, collapse, underground excavation, or removal of lateral support and must include cross liability. The Owner, the Construction Manager, the design engineer, and their officers, principals, agents, subcontractors, and employees must be named as insured on the liability policies.

C. WORKERS COMPENSATION INSURANCE:

The Contractor and each subcontractor must cover or insure under applicable laws relating to workers compensation or employers liability insurance, their employees, working on or about the construction site, regardless of whether such coverage or insurance is mandatory or merely elective under the law. The Contractor must defend, protect, save harmless the Owner from and against claims, suits and actions arising from failure of the Contractor or the subcontractors to maintain such insurance.

D. BUILDERS RISK:

Contractor must secure an all-risk type of builders risk insurance covering work performed under the contract and the materials, equipment or other items to be incorporated therein, while the same are located at the construction site, stored off site, or at the place of manufacture. The policy must cover not less than losses due to fire, flood, explosion, hail, lightning, vandalism, malicious mischief, wind, collapse, riot, aircraft, and smoke until the date of final acceptance of the work. The policy may exclude loss or damage caused by or resulting from errors in design or from the use of substandard materials or supplies used knowingly by or at the direction of the insured, but must not exclude results, physical loss, or damage to other property covered hereunder. Neither exclusion will apply in the event of fire, explosion, or acts of God. The maximum deductible allowable under this policy is $50,000. The policies providing this insurance must name the Owner, the Construction Manager, the design engineer, and their subconsultants as additional insureds as their respective interests appear. The making of progress payments to the Contractor does not create an insurable interest by or for the Owner or relieve the Contractor or his subcontractors of responsibility for loss or direct physical loss, damage or destruction occurring prior to final acceptance.

Consistent with California Public Contracts Code, Section 7105, builders risk insurance is not required for coverage of losses in excess of five percent of the contract price for damages resulting from earthquakes in excess of magnitude of 3.5 on the Richter scale or from tidal waves. Coverage in the amount of five percent of the contract price for such losses must be provided by the Contractor.

PART 6--PROGRESS AND COMPLETION

6.01 NOTICE TO PROCEED

After execution of the contract by the Owner, written notice to proceed will be given by the Owner to Contractor. Notwithstanding other provisions of the contract, the Contractor is not obligated to perform work and the Owner is not obligated to accept or pay for work performed by the Contractor prior to date of the notice to proceed. The Owner's knowledge of work being performed prior to date of the notice to proceed does not obligate the Owner to accept or pay for such work.

6.02 CONTRACT TIME

A. GENERAL:

Time is of the essence of the contract. The Contractor must promptly start the work after the date of the notice to proceed and must prosecute the work so that the project is complete within the time specified in Section 01 11 05. During periods when weather or other conditions are unfavorable for construction, the Contractor will pursue only such portions of the work as will not be damaged thereby. No portions of the work where acceptable quality or efficiency will be affected by unfavorable conditions may be constructed while those conditions exist. It is expressly understood and agreed by and between the Contractor and the Owner that the contract time for completion of the work is reasonable, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the work.

B. CONSTRUCTION SCHEDULE:

The Contractor shall provide a construction schedule and reports for scheduling and coordinating the work within the contract time. Contract time extensions must be incorporated into updated schedules, reflecting their effect at the time of occurrence. Failure of the Contractor to comply with these requirements for submittal of the construction schedule and reports will be cause for delay in review of progress payments by the Construction Manager.

C. CONSTRUCTION PROGRESS:

The Contractor must furnish such manpower, materials, facilities, and equipment as may be necessary to insure the prosecution and completion of the work in accordance with the accepted schedule. If work falls behind the accepted construction schedule, the Contractor agrees that he or she will take some or all of the following actions to return the project to the accepted schedule. These actions may include the following:

1. Increase manpower in quantities and crafts;

2. Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of equipment, or any combination of the foregoing; and/or

3. Reschedule activities.

If requested by the Construction Manager, the Contractor shall prepare a proposed schedule revision demonstrating a plan to make up the lag in progress and insure completion of the work within the contract time. The proposed revision must be submitted to the Construction Manager in accordance with Section 01 33 00. Upon receipt of an acceptable proposed schedule, the revision to the construction schedule will be made in accordance with paragraph 01 33 00-4. All actions to return the project to the accepted schedule are at the Contractor's expense.

The Contractor must pay all costs incurred by the Owner that result from the Contractor's action to return the project to its accepted schedule. Contractor agrees that Owner may deduct such charges from payments due the Contractor. It is further understood and agreed that none of the services performed by the Construction Manager in monitoring, reviewing, and reporting project status and progress operate to relieve the Contractor of responsibility for planning and managing construction work in conformance with the construction schedule.

D. DELAYS:

1. NOTICE OF DELAYS: When the Contractor foresees a delay in the prosecution of the work and, in any event, immediately upon the occurrence of a delay that the Contractor regards as unavoidable, he must notify the Construction Manager in writing of the probability of the occurrence of the delay, the extent of the delay, and its probable cause. The Contractor must take immediate steps to prevent, if possible, the occurrence or continuation of the delay. If this cannot be done, the Construction Manager must determine how long the delay is likely to continue and to what extent the prosecution and completion of the work are being delayed. The Contractor must also determine whether the delay is to be considered avoidable or unavoidable and notify the Contractor of his determination. The Contractor agrees that no claim is allowed for delays the causes of which are not called to the attention of the Construction Manager at the time of their occurrence or as soon thereafter as Contractor becomes aware of them.

2. AVOIDABLE DELAYS: Avoidable delays in the prosecution of the work include delays that could have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or his subcontractors. Avoidable delays include:

a. Delays which may in themselves be unavoidable but which affect only a portion of the work and do not necessarily prevent or delay the prosecution of other parts of the work nor the completion of the whole work within the contract time.

b. Time associated with the reasonable interference of other contractors employed by the Owner which do not necessarily prevent the completion of the whole work within the contract time.

3. UNAVOIDABLE DELAYS: Unavoidable delays in the prosecution or completion of the work include delays that result from causes beyond the control of the Contractor and could not have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or his subcontractors. Delays in completion of the work of other contractors employed by the Owner will be considered unavoidable delays insofar as they interfere with the Contractor's completion of the work. Delays due to normal weather conditions are not regarded as unavoidable because the Contractor agrees to plan his work with prudent allowances for interference by normal weather conditions. Delays caused by acts of God, fire, unusual storms, floods, tidal waves, earthquakes, strikes, labor disputes, freight embargoes and shortages of

materials are considered unavoidable delays if they prevent the Contractor from proceeding with at least seventy-five percent (75%) of the normal labor and equipment force for at least five hours per day toward completion of the current controlling item on the accepted critical path schedule.

If abnormal conditions prevent the work from beginning at the usual starting time, or prevent the Contractor from proceeding with seventy-five percent (75%) of the normal labor and equipment force for a period of at least five hours per day, and the crew is dismissed as a direct consequence, Contractor will not be charged for a working day whether or not conditions change so that the major portion of the day could be considered to be suitable for work on the controlling item.

E. EXTENSION OF TIME:

1. AVOIDABLE DELAYS: If the work is not completed in the accepted construction schedule, including any extension of time that may have been granted for unavoidable delays, the Contractor will be assessed damages for those costs incurred by the Owner that are attributable to the fact that the work was not completed on schedule.

The Owner may grant an extension of time for avoidable delay if he deems it in his best interest. If the Owner grants an extension of time for avoidable delay, the Contractor agrees to pay actual costs, including charges for engineering, inspection, and administration, as specified in paragraph 00 72 00-7.04, incurred during the extension.

2. UNAVOIDABLE DELAYS: For delays that the Contractor considers to be unavoidable, he must submit to the Construction Manager complete information demonstrating the effect of the delay on the controlling operation in the accepted construction schedule. The submission must be made within 30 calendar days of the occurrence that is claimed to be the cause of the unavoidable delay. The Construction Manager will review the Contractor's submission and determine the number of days of unavoidable delay and the effect of any unavoidable delay on controlling operations of the work. The Owner agrees to grant an extension of time to the extent that unavoidable delays affect controlling operations in the construction schedule. During such extension of time, neither extra compensation, nor engineering inspection and administration, nor damages for delay will be charged to the Contractor. It is understood and agreed by the Contractor and Owner that time extensions due to unavoidable delays will be granted only if such unavoidable delays involve controlling operations which would prevent completion of the whole work within the specified contract time.

3. LIQUIDATED DAMAGES: It is agreed by the parties to the contract that in case all the work called for under the contract in all parts and requirements is not finished or completed within the number of working days as set forth in Section 01 11 05, damage will be sustained by the Owner, and that it is and will be impracticable and extremely difficult to ascertain and determine the actual damage which the Owner will sustain in the event of and by reason of the delay; and it is therefore agreed that the Contractor will pay to the Owner, the sum of **Four Hundred dollars ($ 400.00)** per day for each and every calendar day's delay in finishing the work in excess of the number of working days prescribed; and the Contractor agrees to pay the liquidated damages herein provided for, and further agrees that the Owner may deduct the amount thereof from any moneys due or that may become due the Contractor under the contract.

6.03 SUSPENSION PROCEDURES

The Owner may, at his convenience and at any time and without cause, suspend, delay, or interrupt all or any part of the work for a period of not more than 90 days by notice in writing to the Contractor. The Owner must specify the date on which the work must be resumed. The work must be resumed by the Contractor within 10 days after receiving written notice from the Owner to do so. The Contractor will be allowed an increase in the contract price or an extension of contract time, or both, directly attributable to any suspension if he makes a claim therefore as provided in the paragraphs related to change of contract price and change of contract time.

6.04 TERMINATION PROCEDURES

A. TERMINATION BY OWNER FOR DEFAULT:

The Owner may terminate the contract upon written notice to the Contractor and his surety whenever the Contractor is deemed to be in default in the performance of any of its material obligations under this contract and does not or cannot cure such default within ten (10) days of receipt of a notice of default.

For purposes of this paragraph, a material default includes the following events:

1. Contractor is bankrupt or insolvent.

2. Contractor makes a general assignment for the benefit of creditors.

3. A trustee or receiver is appointed for Contractor, or for any of Contractor's property.

4. Contractor files a petition to take advantage of any debtor's act, or to reorganize under any bankruptcy chapter or law.

5. Contractor repeatedly fails to make prompt payments to subcontractors or others for labor, materials, or equipment.

6. Contractor disregards laws, ordinances, rules, regulations, or orders of any public body having jurisdiction.

7. Contractor disregards the authority of Construction Manager.

8. Contractor violates in any substantial way the provisions of the contract documents by failing, neglecting, or refusing to proceed according to and in full compliance with the provisions and covenants of the contract documents.

After termination of the Contract for default, the Owner may exclude the Contractor from the site and take possession of the work and all of the Contractor's tools, appliances, construction equipment, and machinery at the site and use the same to the full extent they could be used by the Contractor. The Owner may incorporate in the work all materials stored at the site or for which the Owner has paid the Contractor that are stored elsewhere. In such case, the Contractor is not entitled to receive any further payment until the work is finished.

If the unpaid balance of the contract price exceeds the direct and indirect cost of the completed work, including compensation for additional professional services, the excess must be paid to the Contractor. If such costs exceed such unpaid balance, the Contractor shall pay the difference to the Owner. The costs incurred by the Owner will be verified by the Construction Manager and incorporated into a change order, but in finishing the work, the Owner will not be required to obtain the lowest figure for work performed.

Where the Contractor's services have been so terminated by the Owner, the termination does not affect any rights of the Owner against the Contractor then existing or that may thereafter accrue. Any retention or payment of monies due the Contractor by the Owner will not release the Contractor from liability.

If the Owner terminates this agreement for default, and it is thereafter determined that the Contractor had not so failed to perform its obligations or defaulted in any way, the termination will then be deemed to have been effected for the convenience of the Owner. In that event, any adjustment of compensation to Contractor must be in accordance with paragraph 00 72 00-6.04 B.

B. TERMINATION BY OWNER FOR OTHER THAN DEFAULT:

1. For Lack of Funds. If grant funding for this project is reduced or deleted by the State of California, then Owner may terminate this contract or reduce the scop of work and compensation to reflect the reduced grant award. In such circumstances, mutual agreement is not required. The Owner must notify the Contractor as soon as practical.

2. For Convenience. The Owner will have the right to terminate this contract if the Owner determines that it is in the best interest of the Owner to do so by serving the Contractor within thirty (30) calendar days' advance written notice of termination. Except as expressly provided herein, the Owner will not incur any liability by virtue of terminating for convenience.

3. Notice. The Owner may, without prejudice to any other remedy it may have under the provisions of the contract, terminate this contract, in whole or in part for either lack of funds or convenience, at any time by giving written notice to Contractor or its representative by certified mail, return receipt requested. Termination is effective upon receipt of the notice by Contractor. Contractor must immediately discontinue work and take all reasonable steps with its suppliers and subcontractors to minimize cancellation charges and other costs.

4. Reasonable Costs and Expenses. In the event of termination for reasons other than default of Contractor, Contractor is entitled to recover all reasonable costs incurred in connection with performance of the work, plus any cost and expense reasonably and necessarily incurred in connection with the termination, plus a percentage of the profit based on the percentage of completion of the work.

C. TERMINATION BY CONTRACTOR:

If the work is stopped by order of a court, a public authority or the Owner for a period of 90 calendar days or more, through no act or fault of the Contractor or anyone employed by him or his

subcontractors, then the Contractor may terminate the contract upon 10 calendar days written notice to the Owner. Upon receipt of the written notice, the Owner must implement procedures as set forth in paragraph 00 72 00-6.04 B.

PART 7--MEASUREMENT AND PAYMENT

7.01 PAYMENTS TO CONTRACTOR

A. BREAKDOWN OF CONTRACT PRICES:

Except in cases where unit prices form the basis for payment under the contract, the Contractor must, within 20 days of receipt of the notice to proceed, submit a breakdown of the contract price showing the value assigned to each part of the work including an allowance for profit and overhead. In submitting the breakdown, the Contractor certifies that it is not unbalanced and that the value assigned to each part of the work represents his estimate of the actual cost, including profit and overhead, of performing that part of the work. The breakdown must be sufficiently detailed to permit its use by the Construction Manager as one of the bases for evaluating requests for payment.

B. PROJECT STATUS REVIEW:

Contractor and Construction Manager shall meet each month prior to the Contractor submitting the progress payment request for the previous month. The purpose of the meeting is to review project status in relation to the construction schedule; review value of work completed during the previous month; and, if applicable, review Contractor's plans to return project status to that required by the schedule. Within 5 days following this meeting, the Contractor shall submit a written progress report comprising:

1. A copy of the current construction schedule marked up to indicate percent complete, actual completion or start dates since the previous review, and the estimated remaining duration for each activity in progress.

2. Reasons any activities are behind schedule and a description of the corrective steps being taken.

C. PROGRESS PAYMENTS:

1. PAYMENT REQUEST PROCEDURES: By the 5th day of each month, the Contractor must submit to the Construction Manager a partial-payment estimate, filled out and signed by the Contractor, covering acceptable work performed during the previous month or since the last partial payment estimate was submitted. If requested by the Construction Manager, the Contractor must provide additional data to support the payment estimate. Additional data may include satisfactory evidence of payment for equipment, materials, and labor including payments to subcontractors and suppliers. Requests for payment for delivered equipment and material must be accompanied by certified invoices by the suppliers. Such equipment and material must be suitably and safely stored at the site of the work.

2. REVIEW PROCEDURES: Within 7 days after receipt of the partial payment estimate, the Construction Manager will review the estimate and either (a) indicate in writing to the Owner's Representative his concurrence with the estimate and his recommendation that payment be made or (b) indicate in writing to the Contractor his reasons for not concurring with the estimate. If the Construction Manager recommends payment and the Owner's Representative concurs, the Owner will, within 30 calendar days after receipt of the Construction Manager's recommendation,

pay the Contractor a progress payment on the basis of the approved partial-payment estimate. The payments will take into account the retention provisions provided for herein.

In the event the Construction Manager does not concur with the estimate, the Contractor may make the changes necessary to obtain the Construction Manager's concurrence and resubmit the partial-payment estimate, or submit the original progress-payment estimate directly to the Owner's Representative, indicating in writing his reasons for refusing to make the changes necessary to obtain concurrence.

3. RETENTION: The Owner will retain a percentage of each payment except as specified below in accordance with Public Contract Code Section 7201. The retained amount is available for the protection and payment of the person, or persons, mechanics, subcontractors, or materialmen who perform labor or work under the contract, and persons who supply such person, persons or subcontractors with components and supplies for carrying on such work.

The Owner will retain 5 percent of each progress payment.

Under no circumstances shall any provision of this section be construed to limit the ability of the Owner to withhold 150 percent of the value of any disputed amount of work from the final payment, as provided for in Section 7107 of the Public Contract Code. In the event of a good faith dispute, nothing in this section shall be construed to require the Owner to pay for work that is not approved or accepted in accordance with the proper plans or specifications.

4. WITHHOLDING: The Construction Manager may refuse to recommend the whole or any part of any payment if in the Construction Manager's opinion it would be incorrect to make such recommendation to the Owner. The Construction Manager may also refuse to recommend any payment, or because of subsequently discovered evidence or the result of any tests, may nullify any payment previously recommended to such extent as may be necessary in the Construction Manager's opinion to protect the Owner from loss as a result of:

a. Defective or damaged work.

b. A deductive change order.

c. Persistent failure of the Contractor to perform the work in accordance with the contract documents, including failure to maintain the progress of the work in accordance with the construction schedule. Persistent failure to maintain the progress of the work means that for a period of two consecutive months following a written notice from the Construction Manager, the Contractor fails to correct a behind-schedule condition at a rate that would reasonably indicate that he will finish the project on schedule.

d. Disregard of authority of the Construction Manager or the laws of any public agency having jurisdiction.

The Owner may refuse to make payment of the full amount recommended by the Construction Manager because of claims made against the Owner on account of Contractor's performance or furnishing of the work or because liens have been filed in connection with the work or because there are other items entitling Owner to reduce the amount recommended. In such

case, the Owner will give Contractor prompt written notice with a copy to the Construction Manager stating the reasons for each action.

5. STOP PAYMENT NOTICES: The Owner, by and through the Construction Manager or other authorized officers, may at its option and at any time retain out of any amounts due the Contractor, sums sufficient to cover claims filed pursuant to Section 3179, et seq., of the Civil Code of the State of California.

6. PROMPT PAYMENT: Prompt payment for partial-payment estimates will be made in accordance to Public Contracts Code Section 20104.50.

D. FINAL PAYMENT:

On the condition that no liens or claims are outstanding, Owner will make final payment to the Contractor in the manner provided by law following the expiration of 35 calendar days after acceptance of the work and filing of the notice of completion by the Owner. Final payment must include the entire sum found to be due under this contract after deducting previous payments and such other lawful amounts as the terms of this contract describe. Prior estimates and payments, including those relating to extra work or work omitted, are subject to correction by the final payment.

Acceptance by the Contractor of final payments as acts as a release to the Owner of all claims by and all liability to the Contractor other than claims in stated amounts that may be specifically excepted by the Contractor for things done or furnished in connection with this work and for every act and neglect of the Owner and others relating to or arising out of this work. Payment by the Owner does not release the Contractor or his surety from any obligation under the contract or under the performance bond and payment bonds.

7.02 CHANGE ORDERS

A. GENERAL:

The Owner may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make any change in the work within the general scope of the contract, including but not limited to the following changes:

1. In the specifications (including drawings and designs).

2. In the method or manner of performance of the work.

3. In the Owner-furnished facilities, equipment, materials, services, or site.

4. Directing acceleration in the performance of the work.

Any other written order or an oral order (which terms as used in this paragraph shall include direction, instruction, interpretation, or determination) from the Owner, that causes any such change, must be treated as a change order under this clause, if the Contractor gives the Owner written notice stating the date, circumstances, and source of the order and if the Contractor regards the order as a change order.

Except as provided in this clause, no order, statement, or conduct of the Owner is or may be treated as a change order under this clause nor does it entitle the Contractor to an equitable adjustment.

If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any order, an equitable adjustment must be made and the contract modified in writing accordingly. However, except for claims based on defective specifications, claims will not be allowed for any costs incurred more than 20 days before the Contractor gives written notice as required. Also, in the case of defective specifications for which the Owner is responsible, the equitable adjustment includes any increased cost reasonably incurred by the Contractor in attempting to comply with such defective specifications.

If the Contractor intends to assert a claim for an equitable adjustment under this clause, he must, within 30 days after receipt of a written change order or the furnishing of a written notice, submit to the Owner a written statement setting forth the general nature and monetary extent of such claim, unless the Owner extends this period. The statement of claim hereunder may be included in the notice.

A claim by the Contractor for an equitable adjustment will not be allowed if it is asserted after final payment under this contract.

B. EXTRA WORK:

Extra work means providing materials and equipment and performing work not directly or by implication called for by the contract. Changes in measured quantity under a unit price contract or item are not extra work. If the Owner requires extra work he may (1) do it himself, (2) employ others to do it, (3) direct the Contractor to perform the extra work at unit bid price or a combination of such items, (4) direct the Contractor to perform the extra work at a mutually agreed upon lump sum, or (5) direct the Contractor to perform the extra work on a time and expense basis.

C. OMITTED WORK:

The Owner may, by written order to the Contractor, omit work, equipment, and material to be provided under the contract, and the value of the omitted work, equipment and material will be deducted from the contract price. The deducted value will be a lump sum or unit bid price agreed upon in writing by the Contractor and Owner based on the breakdown and cost information submitted by the Contractor.

D. UNIT BID PRICE CHANGE:

Increases or decreases in the quantity of a contract item of work that was bid on a unit basis will be made by comparing the total pay quantity of such item of work with the Construction Manager's estimate. When changes in quantities exceed 25 percent of the original bid quantity and the total dollar change of that bid item is significant, the Owner will review the unit price to determine if a new unit price should be negotiated. Methods for Changed Quantity Payment Adjustments shall be those specified in the Caltrans Standard Specifications, latest edition.

E. LUMP SUM CHANGES:

Whenever the Contractor is directed to perform extra work on a lump-sum basis, changes in contract price resulting from the extra work will be based on a mutually agreed upon lump-sum price. The Contractor's proposal for such changes must include a detailed breakdown of labor and materials costs for the extra work to be performed by his forces and the forces of his subcontractors or material suppliers as may be required. The breakdown must include any labor surcharge and any sales- or use-tax cost. Whenever the Owner requests that the Contractor prepare a lump-sum price in connection with a change order, the Contractor is entitled to the costs incurred in the preparation of that price whether or not the lump-sum amount is finally accepted by the Owner. Those costs will be incorporated in the lump-sum amount.

Compensation for the extra work will be based on the direct costs as listed in the detailed proposal, plus a mutually agreed upon percent of direct costs for overhead and profit, plus one percent (1%) of those direct costs for bond. The allowance for overhead and profit must include full compensation for overhead, including superintendence, and additional overhead attributable to a time extension granted because of the change order and no separate charge may be made for overhead.

When the change order involves work omitted, the reduction of the contract price will be based on the direct costs listed in the detailed proposal submitted by the Contractor. An additional reduction may be made of an amount that is identified as reduced overhead costs attributable to the work omitted. No reduction will be made for profit originally attributable to the omitted work.

F. TIME AND EXPENSE CHANGES:

1. GENERAL: Whenever the Contractor is directed to perform extra work on a time and expense basis, he or she will maintain accurate records. Each day a record of labor, materials, and equipment costs will be submitted to the Construction Manager for verification. These records will reflect the actual and necessary expenses pertaining to the extra work and will be available for audit. Audits conducted under this provision must be in accordance with generally accepted auditing standards and established procedures and guidelines of the reviewing or audit agency(ies).

Payment to the Contractor for extra work performed on a time-and-expense basis will consist of the actual necessary expense for doing the extra work, plus an allowance of 15 percent of labor, material and equipment rental for overhead, general superintendence, and profits, plus one percent (1%) of those direct costs for bond. This basis of payment applies to work done directly by the Contractor and to work done by a subcontractor, except the one percent (1%) allowance for bond does not apply to work performed by a subcontractor. When the work is done by a subcontractor, the Contractor may add five percent (5%) to the subcontractor's charges to cover overhead and profit and one percent (1%) for bond.

In determining time-and-expense compensation, the term "actual necessary expense" means the sum of (1) materials and equipment, (2) labor, (3) supervision, (4) construction equipment, (5) professional services, and (6) other costs. "Charges" for such items means the actual cost whether incurred by the Contractor, a subcontractor or others. The items making up "actual necessary expense" are defined as follows:

2. MATERIALS AND EQUIPMENT: Materials and equipment means costs for materials and equipment provided by the Contractor and necessarily used in the work includes applicable taxes.

3. LABOR: The cost of labor will be the sum of actual wages paid, labor surcharge, and subsistence and travel allowances. Actual wages paid include employer payments to or on behalf of the worker for health and welfare, pension, vacation and similar purposes. The labor surcharge includes applicable labor-related taxes, Workers Compensation Insurance premiums, public liability and property damage insurance premiums, and other legally required costs directly related to labor. Where subsistence and travel allowance are required for performance of extra work, the charges include the actual amount paid to each worker for these items.

4. SUPERVISION: If, in the Owner's judgment, full-time supervision of the extra work is required, it will be authorized in writing by the Construction Manager and charges for that supervision will be included as an actual necessary expense. Charges for supervision of the extra work by the Contractor's representative are not part of actual necessary expense.

5. CONSTRUCTION EQUIPMENT: Charges for the use of construction equipment required in the performance of extra work will be based on rental rates set forth in the State of California then-current official published document covering rental of equipment used on force account work. For equipment not listed in that document, the rental rate will be as listed by the local section of the Associated General Contractors. If the equipment is not listed by the Associated General Contractors, the rental rate will be mutually agreed upon in writing between the Contractor and Owner prior to the use of the unlisted equipment. The reasonable cost of moving equipment onto and off the job site will be included, but equipment rental will not be paid when the equipment is inoperative due to breakdowns. Individual pieces of equipment or small tools having a replacement value of $100 or less are considered expendable and no payment will be made for these.

When equipment is used on the extra work for less than five days, hourly rates will be used. Less than 30 minutes of operation is considered one-half hour of operations. When equipment is used on the extra work for more than five days, daily rates apply. In that case, less than four hours of operation is considered to be one-half day of operation.

6. PROFESSIONAL SERVICES: Professional services are included in "actual necessary expense" provided both that the Owner has determined that such services are necessary and the Construction Manager has authorized in writing the provision of such services.

7. OTHER COSTS: Charges for items not included in paragraphs 7.02 F.1 through 6 may be included as "actual necessary expense" if such additional items are authorized in advance and in writing by the Construction Manager.

7.03 CHARGES TO CONTRACTOR

Everything charged to the Contractor under the terms of this contract must be paid by the Contractor to the Owner on demand. Such charges may be deducted by the Owner from money due or to become due to the Contractor under the contract. The Owner may recover such charges from the Contractor or from his surety.

7.04 COMPENSATION TO OWNER FOR TIME EXTENSION

The Owner, in exchange for granting an extension of time for avoidable delay, must be compensated by the Contractor for the actual costs to the Owner of engineering, inspection, general supervision, and overhead expenses that are directly chargeable to the work and accrue during the period of such extension. The actual costs do not include charges for final inspection and preparation of the final estimate by the Owner.

7.05 SUBSTANTIAL COMPLETION

The Contractor, on considering the work to be substantially complete and ready for its intended use, shall so notify the Construction Manager in writing. The notification must include an itemized list of remaining incomplete work. If the Construction Manager determines that the work is not substantially complete, he or she will so notify the Contractor in writing identifying the reasons for such a determination. If the Construction Manager finds the work substantially complete, he or she will meet with the Contractor to (1) prepare a punch list of incomplete items of work; (2) define the division of responsibility between Owner and Contractor with respect to security, operation, maintenance, utilities, insurance, and warranties; and (3) describe any other issues related to acceptance of the substantially completed work. Upon reaching agreement with the Contractor, the Construction Manager will write to the Owner, certifying that the work is substantially complete, listing the items of incomplete work, stating the date for completion of incomplete work, defining the division of responsibilities, and setting forth any other terms related to acceptance.

The Owner, who has sole discretion for determination of substantial completion, will review the Construction Manager's certification that the work is substantially complete and concurring with that certification, will notify the Contractor, in writing, that the work is accepted as substantially complete. Except for any portion(s) of work specified for early completion or required by the Owner for early possession (paragraph 00 72 00-7.06), substantial completion will not occur for any work until the entire project is ready for possession and use. The acceptance notice will include a punch list of incomplete work items, set the date for their completion, describe the division of responsibility between the Owner and Contractor, and describe any other terms of acceptance. The Contractor will acknowledge receipt of the acceptance notice in writing, indicating acceptance of all of its terms and provisions.

Upon receipt of the Contractor's acknowledgment letter, the Owner may take possession of the work or portion of the work and put it into its intended service. The date that the work or portion of the work is put into service will become the date of substantial completion. Unless otherwise specified, warranties will begin on the date of substantial completion.

Subsequent to the substantial completion date, the Owner may exclude the Contractor from the work during such periods when construction activities might interfere with the operation of the project. The Owner, however, shall allow the Contractor reasonable access for completion or correction of incomplete punch list items.

7.06 POSSESSION OF PORTIONS OF THE PROJECT

Should the Contractor fail to meet any date specified for substantial completion of the work or any portion of the work requiring early possession and use by the Owner, the Owner may, after a 10-day written notice to the Contractor, take over such portion or all of the work that is behind schedule. In such case, the Construction Manager will prepare a punch list of incomplete work. The Owner may allow the Contractor reasonable access to the work at such times that the operation of the project will not be affected or the Owner may complete the work itself after giving

the Contractor notice of his intention to do so. The cost of Owner's work will be charged to and deducted from amounts due to the Contractor. The substantial completion date will be established as the date when the Owner actually begins using the project or a portion of the project for its intended purpose. Division of responsibilities between Owner and Contractor, beginning of warranties, and any other issues relating to substantial completion will be as specified in paragraph 00 72 00-7.05.

7.07 ACCEPTANCE OF THE PROJECT

Upon completion of the work, including portions of the work previously accepted as substantially complete, the Contractor must notify the Construction Manager, in writing, that the work is complete. Upon receipt of the notification, the Construction Manager will determine if the work conforms to the terms of the contract. If the Construction Manager finds materials, equipment, or workmanship that do not meet the terms of the contract, he or she will prepare a punch list of non-conforming items and submit it to the Contractor. Following completion of the corrective work by the Contractor, the Construction Manager must notify the Owner that the work has been completed in accordance with the contract. Final determination of the acceptability will be made by the Owner. Upon acceptance of the project, the Owner will immediately file a notice of completion. For portions of the project not previously accepted as substantially complete, the conditions of guarantee commence on the date that the Owner files a notice of completion.

The final application for payment must be accompanied by all required documentation called for in the contract, including complete and legally effective releases or waivers of liens in a form acceptable to Owner. Subject to prior approval of Owner, Contractor may submit in lieu of the lien releases and waivers: (1) receipts of releases in full; (2) an affidavit that the releases and receipts cover all labor, services, materials, and equipment for which a lien could be filed and that all payrolls, materials, and equipment bills and other indebtedness connected with the work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied; and (3) consent of the surety, if any, to final payment. If any subcontractor or supplier fails to furnish a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any lien.

If, after reviewing the Contractor's final application for payment, including all documentation required, the Construction Manager determines that the work is complete, he or she will recommend that final payment, including all retainages, be made by the Owner. The final payment will be due and payable by the Owner within 30 days after any legal notice periods have expired.

END OF SECTION

SECTION 01 03 00

SPECIAL PROJECT PROCEDURES

PART 1 — GENERAL

1.01 SECTION INCLUDES

A. This section includes responsibilities and requirements of the Contractor specific to this project.

PART 2 — PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide labor, equipment and material including, but not limited to the following:

1. Daily containment and removal of all sanitary debris, work debris and trash resulting from any work activities.

   a. Disposal locations for sanitary debris and/or hazardous materials shall be legally certified to accept these materials. Disposal locations for any sanitary debris and/or hazardous materials shall be approved prior to disposal.

   b. Manifests of hauling and disposal of such material shall be submitted to the Owner's Representative by the Contractor. Hauling and disposal costs will be borne by the Contractor.

2. The following shall apply regarding Contract Documents:

   a. The Contract Documents are complementary; what is required by one is as binding as if required by all.

   b. Bring any discrepancies between the drawings and specifications to the attention of the Owner's Representative immediately.

   c. Except as may be otherwise specifically stated in the Contract Documents, or as otherwise directed by the Owner's Representative, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and the provisions of any standard, other specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents).

d. The Contractor shall assume that the most stringent shall apply

3. Coordinate with all trades the work by other utility Owners and jurisdictional agencies, as well as other Owner's work occurring at or near the project location.

   a. Advise the Owner's Representative as to any discrepancies in the work of others that could affect the work in this project and cooperate with the direction provided.

4. Complete field engineering and layout required.

5. Protect work in progress and finished work until the project is completed and final acceptance is granted by the Owner.

   a. Protect work by others when it affects work in this project or becomes part of this project.

6. Meetings:

   a. Arrive on time

   b. Bring:

      1) Authorized field representative(s)

      2) Authorized office representative(s)

      3) Each authorized, capable, and responsible for committing to delivery, manpower and completion dates for their work.

7. Complete and submit to Owner's Representative:

   a. Forms, schedules, narratives, and reports (including technical data reports and forms) as required by these specifications or as directed in accordance with the project Documents.

      1) Failure to submit these in an acceptable and completed manner, and on time could result in a delay in payment.

8. Change Order work will be agreed upon in writing and signed by the Owner before the applicable work will begin.

9. To properly monitor and protect all materials and Owner assets from damage resulting from Contractor's work activities or weather.

   a. Damaged materials or assets will be replaced at Contractor's cost.

b. Cost will be assessed by back charge or other means allowed by the Contract Documents.

10. Work Hours:

a. Work within defined work hours – typically 8:00 am to 5:00 pm Monday through Friday, except for defined holidays.

1) Other hours may be directed by the Owner or Owner's Representative or may be negotiated with the Contractor.

2) Work within a public Right-of-Way.

a) Comply with local jurisdiction and State DOT requirements for defined work hours and days.

3) To perform all necessary overtime as ordered, to get their work back on schedule, if necessary.

a) If premium time is required by any other Contractor(s) to bring the project back to the original schedule, the cost of such premium time shall be borne solely by this Contractor. Contractor is subject to repayment of additional cost incurred by the Owner due to Owner's staff's overtime or premium time necessary to monitor the Contractor's efforts to bring the Work back on schedule or complete a task that requires work outside of normal work hours.

b) Such overtime shall be governed by the requirements and restrictions of the Contract Documents and any applicable jurisdictional permits and shall not violate any noise ordinances or pose any danger or undue nuisance to the public.

11. Perform punch list work in a timely manner or be subject to Owner overhead costs. Punch list items, and completion of such items, will be created and completed as stipulated in this Specification.

a. Contractor shall first review the Work and develop a punch list.

b. Contractor shall provide a copy to the Owner's Representative.

c. Contractor shall complete the work on his punch list and provide the Owner's Representative with a signed off copy.

d. Owner's Representative will review the Work and if determined to be reasonably complete will develop a punch list - If in the opinion of the Owner's Representative, the Work is determined not to be reasonably complete, the Contractor shall be advised to bring the Work closer to a

point of completion that warrants a punch list by the Owner's Representative.

e. Contractor shall complete the items on the list provided by the Owner's Representative. If the punch list is not completed prior to the project completion date, an agreed upon schedule between the Owner's Representative and the Contractor shall be established to monitor the progress and the completion of each punch list item.

f. Owner overhead costs will be established and provided to the Contractor.

g. Owner overhead costs will be assessed if punch list items are not completed on the agreed upon schedule and reoccurring inspections are required.

h. Overhead cost will be based on total job-related costs of the Owner and will be assessed against the retention.

12. Provide certificates of insurance prior to mobilization to the job site.

13. Provide a current copy of the workman's compensation and liability insurance certificate prior to commencing work. Maintain insurance current and provide proof throughout project. Provide insurance coverage on all Contractor's equipment and tools against theft and damage.

    a. No claims will be registered against the Owner for loss or damage of same.

    b. The Contractor will not lien the project for payment of any claims on equipment loss or damage due to vandalism of any other form.

14. Workplace Safety:

    a. OSHA requirements to be the minimum safety level accepted.

    b. Safety requirements from Owner's Representative, supervising or Field personnel will be considered only if the instructions are stricter than those in OSHA requirements.

    c. The Contractor shall maintain all responsibility for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work.

15. Contractor Vehicles:

    a. Personal vehicles shall not be parked at the specific work sites.

b. All vehicles at the work site be the property of the Contractor and marked with an identifiable company sign.

16. Respond to all change notifications within 24 hours

    a. Provide the Owner's Representative with the complete and detailed change estimate cost data within 7 calendar days of notification.

17. Contractor shall provide fulltime onsite dedicated qualified and suitable supervision of their work.

    a. Notify Owner's Representative of name, qualifications and contact information for person designated to perform onsite supervision.

    b. Notify Owner's Representative of change of onsite supervisor immediately. No change shall be permitted without Owner's written permission.

    c. Person designated to perform onsite supervision shall have no other responsibilities.

18. Perform work in accordance with agreed upon Schedule:

    a. Provide any necessary measures required to achieve and maintain this schedule at no additional cost to the Owner, Program Manager and Owner's Representative.

B. Overflows/Spills And Damage To Property And Utilities:

1. Schedule and perform the Work in a manner not causing or contributing to incidences of sanitary sewer overflows (SSOs) as defined in the latest Consent Decree.

2. If Contractor's activities cause or contribute to spills or SSOs

    a. Immediately take appropriate action to contain and/or stop the overflow;

        1) Cleanup the spillage,

        2) Disinfect the area affected by the SSO or spill.

    b. Simultaneously, notify the Owner's Dispatch Center, the Program Manager, and the Owner's Representative

        1) Provide information concerning location, cause, volume of the SSO,

        2) Assessment whether the spill entered a stream or storm drain.

    c. The Contractor will be familiar with the details of spill response plan

1) Detailed in the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP) approved by Owner's Representative.

2) Document can be found on Department of Watershed Management website under the Consent Decree Program or upon request to the Owner or Program Manager.

3. Indemnify and hold harmless the Owner, the Program Manager and the Owner's Representatives for any fines or third-party claims for personal or property damage arising out of an SSO or spill fully or partially the responsibility of the Contractor,

4. Including the legal, engineering, and administrative expenses of the Owner, Program Manager, and Owner's Representatives in defending such fines and claims.

5. Any damage to public or private property due to the work performed by the Contractor is the sole responsibility of the Contractor.

   a. Damage to municipal or private utilities shall be repaired in a manner approved by the Owner/Program Manager at the Contractor's expense.

   b. Damage to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor's sole expense.

   c. Equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor immediately at the sole expense of the Contractor. All necessary precautions to avoid a spill or SSO shall be employed immediately and maintained until safe service is provided.

   d. Notify the Owner, Program Manager, and Owner' Representative prior to initiating retrieval.

   e. Damage to the Contractor's equipment is the Contractor's sole responsibility.

   f. Equipment stuck or left in the sewer line/lateral that causes a SSO or spill,

      1) Contractor is liable for the SSO or spill and all associated damages.

6. The Owner and/or the Program Manager reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

C. Relocations

1. Relocate (including all associated work) structures, such as:

a. light poles,

b. fences,

c. piping,

d. conduits,

e. and drains interfering with the positioning and execution of the Work.

2. Work so ordered will be paid for at the Contract unit prices, if applicable, or as extra work under the Allowance Bid Item. Reference Section 01015 Part 3 – Execution Installation 3.01 G. Protection and Relocation of Existing Structures and Utilities.

D. Effective and suitable temporary provisions necessary for public safety resulting from such relocations, shall be provided by the Contractor at no additional cost to the Owner.

E. Existing Underground Piping, Structures, And Utilities

1. Existing water, gas, telephone, electrical, cable or other utility lines may be existing and may not be indicated on the drawings.

   a. Exercise extreme care before and during any excavation activity to locate, preserve, protect and flag these lines so as to avoid damage to the existing lines.

   b. Should damage occur to an existing line, the Contractor shall repair or pay for repairs to the line to the satisfaction of the utility owner and at no cost to the Owner.

      1) If the Owner of the utility requires the use of his own forces to repair the damaged lines – Contractor shall pay for all repair costs.

2. Locations of existing underground piping and utilities shown on the Drawings:

   a. Are shown without express or implied representation, assurance, or guarantee they are complete or correct.

   b. Or that they represent a true picture of underground piping to be encountered.

   c. Existing piping and utilities interfering with any assessment or construction shall be rerouted.

1) Prior to rerouting notify the Owner's Representative of the location of the pipeline or utility

2) Reroute or relocate the pipeline or utility as directed.

3. Carefully protect existing utilities that do not interfere with project work.

   a. Existing utilities damaged in any way by the Contractor shall be restored or replaced by the Contractor at its expense as directed by the utility owner and the Owner's Representative.

F. WATER FOR CONSTRUCTION PURPOSES

1. Water required for the work identified in the Contract including water for construction and dust control **will be obtained at the expense of the Contractor and must be recorded through a City hydrant meter, requiring a deposit.**

2. Water for irrigation and plant establishment will be run through City meters installed for the permanent irrigation systems. This water will be paid for by the City.

END OF SECTION

SECTION 01 11 00

SUMMARY OF WORK

1.01 GENERAL

A. The following Summary of Work is not meant to be an all-inclusive description of every item of Work necessary for a complete project. This Summary of Work is meant to aid the Contractor in developing an accelerated understanding of the basic project requirements.

B. Descriptions that are included in this Summary of Work will be considered part of the Specifications and Contract.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. DESCRIPTION OF WORK:

1. Generally, the Work consists of furnishing all labor, materials, equipment and incidentals, and performing all work required to complete the project. The work includes, but is not limited to:

   a. Install & remove tree protection fencing,
   b. Clearing, grubbing, tree removal, and grading,
   c. Demolition of existing structures, concrete, and asphalt
   d. Earthwork and grading including the amphitheater berms and landscape berms,
   e. Parking lot construction/repair,
   f. Storm drain, rain garden, and retention basin construction/repair,
   g. Water and sewer lateral construction/repair,
   h. Vendor utility connections including electrical infrastructure and pedestals,
   i. Electrical conduit and path lighting installation,
   j. Playground expansion at Kidtown,
   k. Concrete pedestrian pathways and plazas,
   l. Landscaping, seeding, planting, and irrigation installation,
   m. Installation of picnic tables, benches, bicycle rack, drinking fountain, and fencing.

2. Work is located in Crescent City, California. The location of the project is shown on the Plans.

B. WORK EXCLUDED FROM THIS CONTRACT

1. There are items shown in this plan set that have been deleted or previously performed.
   a. Existing facilities installed in Phase 1A and Phase 1C of the Beachfront Park Improvements.
   b. Existing facilities or work under contract as of the Front Street Gateway and Beautification and the Tolowa Trail projects that are both already under contract. This project, known as Beach Front Park Phase 1B,

connects with some of the improvements in the two beforementioned projects. End limits of construction are included in the plan drawings.

c. The Tolowa Cultural Trail nodes that are referenced on the plans drawings are under differing contracts. The Canoe node and its access walkway are to be adjoined with the trail included in this Phase 1B project without any grade adjustments. The existing previously rocked trail sections are to be regraded and conformed as shown on the Phase 1B plan set.

C. CONTRACTOR'S DUTIES:

1. Except as specifically noted, provide and pay for:

   a. Labor, materials, and equipment;
   b. Tools, construction equipment, and machinery;
   c. Water, heat, and utilities required for construction; and
   d. All other facilities and services necessary for proper execution and completion of work, including commissioning.

2. Conform to and comply with the California Green Building Code.

3. Pay legally required sales, consumer, and use taxes.

4. Prepare a Construction Schedule and Schedule of Values and receive approval from the Owner as required by these Contract Documents.

5. Procure and maintain all insurance and bonds required by these Contract Documents.

6. Secure and pay for proper execution and completion of the Work, and applicable permits and licenses, as necessary.

7. Give required notices.

8. Comply with codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities which bear on performance of the Work.

9. Promptly submit written notice to Engineer of observed variance of contract documents from legal requirements.

10. Enforce strict discipline and good order of the employees. Do not employ on work:

    a. Unfit persons; or
    b. Persons not skilled in assigned tasks.

11. Prepare a shoring plan specific to the construction demolition and sequencing performed on this project.

D. PERMITS AND AGREEMENTS:

Obtain and comply with all permits not specifically obtained by Owner.

END OF SECTION

SECTION 01 11 05

CONTRACT TIME

1.0 COMPLETION SCHEDULE

Work must be completed within 240 working days from the Notice to Proceed. Seasonal work stoppages to suspend the project calendar on critical path items may be requested due to weather as long as the completion calendar does not extend beyond October 31, 2027. An updated CPM schedule must be submitted with the written request for project suspension due to weather and its impact on the critical path item(s).

END OF SECTION

SECTION 01 20 00

MEASUREMENT AND PAYMENT

1.0 GENERAL

A. LUMP SUM PAYMENT ITEMS:

Payment items for the work of this contract for which contract lump sum payments will be made are listed in the Bid Schedule and described below. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be included in the listed lump sum item most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials (where not provided by City), equipment, performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests, reports, and for performing all work required for which separate payment is not otherwise provided.

B. UNIT PRICE PAYMENT ITEMS:

Payment items for the work of this contract on which the contract unit price payments will be made are listed in the Bid Schedule and described below. The unit price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials (where not provided by City), and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests, and reports, and for performing all work required for each of the unit price items.

2.0 BID ITEMS

1. Mobilization: Mobilization is as described in Section 9-1.16D, "Mobilization" of the Standard Specifications. Mobilization will be paid on a lump sum basis as follows provided that total mobilization cost does not exceed 10 percent of the total bid: 25 percent when 10 percent of the project is earned. 50 percent when 20 percent is earned. 75 percent when 50 percent is earned. 100 percent when 75 percent is earned. Where mobilization exceeds 10 percent of the contract, see Public Contract Code.

2. SWPPP Plan and Reporting: This item includes all additional work necessary for maintaining and updating the stormwater pollution prevention plan by a qualified QSD. Includes reporting results of work covered under this item in accordance with Specification Section 01 57 23. The City is to provide and upload the initial plan to the SMARTS website. This lump sum item will be paid based on the percentage of the project earned, rounded down to the nearest 10 percent, until 90 percent is earned. The final 10 percent will be paid with the final payment.

3. Water Pollution Prevention BMPs: This item includes all additional work necessary for meeting the requirements set out in the SWPPP and work covered under this item in accordance with Specification Section 01 57 23. As the approved SWPPP is not available at bid time, a pre-bid budget of $20,000 will be established for the

installation and maintenance of the project BMPs. Upon approval of the SWPPP, it will be provided to the successful bidder with actual costs to be negotiated or handled on a T&M basis.

4. Pedestrian & Traffic Control: Traffic Control is as described in Specification Section 01 55 26, "Temporary Traffic Control". This lump sum item will be paid based on the percentage of the project earned, rounded down to the nearest 10 percent. The final 10 percent will be paid with the final payment.

5. Tree protection fencing installation and removal: Installation (and removal after construction) of tree protection fencing will be paid at the bid unit price per linear foot. Work shall include the installation in accordance with all plans and specifications including specification section 01 56 39. Work comprises the following: underground utility locating, fence post installation, stretching of temporary tree protection and removal of all components after construction. 70 percent will be paid based on completion of the temporary fence installation. The remaining 30 percent will be paid upon successful removal of fencing.

6. Sheeting Shoring and Bracing: This item shall include all temporary sheeting, shoring, and bracing, or equivalent methods, adequate for the protection of life or limb, which shall conform to the applicable construction safety orders as required for completion of the project as described in Specification Section 31 23 17 and 31 40 00. This bid item is pursuant to Labor Code Section 6707. This lump sum item will be paid based on the percent of the project earned, rounded down to the nearest 10 percent.

7. Quality Control: Quality Control as described in Specification Section 01 45 00 shall be paid on a lump sum based on the percentage of the project earned, rounded down to the nearest 10 percent.

8. Materials Testing: Materials Testing as described in Specification Section 01 45 29 shall be paid on a lump sum based on the percentage of the project earned, rounded down to the nearest 10 percent.

9. Clear, Grub & Tree Removal: This item will be paid based on the bid unit price per lump sum. Clearing and grubbing to be as described in Specification Section 31 10 00, "Site Clearing." Work includes but is not limited to removal and disposal or salvage of trees, shrubs, and grass. This lump sum item will be paid based on the percentage of this item completed.

10. Demolition of Existing Facilities including Monument Salvage: Demolition is as described in Specification Section 02 41 00, "Demolition." Demolition shall cover all work identified on Plan Sheets L3.01 – L3.04 and all other necessary demolition work not covered under other bid items. Work includes but is not limited to removal and disposal or salvage of existing items not covered in bid items #11 and #12. These items may include aggregate base, light poles, trees and landscaping, foundations, seawalls, signs, storm drainage, sanitary sewer manholes, and other buried utilities. This lump sum item will be paid based on the percentage of this item completed.

11. Demolition of Existing Concrete: Demolition is as described in Specification Section 02 41 00, "Demolition." Demolition shall cover all work identified on Plan Sheets L3.01 – L3.04 and all other necessary demolition work not covered under other bid items. Work includes but is not limited to removal and disposal of existing sidewalks, curb and gutters. This lump sum item will be paid based on the percentage of this item completed.

12. Demolition of Existing Asphalt Concrete: Demolition is as described in Specification Section 02 41 00, "Demolition." Demolition shall cover all work identified on Plan Sheets L3.01 – L3.04 and all other necessary demolition work not covered under other bid items. Work includes but is not limited to removal and disposal of existing asphalt. This lump sum item will be paid based on the percentage of this item completed.

13. Rough Grading: This item will be paid based on the bid unit price per square yard. Grading work includes: required removal, moving, importing and placement of sub-soil to prepare the site for other bid items at a future date. Scarification and compaction of subgrade to required 90% compaction prior to placement of top soil, aggregate base material, etc. 40 percent will be paid based on excavation of native material according to plans and specifications including specification section 31 22 00. 10 percent will be paid based on completion of scarification and compaction. The remaining 50 percent will be paid once subgrade is prepared and ready to accept top condition. This item will be paid based on Owner's estimate of the percentage complete for each of the above activities.

14. Rain Garden Excavation: This item will be paid based on the bid unit price per cubic yard. Excavation work includes: required removal to construct rain garden per plan grades. This item will be paid based on Owner's estimate of the percentage complete for each of the above activities.

15. Import Soil for Berm Placement and Amphitheater Capping: This item will be paid based on the bid unit price per cubic yard and includes all labor, materials, and equipment necessary to import (or transport city approved spoils from other sites), place, grade, and compact the soil as shown on the Plans. The Owner will only pay for soil quantities identified in the bid schedule. Contractor is responsible for proper grading and placement of subgrade to achieve lines and grades per plans and specifications including section 32 91 13. This item will be paid based on Owner's estimate of the percent of total soil placed during each billing cycle.

16. Aggregate Base for asphalt paved section: This item will be paid on the bid unit price per cubic yard and includes all labor, materials, and equipment necessary to import, place, grade, and compact the aggregate base rock for the road base as shown on the Plans. The Owner will only pay for base rock quantities identified in the bid schedule. Contractor is responsible for proper grading and placement of subgrade to achieve lines and grades according to plans and specifications including section 32 11 00. This item will be paid based on Owner's estimate of the percent of total aggregate base placed during each billing cycle.

17. Hot Mix Asphalt Concrete: This item includes all work necessary to provide and place hot mix asphaltic concrete. This item will be paid on the bid unit price per ton. The Owner will only pay for Hot Mix Asphalt quantities identified in the bid schedule. Contractor is responsible for proper grading and placement of subgrade and rock to achieve lines and grades. This item will be paid based on Owner's estimate of the number of tons of hot mix asphalt placed during each billing cycle.

18. Pavement Striping and Wheelstops: This item includes all work necessary to stripe crosswalks, center lines, fog lines, parking spaces and other striping as shown on the Plans. This item includes all work necessary to place wheel stops as shown on the Plans. This item will be paid for per lump sum price based on Owner's estimate of the percentage of striping and wheel stops completed during each billing cycle.

19. Crackfill & Sealcoat Playground Parking Lot: This item includes all work necessary to hot-air-lance clean cracks to be filled, placement of Crafco Roadsaver Low Tack 543 crack seal or equivalent, and placement of a seal coat as shown on the Plans. This item will be paid on the bid unit price per square foot based on Owner's estimate of the square feet completed during each billing cycle.

20. Parking and Path of Travel Signs: This item includes all work necessary to procure and place (including foundation and pole) the signs as shown on the Plans and specifications including section 10 14 53 and 10 45 00. This item will be paid for per lump sum price based on Owner's estimate of the percentage of signs completed during each billing cycle.

21. Storm Drain 24 inch HDPE: Installation of 24-inch diameter Storm Drainpipe will be paid at the bid unit price per foot. Work shall include the installation of the pipes in accordance with all specifications. Work shall be performed in accordance with Specification Section 22 14 00 and 33 41 00 and comprises the following: trench excavation and disposal of native material, removal and disposal of existing pipe or structures where shown, installation of new and replacement piping and connections, connection to existing facilities including the couplings needed to join dissimilar pipes, backfill material, and compaction of materials to subgrade (soil ready to receive road base). Pipe measurement will include the actual length of pipe installed and will not include waste pipe or measurement through junction structures or other structures. This item will be paid for per linear foot based on Owner's estimate of the number of feet installed during each billing cycle.

22. Storm Drain 18 inch HDPE: Installation of 18-inch Storm Drainpipe will be paid at the bid unit price per foot in accordance with item 21 above.

23. Storm Drain 12 inch HDPE: Installation of 12-inch Storm Drainpipe will be paid at the bid unit price per foot in accordance with item 21 above.

24. Flared End Section: Installation of the flared end section will be paid for on a per each basis. Work shall include the installation of the new ends in accordance with all specifications. This item comprises the following: excavation and disposal of native material, removal and disposal of existing structures where shown, placement of flared ends, placement of backfill material, and compaction of materials. This item

will be paid for per each based on Owner's estimate of the number of flared ends installed during each billing cycle.

25. Duckbill Outlet: Installation of the duckbill outlet will be paid for on a per each basis. Work shall include the installation of the new outlet in accordance with all specifications. This item comprises the following: excavation and disposal of native material, removal and disposal of existing structures where shown, placement of Duckbill outlet, placement of backfill material, and compaction of materials. This item will be paid for per each based on Owner's estimate of the number of outlets installed during each billing cycle.

26. Retention Basin Inlets: Installation of the retention basin inlets will be paid for on a per each basis. Work shall include the installation of the new inlets in accordance with all specifications. This item comprises the following: excavation and disposal of native material, removal and disposal of existing structures where shown, placement of inlets, placement of backfill material, and compaction of materials. This item will be paid for per each based on Owner's estimate of the number of inlets installed during each billing cycle.

27. Install 12"x12" Area Drains: Installation of the area drains will be paid for on a per each basis. Work shall include the installation of the new area drains in accordance with all specifications. This item comprises the following: excavation and disposal of native material, removal and disposal of existing structures where shown, placement of area drains, placement of backfill material, and compaction of materials. This item will be paid for per each based on Owner's estimate of the number of area drains installed during each billing cycle.

28. Connect to Existing Storm Drain: Connection to existing storm drain system will be paid at the bid unit price per lump sum. Work shall include the connection of the pipes in accordance with all specifications. Work shall be performed in accordance with Specification Section 22 14 00 and comprises the following: trench excavation and disposal of native material, removal and disposal of existing pipe or structures where shown, installation of new and replacement piping and connections, connection to existing facilities including the couplings needed to join dissimilar pipes, backfill material, and compaction of materials to subgrade (soil ready to receive road base). This item will be paid for based on Owner's estimate of the percentage of completion during each billing cycle.

29. Drainage Inlets (Caltrans Type G0): Installation of the concrete drop inlets (CalTrans Type G0) including hot dip galvanized grate, will be paid for on a per each basis. Work shall include the installation of the new inlets in accordance with all specifications. This item comprises the following: excavation and disposal of native material, removal and disposal of existing structures where shown, placement of precast inlets, placement of backfill material, and compaction of materials. This item will be paid for per each based on Owner's estimate of the number of drainage inlets installed during each billing cycle.

30. Adjust Existing Inlets to Grade: Adjustment of the existing inlet(s) to grade will be paid for on a per each basis. The work comprises the following: sawcutting of

asphalt for a clean edge, demolition of existing collar, excavation and disposal of native material, salvaging of existing structures, placement of backfill material as required, setting inlet to grade, compaction of materials, and placing a concrete collar. This item will be paid for per each based on Owner's estimate of the number of inlets adjusted during each billing cycle.

31. 4" Sanitary Sewer Lateral: Installation of sewer lines will be paid at the bid unit price per linear foot. Work shall include installation of the new lines in accordance with all specifications. This item comprises the following: trench excavation and disposal of native material, removal and disposal of existing lines and structures where shown, installation of new and replacement piping and connections, connection to existing facilities including the couplings needed to join dissimilar pipes, backfill material, and compaction of materials to subgrade (soil ready to receive road base) according to plans and specifications including section 22 25 35, 22 26 22, and 33 30 00. This item will be paid for based on Owner's estimate of the number of linear feet installed during each billing cycle.

32. Sanitary Sewer Cleanout with G-5 Boxes & Lids: Installation of the sanitary sewer cleanouts including piping and G-5 boxes, will be paid for on a per each basis. Work shall include the installation of the new cleanouts in accordance with all specifications. This item comprises the following: excavation and disposal of native material, removal and disposal of existing structures where shown, placement of piping and boxes, placement of backfill material, and compaction of materials. 90 percent will be paid on completion of compaction to subgrade. Final 10 percent will be paid upon completion of paving.

33. 1" Water Line: Installation of water lines will be paid at the bid unit price per linear foot. Work shall include installation of the new lines in accordance with all specifications including section 33 10 00. This item comprises the following: trench excavation and disposal of native material, removal and disposal of existing lines and structures where shown, installation of new and replacement piping and connections, connection to existing facilities including the couplings needed to join dissimilar pipes, backfill material, and compaction of materials to subgrade (soil ready to receive road base). 90 percent will be paid on completion of compaction to subgrade. Final 10 percent will be paid upon required testing, flushing, and disinfection being completed successfully.

34. Water Meter Connections: City to supply meters and boxes. All other piping and fittings supplied by the contractor. Installation of Water Meters will be paid for on a per each basis. Work shall include the installation of the new meters in accordance with all specifications. This item comprises the following: excavation and disposal of native material, removal, and salvage of existing meters and/or structures where shown, connection to existing facilities including the couplings needed to join dissimilar pipes, placing of meter and box and lid and needed appurtenances, backfill material, and compaction of materials to grade.

35. Reconnect restroom sewer & water: Connection of the restroom to existing water & sewer system will be paid at the bid unit price per lump sum. Work shall include the connection of the pipes in accordance with all specifications. Work shall be

performed in accordance with Specification Division 33 and comprises the following: trench excavation and disposal of native material, removal and disposal of existing pipe or structures where shown, installation of new and replacement piping and connections, connection to existing facilities including the couplings needed to join dissimilar pipes, backfill material, and compaction of materials to subgrade (soil ready to receive road base). This item will be paid for based on Owner's estimate of the percentage of completion during each billing cycle.

36. Electrical: This item shall be paid on a lump sum basis and shall include pull boxes, electrical conduit, receptacles, covers, related conductors, electrical enclosures, breakers, needed appurtenances and other subsurface items related to the final buildout of the electrical system not itemized in bid items 37 through 46, as shown on the Plans and specifications including division 26. All work is to be installed where shown on the Plans or as directed by the City or the Engineer. This item comprises the following: coordination with Pacific Power; trench or other excavation and disposal of native material; removal and disposal of existing conductors; backfill material; purchase and installation of conduits, pull tape, pull boxes, needed appurtenances, aggregate base, and compaction of materials to grade. This item to be paid based on Owner's estimate of the percent of related work installed on the project during each billing cycle.

37. Lighted Bollards: This item shall be paid on a per each basis and shall include all the work necessary to install lighted bollards and all equipment needed for fully functional lights. All work is to be installed where shown on the Plans and specifications including section 26 50 00 or as directed by the City or the Engineer. This item comprises the following: furnishing and installation of lighted bollards (poles, base, foundation, and hardware). This item to be paid based on Owner's estimate of the number of bollards installed on the project during each billing cycle.

38. Step Lighting: This item shall be paid on a per each basis and shall include all the work necessary to install step lighting and all equipment needed for fully functional lights. All work is to be installed where shown on the Plans and specifications including section 26 50 00 or as directed by the City or the Engineer. This item comprises the following: furnishing and installation of step lights (fixture, base, placement, and hardware). This item to be paid based on Owner's estimate of the number of lights installed on the project during each billing cycle.

39. Stamps Way Entry Lighting: This item shall be paid on a lump sum basis and shall include all the work necessary to install the entry way lighting and all equipment needed for fully functional lights. All work is to be installed where shown on the Plans and specifications including section 26 50 00 or as directed by the City or the Engineer. This item comprises the following: furnishing and installation of lights (poles, base, foundation, and hardware). This item to be paid based on Owner's estimate of the percentage installed on the project during each billing cycle.

40. Post Lights: This item shall be paid on a per each basis and shall include all the work necessary to install post lights and all equipment needed for fully functional lights. All work is to be installed where shown on the Plans and specifications including section 26 50 00 or as directed by the City or the Engineer. This item comprises the following:

furnishing and installation of post lights (posts, base, foundation, and hardware). This item to be paid based on Owner's estimate of the number of posts installed on the project during each billing cycle.

41. Electrical Transformer Vault Install: This item shall be paid on a per each basis and shall include all the work necessary to install the transformer vault and all equipment needed for fully functional electrical hookup. All work is to be installed where shown on the Plans and specifications including division 26 or as directed by the City or the Engineer. This item comprises the following: furnishing and installation of vault (vault, conduit, base, foundation, and hardware). This item to be paid based on Owner's estimate of the number of vaults installed on the project during each billing cycle.

42. 600A MDP Panel: This item shall be paid on a per each basis and shall include all the work necessary to install the panel and all equipment needed for fully functional electrical hookup. All work is to be installed where shown on the Plans and specifications including section 26 24 16 or as directed by the City or the Engineer. This item comprises the following: furnishing and installation of panel (panel, conduit, mounting, foundation, and hardware). This item to be paid based on Owner's estimate of the number of panels installed on the project during each billing cycle.

43. 400A SDP Panel: This item shall be paid on a per each basis and shall include all the work necessary to install the panel and all equipment needed for fully functional electrical hookup. All work is to be installed where shown on the Plans and specifications including section 26 24 16 or as directed by the City or the Engineer. This item comprises the following: furnishing and installation of panel (panel, conduit, mounting, foundation, and hardware). This item to be paid based on Owner's estimate of the number of panels installed on the project during each billing cycle.

44. Food Truck Pedestal 220V: This item shall be paid on a per each basis and shall include all the work necessary to install the pedestals and all equipment needed for fully functional hookup. All work is to be installed where shown on the Plans and specifications including division 26 or as directed by the City or the Engineer. This item comprises the following: furnishing and installation of the pedestals (fixture, base, foundation, and hardware). This item to be paid based on Owner's estimate of the number of pedestals installed on the project during each billing cycle.

45. 220V Outlets: This item shall be paid on a per each basis and shall include all the work necessary to install the outlets and all equipment needed for fully functional electrical hookup. All work is to be installed where shown on the Plans and specifications including division 26 or as directed by the City or the Engineer. This item comprises the following: furnishing and installation of the outlets (fixture, base, foundation, and hardware). This item to be paid based on Owner's estimate of the number of outlets installed on the project during each billing cycle.

46. 110V Outlets: This item shall be paid on a per each basis and shall include all the work necessary to install the outlets and all equipment needed for fully functional

electrical hookup. All work is to be installed where shown on the Plans and specifications including division 26 or as directed by the City or the Engineer. This item comprises the following: furnishing and installation of the outlets (fixture, base, foundation, and hardware). This item to be paid based on Owner's estimate of the number of outlets installed on the project during each billing cycle.

47. Concrete Vehicular Paving – 6" Section: This item will be paid at the bid unit price per square foot. This item includes all work necessary to construct 6-inch unreinforced concrete walkway including subgrade preparation, and all other items needed to install the paving in accordance with the plans and specifications including section 32 12 13. This item to be paid based on Owner's estimate of the square footage of paving installed on the project during each billing cycle.

48. Concrete Pedestrian Sidewalks – 4" Section: This item will be paid at the bid unit price per square foot. This item includes all work necessary to construct 4-inch unreinforced concrete sidewalks, including subgrade preparation, and all other items needed to install the sidewalks in accordance with the plans and specifications including section 32 12 13. This item to be paid based on Owner's estimate of the square footage of sidewalk installed on the project during each billing cycle.

49. Concrete Pedestrian Playground Sidewalks – 4" Section: This item will be paid at the bid unit price per square foot. This item includes all work necessary to construct 4-inch unreinforced concrete sidewalks, including subgrade preparation, and all other items needed to install the sidewalks in accordance with the plans and specifications including section 32 12 13. This item to be paid based on Owner's estimate of the square footage of sidewalk installed on the project during each billing cycle.

50. Concrete Decorative Paving – 4" Section: This item will be paid at the bid unit price per square foot. This item includes all work necessary to construct 4-inch unreinforced concrete sidewalks, including subgrade preparation, and all other items needed to install the sidewalks in accordance with the plans and specifications including but not limited to Cast in Place Concrete – 03 30 00; Concrete Paving – 32 13 13, and Decorative Concrete Paving – 32 13 16. Concrete to be exposed black concrete with embedded glass. This item to be paid based on Owner's estimate of the square footage of sidewalk installed on the project during each billing cycle.

51. Concrete Exercise Equipment Pad – 6" Section: This item will be paid at the bid unit price per square foot. This item includes all work necessary to construct 6-inch unreinforced concrete pad including subgrade preparation, and all other items needed to install the pad in accordance with the plans and specifications including section 32 12 13. This item to be paid based on Owner's estimate of the square footage of pad installed on the project during each billing cycle.

52. Grade and Rock for Concrete Paving: This item will be paid on the bid unit price per square foot and includes all labor, materials, and equipment necessary to import, place, grade, and compact the aggregate base rock for the concrete flatwork as shown on the Plans and specifications including section 32 11 00. The Owner will only pay for base rock quantities identified in the bid schedule. Contractor is responsible for proper grading and placement of subgrade to achieve lines and

grades. This item will be paid based on Owner's estimate of the number of square feet of aggregate base placed during each billing cycle.

53. ADA Dectable Warning Panels: This item is to be paid on a per square foot basis. This item includes all labor, materials, and equipment needed for installation of detectable warning surfaces placed at the ramps and crosswalks as shown on the Plans and in accordance with the CalTrans Standard Plans and Specifications including section 32 17 26. Concrete material is excluded from this bid item. The square footage of each Detectable Warning Surface may vary per location. This item to be paid based on Owner's estimate of the square feet of panels installed on the project during each billing cycle.

54. Curb Through Drain: This item will be paid on the bid unit price per each and includes all work necessary to place the drain through the curb including excavation and disposal of native soils, subgrade preparation, aggregate base, compaction, and all other items needed for installation as shown on the Plans. This item to be paid based on Owner's estimate of the number of drains installed on the project during each billing cycle.

55. Roll-over Reinforced Curb: This item will be paid on the bid unit price per linear foot and includes all work necessary to construct concrete roll-over curbs and gutters including excavation and disposal of native soils, subgrade preparation, aggregate base, compaction, steel reinforcement, and all other items needed for a complete and functioning gutter system. This item to be paid based on Owner's estimate of the linear feet of roll-over installed on the project during each billing cycle.

56. Valley Gutter: This item will be paid on the bid unit price per linear foot and includes all work necessary to construct valley gutters, including excavation and disposal of native soils, subgrade preparation, aggregate base, compaction, steel reinforcement, and all other items needed for valley gutters as shown on the Plans. This item to be paid based on Owner's estimate of the linear feet of valley gutter installed on the project during each billing cycle.

57. Concrete Stage, Foundation, Ramp, and Stairs: This item will be paid at the bid unit price per cubic yard. This item includes all work necessary to construct the stage, foundation, ramp and stairs including subgrade preparation, placing and compaction of aggregate base, steel reinforcement, and all other items needed to install the stage in accordance with the plans & specifications. This item to be paid based on Owner's estimate of the cubic yards of concrete placed on the project during each billing cycle.

58. Concrete Seat Wall: This item will be paid at the bid unit price per linear foot. This item includes all work necessary to construct a seat wall including subgrade preparation, placing and compaction of aggregate base, reinforcing steel, and all other items needed to install the seat walls in accordance with Detail 6 on L9.03 of the Beachfront Park Improvements Phase 1B plans and specifications. This item to be paid based on Owner's estimate of the linear feet of wall installed on the project during each billing cycle.

59. Curb Bands – 6" wide: This item will be paid at the bid unit price per linear foot. This item includes all work necessary to construct a 6-inch wide concrete mow band including subgrade preparation, placing and compaction of aggregate base, and all other items needed to install the band in accordance with details on L9.02 of the Beachfront Park Improvements Phase 1B plans and specifications. This item to be paid based on Owner's estimate of the linear feet of wall installed on the project during each billing cycle.

60. Landscape Soil Import: This item will be paid on the bid unit price per cubic yard and includes all labor, materials, and equipment necessary to import, place, grade, and compact the landscaping soil as shown on the plans and specifications including Specification 32 91 13. The Owner will only pay for soil quantities identified in the bid schedule. Contractor is responsible for proper grading and placement of soil to achieve lines and grades. This item will be paid based on Owner's estimate of the cubic yards of soil placed during each billing cycle.

61. Lawn Irrigation: Installation of irrigation lines will be paid at the bid unit price per square foot. Work shall include installation of the new lines, sprinklers, valves, and fittings, etc. in accordance with all plans and specifications including Specification 32 84 00. This item comprises the following: trench excavation and disposal of native material, removal and disposal of existing lines and structures where shown, backfill material, and compaction of materials to subgrade (soil ready to receive landscaping). This item will be paid based on Owner's estimate of the square feet of irrigation lines placed during each billing cycle.

62. Planting Areas Irrigation: Installation of irrigation lines will be paid at the bid unit price per square foot. Work shall include installation of the new lines, sprinklers, valves, controllers, backflow devices, and fittings, etc. in accordance with all plans and specifications including Specification 32 84 00. This item comprises the following: trench excavation and disposal of native material, removal and disposal of existing lines and structures where shown, backfill material, and compaction of materials to subgrade (soil ready to receive landscaping). This item will be paid based on Owner's estimate of the square feet of irrigation lines placed during each billing cycle.

63. Seeding Lawn: Seeding of lawn will be paid at the bid unit price per square foot. Work shall include soil preparation (grading, soil application, and tilling), approval of seed mixture, and seeding, etc. all in accordance with all plans and specifications including Specification 32 92 00. This item will be paid based on Owner's estimate of the square feet of completion during each billing cycle. 50 percent will be paid on completion of soil preparation and 40 percent will be paid on completion of seeding.

64. Planting Ground Cover & Shrubs: Planting of ground cover and shrubs will be paid at the bid unit price per square foot. Work shall include soil preparation (grading, soil application, and tilling), approval of seed/plant selection, and placement, etc. in accordance with all plans and specifications including Specification 32 93 00. This item will be paid based on Owner's estimate of the square feet of completion during each billing cycle. 50 percent will be paid on completion of soil preparation and 40 percent will be paid on completion of planting.

65. Planting Rain Gardens: Planting of rain gardens will be paid at the bid unit price per square foot. Work shall include soil preparation (grading, soil application, and tilling), approval of seed/plant selection, and placement, etc. in accordance with all plans and specifications including Specification 32 93 00. This item will be paid based on Owner's estimate of the square feet of completion during each billing cycle. 50 percent will be paid on completion of soil preparation and 40 percent will be paid on completion of planting.

66. Planting Berms: Planting of berms will be paid at the bid unit price per square foot. Work shall include soil preparation (grading, soil application, and tilling), approval of seed/plant selection, and placement, etc. in accordance with all plans and specifications including Specification 32 92 00. This item will be paid based on Owner's estimate of the square feet of completion during each billing cycle. 50 percent will be paid on completion of soil preparation and 40 percent will be paid on completion of planting.

67. Planting Trees Ball & Burlap: Planting of trees will be paid at the bid unit price per each. Work shall include soil preparation, approval of tree selection size and type, root barrier (if applicable), and placement, etc. in accordance with all plans and specifications including Specification 32 93 00. This item will be paid based on Owner's estimate of the number of trees placed during each billing cycle.

68. Bark Mulch 4 inches: Application of 4 inches of bark mulch will be paid at the bid unit price per cubic yard. Work shall include importing and placement of mulch in accordance with all plans and specifications. This item will be paid based on Owner's estimate of the cubic yards of mulch placed during each billing cycle.

69. Landscaping Maintenance: Landscape maintenance will be paid at the bid unit price per lump sum. Work shall include as required reseeding/replacement of trees/shrubs/plants/grass which die for any cause, pruning, irrigation system inspection and maintenance, application of bark mulch, fertilizer, herbicide, and/or pesticide in accordance with all plans and specifications including Specification 32 93 10. This item will be paid (8.3 percent/month) on a monthly progress payment over the course of one year starting with the City's issuance of a Substantial Completion letter.

70. Play Surface Type 1: Installation of Play Surface Type 1 will be paid at the bid unit price per square foot. Work shall include ground preparation (grading, compaction, etc.) and placement of play surface in accordance with all plans and specifications. This item will be paid based on Owner's estimate of the square feet of play surface installed during each billing cycle.

71. Play Surface Type 2: Installation of Play Surface Type 2 will be paid at the bid unit price per square foot. Work shall include ground preparation (grading, compaction, etc.) and placement of play surface in accordance with all plans and specifications. This item will be paid based on Owner's estimate of the square feet of play surface installed during each billing cycle.

72. Playground Equipment – Tree: Installation of the playground tree will be paid at the bid unit price per lump sum. Work shall include ground preparation (grading, compaction, etc.), placement of foundation, and placement equipment in accordance with all plans and specifications. This item will be paid based on Owner's estimate of the percent completion rounded down to the nearest 10% during each billing cycle.

73. Playground Equipment – Swing 2 Bay: Installation of the playground 2 bay swing will be paid at the bid unit price per lump sum. Work shall include ground preparation (grading, compaction, etc.), placement of foundation, and placement equipment in accordance with all plans and specifications. This item will be paid based on Owner's estimate of the percent completion rounded down to the nearest 10% during each billing cycle.

74. Playground Equipment – Boat: Installation of the playground boat will be paid at the bid unit price per lump sum. Work shall include ground preparation (grading, compaction, etc.), placement of foundation, and placement equipment in accordance with all plans and specifications. This item will be paid based on Owner's estimate of the percent completion rounded down to the nearest 10% during each billing cycle.

75. Playground Equipment – Musical: Installation of the playground musical equipment will be paid at the bid unit price per lump sum. Work shall include ground preparation (grading, compaction, etc.), placement of foundation, and placement equipment in accordance with all plans and specifications. This item will be paid based on Owner's estimate of the percent completion rounded down to the nearest 10% during each billing cycle.

76. Playground Equipment – Water Elements: Installation of the playground water elements will be paid at the bid unit price per lump sum. Work shall include ground preparation (grading, compaction, etc.), placement of foundation, and placement equipment in accordance with all plans and specifications. This item will be paid based on Owner's estimate of the percent completion rounded down to the nearest 10% during each billing cycle.

77. Playground Equipment – Independent Elements: The installation of the independent playground equipment elements shall be paid on a per each basis and shall include all labor, foundation, and installation related to the final buildout as shown in the plans and specifications. All work is to be installed where shown on the Plans or as directed by the City or the Engineer. This item to be paid based on Owner's estimate of the number of elements installed on the project during each billing cycle.

78. Playground Fencing: Installation of playground fencing will be paid at the bid unit price per linear foot. This item includes all work necessary to install fencing including foundation, posts, gates, fencing, and all other items needed to install the fence in accordance with plans & specifications including section 32 31 13. This item to be paid based on Owner's estimate of the linear feet of fence installed on the project during each billing cycle.

79. Playground Specialized Fencing: Installation of specialized playground fencing will be paid at the bid unit price per linear foot. This item includes all work necessary to install fencing including foundation, posts, gates, fencing, and all other items needed to install the fence in accordance with plans & specifications including section 32 31 13. This item to be paid based on Owner's estimate of the linear feet of fence installed on the project during each billing cycle.

80. Playground Shotcrete Boulders: Placement of shotcrete boulders will be paid at the bid unit price per square foot. Work shall include soil preparation (grading, compaction, etc.), import, and placement in accordance with all plans and specifications. This item will be paid based on Owner's estimate of the square feet of completion during each billing cycle.

81. Picnic Tables: The installation of the picnic tables shall be paid at the bid unit price per each basis and shall include all labor, foundation, and installation related to the table placement as shown in the plans and specifications. All work is to be installed where shown on the Plans or as directed by the City or the Engineer. This item to be paid based on Owner's estimate of the number of tables installed on the project during each billing cycle.

82. Standard Concrete Benches: The installation of the benches shall be paid at the bid unit price per each basis and shall include all labor, foundation, and installation related to the bench placement as shown in the plans and specifications. All work is to be installed where shown on the Plans or as directed by the City or the Engineer. This item to be paid based on Owner's estimate of the number of benches installed on the project during each billing cycle.

83. Furnish & Install Removable Bollards: The installation of removable bollards shall be paid on a per each basis and shall include all labor, foundation, inserts, sleeves, and adjacent paving related to the final buildout of the removable bollards as shown in Detail 3 on L9.07 of the Beachfront Park Improvements Phase 1B plans and specifications including section 26 00 00. All work is to be installed where shown on the Plans or as directed by the City or the Engineer. This item to be paid based on Owner's estimate of the number of bollards installed on the project during each billing cycle.

84. Furnish & Install Stage Rail: Installation of the handrails on the Amphitheater Stage will be paid for per linear foot. Work shall include the fabrication and installation of the handrail in accordance with sheets L9.04 & L9.05 of the Beachfront Park Improvements Phase 1B plans and and specifications. This item comprises the following: embedment/foundation, placement, and finish of handrails. This item to be paid based on Owner's estimate of the number of linear feet installed on the project during each billing cycle.

85. Install Bicycle Racks: Installation of the bicycle racks will be paid at the bid unit price per each. Work shall include the purchase and installation of the bicycle racks in accordance with detail 7 on page L9.06 of the Beachfront Park Improvements Phase 1B plans and specifications including section 32 33 00. This item comprises the following: footing/foundation, flange placement, and installation of bicycle rack.

This item to be paid based on Owner's estimate of the number of racks installed on the project during each billing cycle.

86. Drinking Fountain: The installation of the accessible drinking fountain will be paid at the bid unit price per lump sum. Installation of the accessible drinking fountain shall include excavation and disposal of native material, removal and disposal of existing structures, backfill material, compaction of materials, foundation, surface mounting, and plumbing in accordance with detail 4 on sheet L9.07 of the Beachfront Park Improvements Phase 1B plans, and specifications including section 32 33 00. This item 90 percent will be paid on completion of installation and compaction to subgrade. The final 10 percent will be paid with the final payment.

87. Fencing – Guardrail: Installation of the guardrail fencing will be paid at the bid unit price per linear foot. This item includes all work necessary to install fencing including foundation, posts, rail, and all other items needed to install the fence in accordance with plans & specifications including section 32 31 13. This item to be paid based on Owner's estimate of the linear feet of fence installed on the project during each billing cycle.

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.

2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.

b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.

f. Certificates and qualification data, where applicable or requested.

g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.

h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.

i. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

j. Cost information, including a proposal of change, if any, in the Contract Sum.

k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.

l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Landscape Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.

b. Substitution request is fully documented and properly submitted.

c. Requested substitution will not adversely affect Contractor's construction schedule.

d. Requested substitution has received necessary approvals of authorities having jurisdiction.

e. Requested substitution is compatible with other portions of the Work.

f. Requested substitution has been coordinated with other portions of the Work.

g. Requested substitution provides specified warranty.

h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Landscape Architect will consider requests for substitution if received within 60 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Landscape Architect.

1. Conditions: Landscape Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Landscape Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Landscape Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

b. Requested substitution does not require extensive revisions to the Contract Documents.

c. Requested substitution is consistent with the Contract Documents and will produce indicated results.

d. Substitution request is fully documented and properly submitted.

e. Requested substitution will not adversely affect Contractor's construction schedule.

f. Requested substitution has received necessary approvals of authorities having jurisdiction.

g. Requested substitution is compatible with other portions of the Work.

h. Requested substitution has been coordinated with other portions of the Work.

i. Requested substitution provides specified warranty.

j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

END OF SECTION

SECTION 01 33 00

SUBMITTALS

1.0 GENERAL

Submittals covered by these requirements include manufacturers' information, shop drawings, test procedures, test results, samples, requests for substitutions, and miscellaneous work-related submittals. Submittals also include, but are not limited to, all mechanical, electrical and electronic equipment and systems, materials, reinforcing steel, fabricated items, and piping and conduit details. The Contractor shall furnish all drawings, specifications, descriptive data, certificates, samples, tests, methods, schedules, and manufacturer's installation and other instructions as specifically required in the contract documents to demonstrate fully that the materials and equipment to be furnished and the methods of work comply with the provisions and intent of the contract documents.

2.0 CONTRACTOR'S RESPONSIBILITIES

The Contractor will be responsible for the accuracy and completeness of the information contained in each submittal and must assure that the material, equipment or method of work will be as described in the submittal. The Contractor must verify that all features of all products conform to the specified requirements. Submittal documents must be clearly edited to indicate only those items, models, or series of equipment, which are being submitted for review. All extraneous materials must be crossed out or otherwise obliterated. The Contractor must ensure that there is no conflict with other submittals and notify the Construction Manager in each case where his submittal may affect the work of another contractor or the Owner. The Contractor must coordinate submittals among his subcontractors and suppliers including those submittals complying with unit responsibility requirements specified in applicable technical sections.

The Contractor must coordinate submittals with the work so that work will not be delayed. The Contractor shall coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals. The Contractor must not proceed with work related to a submittal until the submittal process is complete. This requires that submittals for review and comment must be returned to the Contractor stamped "No Exceptions Taken" or "Make Corrections Noted."

The Contractor shall certify on each submittal document that he has reviewed the submittal, verified field conditions, and complied with the contract documents.

The Contractor may authorize in writing a material or equipment supplier to deal directly with the Construction Manager or with the Owner with regard to a submittal. These dealings will be limited to contract interpretations to clarify and expedite the work.

3.0 CATEGORIES OF SUBMITTALS

A. GENERAL:

Submittals fall into two general categories; submittals for review and comment, and submittals which are primarily for information only. Submittals that are for information only are generally specified as PRODUCT DATA in Part 2 of applicable specification sections.

A copy of each specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation must be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager will be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. *Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal will be sufficient cause for rejection of the entire submittal with no further consideration.*

The Contractor shall submit a submittal schedule listing all submittals and associated submittal dates. Two separate lists must be provided: submittals for review and comment and product data (submittals) for information only. No submittals will be reviewed without a submittal schedule. Three (3) copies of the submittal schedule must be provided to the Construction Manager within 15 days of the pre-construction meeting. The schedule must be updated weekly with approval or rejection notes and dates, re-submittals with associated dates, and any additional information as required by the Construction Manager.

The Contractor shall maintain an accurate submittal log in a form acceptable to the Construction Manager, for the duration of the Contract. Show current status of all submittals at all times. Make the submittal log available for the Construction Manager's review upon request and with each submittal.

B. SUBMITTALS FOR REVIEW AND COMMENT:

All submittals except where specified to be submitted as product data for information only must be submitted by the Contractor to the Construction Manager for review and comment.

C. SUBMITTALS (PRODUCT DATA) FOR INFORMATION ONLY:

Where specified, the Contractor shall furnish submittals (product data) to the Construction Manager for Information only. If the Construction Manager is dissatisfied with any submittal, submitted as Product Data, or for information only, they may be reviewed and commented upon.

4.0 TRANSMITTAL PROCEDURE

A. GENERAL:

Unless otherwise specified, submittals regarding material and equipment must be accompanied by Transmittal Form 01300-A specified in Section 00 62 00. A separate form must be used for each specific item, class of material, equipment, and items specified in separate, discrete sections, for which the submittal is required. Submittal documents common to more than one piece of equipment must be identified with all the appropriate equipment numbers. Submittals for various items may be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.

A unique number, sequentially assigned, must be noted on the transmittal form accompanying each item submitted. Original submittal numbers will have the following format: "XXX"; where "XXX" is the sequential number assigned by the Contractor. Resubmittals will have the following format: "XXX-Y"; where "XXX" is the originally assigned submittal number and "Y" is a sequential letter assigned for resubmittals, i.e., A, B, or C being the 1st, 2nd, and 3rd resubmittals, respectively. Submittal 25B, for example, is the second resubmittal of submittal 25.

B. DEVIATION FROM CONTRACT:

If the Contractor proposes to provide material, equipment, or method of work that deviates from the project manual, he or she must so indicate under "deviations" on the transmittal form accompanying the submittal copies.

C. SUBMITTAL COMPLETENESS:

Submittals which do not have all the information required to be submitted, including deviations, are not acceptable and will be returned without review.

5.0 REVIEW PROCEDURE

A. GENERAL:

Submittals are specified for those features and characteristics of materials, equipment, and methods of operation which can be selected based on the Contractor's judgment of their conformance to the specified requirements. Other features and characteristics are specified in a manner that enables the Contractor to determine acceptable options without submittals. The review procedure is based on the Contractor's guarantee that all features and characteristics not requiring submittals conform as specified. Review will not extend to means, methods, techniques, sequences or procedures of construction, or to verifying quantities, dimensions, weights or gages, or fabrication processes (except where specifically indicated or required by the project manual) or to safety precautions or programs incident thereto. Review of a separate item, as such, will not indicate approval of the assembly in which the item functions.

When the contract documents require a submittal, the Contractor shall submit the specified information as follows:

1. Three (3) copies of all submitted information plus one reproducible original of all information must be transmitted with submittals for review and

comment. The reproducible original must be submitted in a three ring binder with spine identification, cover identification, and table of contents and index tabs to indentify the various items. Contractor is also advised to submit these documents in electronic (pdf) format, to expedite Engineer's approval process.

2. Unless otherwise specified, 4 copies of all submitted information must be transmitted with submittals (Product Data) for information only.

B. SUBMITTALS FOR REVIEW AND COMMENT:

Unless otherwise specified, within 30 calendar days after receipt of a submittal for review and comment, the Construction Manager shall review the submittal and return 2 copies of the marked-up reproducible original noted in 1 above. The reproducible original will be retained by the Construction Manager. The returned submittal will indicate one of the following actions:

1. If the review indicates that the material, equipment or work method complies with the project manual, submittal copies will be marked "NO EXCEPTIONS TAKEN." In this event, the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.

2. If the review indicates limited corrections are required, copies will be marked "MAKE CORRECTIONS NOTED." The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections.

3. If the review reveals that the submittal is insufficient or contains incorrect data, copies will be marked "AMEND AND RESUBMIT." Except at his own risk, the Contractor may not undertake work covered by this submittal until it has been revised, resubmitted and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

4. If the review indicates that the material, equipment, or work method does not comply with the project manual, copies of the submittal will be marked "REJECTED - SEE REMARKS." Submittals with deviations that have not been identified clearly may be rejected. Except at his own risk, the Contractor may not undertake the work covered by such submittals until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

C. SUBMITTALS (PRODUCT DATA) FOR INFORMATION ONLY:

Such information is not subject to submittal review procedures and will be provided as part of the work under this contract and its acceptability determined under normal inspection procedures.

6.0 EFFECT OF REVIEW OF CONTRACTOR'S SUBMITTALS

Review of contract drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide, will not relieve the Contractor of his or her responsibility for errors therein and may not be regarded as an assumption of risks or liability by the

Construction Manager or the Owner, or by any officer or employee thereof, and the Contractor will have no claim under the contract on account of the failure, or partial failure, of the method of work, material, or equipment so reviewed. A mark of "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" means that the Owner has no objection to the Contractor, upon his own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

END OF SECTION

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1--GENERAL

1.01 PERMITS

A. The following permit shall be obtained at City Hall at Contractor's expense:

1. City Business License

Contractor shall conform to all requirements stated in these permits and shall make all necessary corrections to the installation that may be directed by agency engineers and inspectors. Once a permit has been acquired, the Contractor shall review the conditions of the permit and assess if they are consistent with the executed Contract. If not, Contractor shall within 10 working days provide notice in writing of changed items not originally included in the Contractor's Bid or subsequent contract.

B. Contractor shall secure all other permits or licenses required to complete the project and any that may be required to construct the project, including, but not limited to the following:

1. Post at the work site copies of Construction Safety Orders and General Safety Orders issued by the California State Division of Industrial Safety.

2. Submit to the Construction Manager a detailed plan showing the design of shoring, bracing, sloping or other provisions as required in Section 31 40 00 of these specifications. No excavation shall start until the Engineer or Construction Manager has accepted the plan and the Contractor has obtained a permit from the State Division of Industrial Safety. A copy of the permit shall be submitted to the Construction Manager.

3. Any permits required by the appropriate Air Quality Management District to operate construction equipment. For information concerning permits contact North Coast Unified Air Quality Management District (AQMD), Permit/Application Receiving at (707) 443-3093.

4. ~~Requirements of the Energy Star Program, Enterprise Green Communities, and the California Green Building Code.~~ Not Required

5. ~~Caltrans Encroachment Permit.~~ Not Required

C. Contractor shall be responsible for payment of any additional costs or fines due to re-inspection and approval of the work or other related problems deemed necessary by an agency inspector.

1.02 FIRE SAFETY

A. Contractor is to be especially careful in all welding and cutting operations to avoid fire.

B. Onsite inspection shall be required for all hot work. Prior to starting hot work notify the Owner and any adjacent tenants of the property within 100 feet of the hot work location, 48 hours prior to the work.

C. Furnish all safety devices, extinguishers, and fire watch personnel, as necessary to protect the public, the work and the Owner.

1.03 TRAFFIC CONTROL

Provide all traffic control signs, barricades, and warning devices necessary to control traffic from all directions. Land traffic shall be in accordance with the Manual of Uniform Traffic Control Devices (MUTCD) as required in Section 01 55 26 of these Specifications; and water traffic shall be in accordance with the requirements of the U.S. Coast Guard. Traffic control plans shall be submitted within 15 days of the pre-construction meeting.

1.04 SHEETING, SHORING, & BRACING

Pursuant to Labor Code Section 6705, the excavation of any trench or trenches five feet or more in depth requires the submission by the Contractor and acceptance by the Owner or by a registered civil or structural engineer, employed by the Owner, to whom authority to accept has been delegated, in advance of excavation, of a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system standards, the plan shall be prepared by a registered civil or structural engineer.

Nothing in this clause shall be deemed to allow the use of a shoring, sloping, or protective system less effective than that required by the Construction Safety Orders.

PART 2--NOT USED

PART 3--EXECUTION

3.01 EQUIPMENT (NOT USED)

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1--GENERAL

1.01 DESCRIPTION

This section specifies administrative and procedural requirements for quality control services, field inspections, and field testing of civil and structural constructs required for this project. Contractor is responsible for the quality assurance and quality control of their respective work.

1.02 DEFINITIONS

Quality Control System (QCS): The quality control, assurance, and inspection system established and carried out to ensure compliance with the Plans and Specifications.

QCS Supervisor: That person in responsible charge of the work occurring, as designated by the Contractor in the QCS Plan.

QCS Inspector: Responsible, certified personnel inspecting the various constructs at specified milestones and during the project overall and designated by the Construction Manager. The Special Inspector is part of the QCS Inspector team.

Factory Test: Tests made on various materials, products and component parts prior to shipment to the job site.

Field Tests: Tests and analyses made at or in the vicinity of the job site in connection with the actual construction.

Certified Inspection Report: Reports signed by approved inspectors attesting that the items inspected meet the specification requirements other than any exceptions included in the report

Certificate of Compliance: Certificate from the manufacturer of the material or equipment identifying said manufacturer, product and referenced standard, and shall be signed by a designated officer of the manufacturer.

Standard Compliance: Condition whereby specified materials or equipment must conform to the standards of organizations such as the American National Standard Institute (ANSI), American Society for Testing and Materials (ASTM), Underwriters Laboratories (UL) or similar organization.

Quality Assurance: The day-to-day, in-process supervisory observations of work and materials conducted by the Contractor to assure that the proper methods and materials are being used and installed by tradesmen.

Source Quality Control: The in-process testing and inspections conducted by the QCS Inspector(s) to verify that the materials, equipment, workmanship and shop manufactured constructs are in compliance with the Contract Documents, applicable Codes and standards.

Field Quality Control: The testing and inspections conducted by the QCS Inspector(s) in the field during and at the completion of each construct to verify that the in-process and completed construction is in compliance with the Contract Documents, applicable Codes and standards.

Energy Star Inspector/Certifier: Designated and paid for by the Owner.

Building Official/Building Inspector: As defined by the IBC and California Code of Regulations Title 24. This project is not in the jurisdiction of the Humboldt County Building Department. The Owner has retained the services of the Project Designers to perform that role on this project.

1.03 REFERENCES

This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization, or if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
ASTM C102	Practice for Laboratories Engaged in the Testing of Building Sealants.
ASTM C802	Practice for Conducting an Inter-Laboratory Test Program to Determine the Precision of Test Methods for Construction.
ASTM D3740	Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
ASTM D4561	Practice for Quality Control Systems for an Inspection and testing Agency for Bituminous Paving Materials.
ASTM E329	Practice for Use in the Evaluation of Inspection and Testing Agencies as Used in Construction.
IBC	2016 California Building Code

1.04 CONTRACTOR'S RESPONSIBILITIES

Contractor's responsibilities shall be as follows:

1. Monitor quality assurance over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

2. Coordinate with, schedule specified inspections by, and provide normal and customary assistance to the QCS Inspectors.

3. Comply fully with manufacturers' instructions, including each step in sequence.

4. Should manufacturers' instructions conflict with Contract Documents, request clarification before proceeding from Construction Manager.

5. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

6. Perform work by persons qualified to produce workmanship of specified quality.

7. Notify Building Inspector with 48-hour notice to observe all construction elements related to the project, regardless of trade, prior to covering. No work elements shall be covered prior to written acceptance by the Building Inspector. If so, the work shall be exposed and recovered by and at the sole expense of the Contractor.

8. To demonstrate his compliance with the contract requirements, the Contractor must assist the Construction Manager in his performance of inspection work. The Contractor must grant the Construction Manager access to the work and to the site of the work, and to the places where work is being prepared, or whence materials, equipment or machinery are being obtained for the work. The Contractor must provide information requested by the Construction Manager in connection with inspection work.

   If the contract documents, laws, ordinances, or any public regulatory authority require parts of the work to be specially inspected, tested or approved, the Contractor will give the Construction Manager adequate prior written notice of the availability of the subject work for examination.

   If parts of the work are covered in contravention of the Construction Manager's directive, the cost of exposing the work for inspection and closing must be borne by the Contractor regardless of whether or not the work is found to be in compliance with the contract.

   If any work is covered in the absence of the Construction Manager's directive to the contrary, the Contractor must, if directed to do so by the

Construction Manager, uncover, expose or otherwise make available for inspection, portions of covered work. If it is found that such work is defective, the Contractor must bear the expense of uncovering and reconstructing. If the work is found to be in compliance with the contract, the Contractor will be allowed an increase in the contract price, or an extension in the contract time, or both. A change order will be issued to document the increase, extension or both.

1.05 REGULATORY REQUIREMENTS

A. GENERAL:

Comply with all Federal, State, and local Codes as referenced herein. Such regulations apply to activities including, but not limited to, sitework and zoning, building practices and quality, on and offsite disposal, safety, sanitation, nuisance, and environmental quality.

B. SPECIAL INSPECTION:

Special Inspection shall be performed by the Special Inspector under contract with the Construction Manager in conformance with the IBC. Special Inspection is in addition to, but not replacing, other inspections and quality control requirements herein. Where sampling and testing required herein conforms to Special Inspection standards, such sampling and testing need not be duplicated.

C. STRUCTURAL OBSERVATION:

Engineer shall make visual inspections of the work to assess general conformance with the Contract Documents at significant construction stages and at completion of the structural system. The QCS shall include a preliminary set of Structural Observations and what items are expected to be observed. Contractor shall request this preliminary set from Engineer through Construction Manager and submit as part of their QCS submittal.

The following structural milestones shall be considered significant construction stages:

(NONE)

1.06 FIELD SAMPLE PROCEDURES

When field samples are specified in a unit of work, construct each field sample to include work of all trades required to complete the field sample prior to starting related field work. Field samples may be incorporated into the project after acceptance by Construction Manager. Remove unacceptable field samples when directed by Construction Manager. Acceptable samples represent a quality level for the work.

1.07 CONTRACTOR DESIGNED STRUCTURAL SYSTEMS

A. DESIGN ENGINEERING:

Contractor shall employ and pay for engineering services from a Professional Engineer registered in the State of California for structural design of Contractor designed structural systems including but not limited to temporary shoring and bracing, formwork support, and

support systems for fire protection, plumbing, mechanical, and electrical systems and equipment.

B. TESTS AND INSPECTIONS OF CONTRACTOR DESIGNED STRUCTURAL SYSTEMS:

Contractor shall pay for preliminary testing of concrete, grout, and mortar mix designs where required by Code or the submittal process prior to start of such work. Contractor shall pay for required shop and site inspection of Contractor designed structural systems where required by Code or these specifications, to the extent such testing and inspection exceeds that required for the structural system on the drawings and in these specifications.

1.08 MANUFACTURERS' FIELD SERVICES AND REPORTS

When specified in individual specification Sections, product suppliers or manufacturers shall provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment as applicable, and to provide instructions when necessary. Contractor shall submit qualifications of observer to Construction Manager 30 days in advance of required observations. QCS Inspector shall record observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

1.09 JOB SITE CONDITIONS

Schedule to ensure all preparatory work has been accomplished prior to proceeding with current work. Proceeding with the work constitutes acceptance of conditions. Allow adequate time for materials susceptible to temperature and humidity to "stabilize" prior to installation.

1.10 SUBMITTALS

The following information shall be provided in accordance with Section 01 33 00:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. *Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.*

2. Written description of Contractor's proposed QCS plan in sufficient detail to illustrate understanding and approach. The QCS plan and submittal shall include a log showing anticipated inspections, Special Inspections, and source and field Quality Assurance procedures. Preliminary submittal of the QCS plan may be made prior to commencing field work. The preliminary submittal will illustrate the project's initial three (3) month's work and be followed one month later by a final QCS plan submittal.

3. Contractor's proposed QCS Supervisor, qualifications, and if requested, references.

4. Preliminary structural observation set as described in paragraph 1.05 C.

5. Complete structural system information describing Contractor designed structural systems, including sealed calculations, shop and erection drawings, product literature for the various components, ICBO Evaluation Reports for structural components, and a discussion of risk issues associated with the proposed system which could adversely impact overall project completion.

6. If requested by the Construction Manager during the work, manufacturer's field services and reports. If not so requested, treat same as Product Data.

PART 2--PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. CONTRACTOR RESPONSIBILITIES:

Provide source quality control according to the reviewed and accepted QCS plan and paragraph 1.04 herein. Coordinate with Construction Manager to facilitate the work of the Testing Laboratory specified in Section 01 45 29 and Special Inspector. Provide ready access to sampling and inspection locations and incidental labor customary in such sampling and inspections. Timely prepare and submit submittals and revise as indicated by review comments. Comply with technical requirements in each specification Section that applies to the work.

B. CONSTRUCTION MANAGER RESPONSIBILITIES:

Review Contractor's tracking of QCS activities at monthly meetings. Facilitate completion of submittal review per Section 01 33 00. Assist Contractor to ensure that Special Inspection occurs where and when specified.

C. ACCEPTANCE CRITERIA:

Acceptable characteristics and quality of a particular item or construct is defined in that item's or construct's specification Section.

2.02 PRODUCT DATA

The following product data shall be provided in accordance with Section 01 33 00.

1. Manufacturers' field services and reports unless requested by Construction Manager to be submitted for review.

2. Special Inspection reports, unless otherwise directed in each technical specification Section.

PART 3--EXECUTION

3.01 FIELD QUALITY CONTROL

Field quality control responsibilities of the Contractor and Construction Manager are substantially the same as described in paragraph 2.01, with the exception that this work occurs primarily on the jobsite as the work progresses, and Special Inspection will occur more often than at the source.

Acceptable characteristics and quality of a particular item or construct is defined in that item's or construct's specification section.

3.02 REGULATORY COMPLIANCE – SPECIAL INSPECTIONS

The following types of work require Special Inspection according to Chapter 17 of the IBC and each system's specification section:

~~1. Structure fill.~~

~~2. Structural concrete and reinforcing.~~

3. Anchor bolts and post-installed anchor systems.

4. Structural steel and aluminum including connections.

Section 01 45 29 describes Testing Laboratory sampling, testing and reporting, much of which is conforming to Special Inspection requirements, and need not be replicated.

Contractor designed structural systems are subject to the same Special Inspection requirements as all other work.

3.03 CORRECTION OF DEFECTIVE WORK

Remove and replace defective, rejected, and condemned work at Contractor's expense until such work meets the requirements of Contract Documents. Costs for Inspection of corrected work shall be paid by the Contractor.

END OF SECTION

SECTION 01 45 29

TESTING LABORATORY SERVICES

PART 1 – GENERAL

1.01 DESCRIPTION

This Section specifies Quality Control testing and reporting performed by the Testing Laboratory. Construction Manager shall select a qualified Testing Laboratory and contract for the services specified herein, except as specifically noted where Contractor may elect to utilize Testing Laboratory to fulfill submittal requirements. Such an arrangement does not relieve the Contractor from their responsibility to provide the completed project as specified, and to perform Quality Assurance according to the QCS as reviewed and accepted.

1.02 REFERENCES

This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
AASHTO T-27	Standard Method of Test for Sieve Analysis of fine and Course Aggregate
ACI 214	Evaluation of Strength Test Results of Concrete
ASTM A880	Criteria for Use in Evaluation of Testing Laboratories and Organizations for Examination and Inspection of Steel, Stainless Steel, and Related Alloys
ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C31	Making and Curing Concrete Test Specimens in the Field
ASTM C39	Compressive Strength of Cylindrical Concrete Specimens
ASTM C42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

Reference	Title
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
ASTM C136	Standard Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143/C143M	Slump of Hydraulic Cement Concrete
ASTM C172	Sampling Freshly Mixed Concrete
ASTM C802	Conducting an Inter-laboratory Test Program to Determine the Precision of Test Methods for Construction Materials
ASTM C1021	Laboratories Engaged in the Testing of Building Sealants
ASTM Cl077	Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM D75	Sampling Aggregates
ASTM D1556	Test Method for Density of Soil in Place by the Sand-Cone Method
ASTM D1557	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.5-kg) Rammer and 18-in. (457-mm) Drop
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2487	Classification of Soils for Engineering Purposes
ASTM D3017	Test Method for Moisture Content of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D3441	Standard Test Method for Mechanical cone Penetration Tests of Soil
ASTM D3666	Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D3740	Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM D4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4561	Quality Control Systems for Organizations Producing and Applying Bituminous Paving Materials
ASTM D4832	Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders
ASTM E4	Force Verification of Testing Machines
ASTM E329	Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
ASTM E543	Agencies Performing Nondestructive Testing

Reference	Title
ASTM E994	Calibration and Testing Laboratory Accreditation Systems General Requirements for Operation and Recognition
IBC	2013 California Building Code

1.03 TESTING LABORATORY QUALIFICATIONS

Testing Laboratory shall satisfy the following qualifications:

1. Recommended Requirements for Independent Laboratory Qualification, published by American Council of Independent Laboratories.

2. Conform to the requirements of ASTM E329 in particular, and other reference standards as generally pertain to this project.

3. Authorized to operate in the State of California, with personnel and equipment based sufficiently close to the project to allow short-notice site access for sampling and testing.

4. Acceptable to Owner, Construction Manager, and local building authorities.

1.04 TESTING LABORATORY RESPONSIBILITIES

Testing Laboratory shall provide qualified personnel at the site and cooperate with Construction Manager and Contractor in performance of the following services:

1. Perform specified independent inspection, sampling, and testing of products in accordance with specified standards, to determine compliance with requirements of Contract Documents.

2. Provide sampling equipment and personnel, deliver samples to the testing laboratory, record field measurements, and cure samples as required by Contract Documents.

3. Perform Building Department required tests and inspections, including Special Inspection as specified in Section 01 45 00.

4. Timely prepare and deliver reports summarizing results of tests and inspections.

5. Attend pre-construction conferences and, if requested, a limited number of progress meetings where Quality Control, testing, and inspection issues require discussion.

6. When directed by the Construction Manager or requested by the Contractor, provide special and additional tests and inspections to verify material compliance with requirements of Contract Documents.

a. Construction Manager shall pay for special tests and inspections where work conforms to the Contract Document requirements.

b. Contractor shall pay for additional tests and inspections where work fails to comply with Contract Document requirements (re-inspection) and for costs associated with cancelled or short-notice re-scheduling of requested sampling, testing, and inspection. Testing Laboratory work requested by Contractor to fulfill submittal requirements shall also be considered additional tests.

1.05 CONTRACTOR RESPONSIBILITIES

Contractor shall deliver adequate samples of materials proposed to be used and which require testing to the Testing Laboratory. Contractor shall cooperate with Testing Laboratory personnel and provide access to the work and to manufacturer's facilities. Contractor shall provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.

Contractor shall notify Testing Laboratory and Construction Manager 24 hours prior to expected time for operations requiring inspection, sampling and testing services.

1.06 TEST AND INSPECTION REPORTS

A. REPORT CONTENTS:

At a minimum, Test and Inspection Reports shall include the following:

1. Project name and date of report.

2. Testing Laboratory name, address, telephone number, name of laboratory field sampling personnel, lab testing personnel, or QCS Inspector as applicable.

3. Date, time, and location of sampling, testing, and inspecting.

4. Ambient temperature and weather conditions at the site or shop and curing conditions of samples.
5. Product identification and referenced specification Section number.

6. Type of sample, test, and inspection and industry standard for sampling and testing.

7. Results of sample, test, and inspection.

8. Evaluation of compliance with requirements in Contract Documents.

9. Certified Inspection Reports shall specifically indicate the qualification of the inspector to render judgment and certify said inspection.

10. When requested by Construction Manager, interpretation of test results.

B. DISTRIBUTION OF TEST AND INSPECTION REPORTS:

Test and Inspection reports shall be submitted to the Construction Manager for distribution as Product Data described in Section 01 33 00, unless technical specification sections require submittal for review. Test reports shall be submitted not more than two days after completion of required tests. Inspection reports shall be submitted immediately if deficiencies or significant irregularities are noted, and in no case less than two working days after said inspection. Provide six (6) copies of all reports.

1.07 SUBMITTALS

The following information shall be provided in accordance with Section 01 33 00:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. *Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.*

2. Documentation of conformance with Testing Laboratory Qualifications as specified in paragraph 01 45 29-1.03 herein.

3. Form A described in paragraph 01 45 29-3.03 herein, by both Testing Laboratory and Contractor.

4. Final laboratory report as described in paragraph 01 45 29-3.04.

1.08 LIMITS ON TESTING LABORATORY AUTHORITY

Testing Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents. Testing Laboratory may not approve or accept any portion of the work, nor assume any duties of Contractor. Testing Laboratory has no authority to stop the work.

PART 2--PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. GENERAL:

Source quality control is defined in Section 01 45 00. This Section provides general guidelines as to the sampling, tests, and inspections required of products and manufactures prior to delivery to the project site and should be considered a minimum. Additional information and requirements are provided in each technical specification Section and those requirements shall control over this Section when in conflict. Absence of a test, inspection or requirement listed herein from a subsequent specification Section does not relieve the Testing Laboratory or the Contractor from their respective responsibilities specified in this Section.

B. REFERENCE STANDARDS IN OTHER SECTIONS:

Codes, standards, and other references called out below, but which are not listed in paragraph 1.02 are described in other specification Sections and not repeated herein.

C. FILL MATERIALS:

1. IMPORTED FILL MATERIALS: Testing Laboratory may conduct additional testing on behalf of Contractor to prepare required submittals specified in Section 31 00 00. Tests shall conform to the following for both Source and Field Quality Control:

Test	Standard Procedure
Moisture content	ASTM D3017
Gradation	ASTM C136
Density in-place	ASTM D1556
Moisture-density relationships	ASTM D1557
Liquid Limit, Plasticity Index	ASTM D4318

2. TYPE C FILL MATERIAL: Testing Laboratory shall conduct required testing to verify on-site materials proposed for fill conforms to specification Section 31 20 00. Contractor shall pay Testing Laboratory for such sampling and testing. Sampling and testing shall Classify Soil according to ASTM D2487 including Liquid Limit, Plasticity Index, and determine optimum moisture content and density relationship, and other data as required for proper use of this material.

D. PAVING MATERIALS:

Provide sampling and testing requested by Construction Manager or additional testing as requested by Contractor to verify materials proposed for use conform to specification Sections 31 20 00 and 32 00 00.

E. CONCRETE REINFORCING:

Provide sampling and testing requested by Construction Manager or additional testing as requested by Contractor to verify materials proposed for use conform to specification Section 03 20 00.

F. CAST-IN-PLACE CONCRETE:

1. GENERAL: Field sampling and testing shall be performed by the testing laboratory specified in paragraph 01 45 29-1.01 A. Samples shall be taken at random locations and at such times to represent the quality of the materials and work throughout the project. The laboratory shall provide the necessary labor, materials and facilities for sampling. Aggregates shall be sampled not less than 30 days prior to the use of such aggregates in the work. At Contractor's expense, Testing Laboratory may assist Contractor in formulating concrete mix designs, testing and reporting same, and providing the services of a Professional Engineer to review and seal the mix design.

2. AGGREGATES: Samples shall be taken at the discharge gates of the bins feeding the weigh hopper. The Contractor shall provide safe and suitable facilities for obtaining samples. Testing shall confirm continuing conformance with specifications for gradation, cleanliness and sand equivalent. A maximum of one test per day of each aggregate is required. Sampling shall be repeated when the source of material is changed or when unacceptable deficiencies or variations from the specified requirements of materials are found in testing. The full test program is required before source changes will be accepted. Aggregate samples shall be tagged and their sources identified.

3. COARSE AGGREGATE: A sample weighing between 50 and 60 pounds shall be taken after the batch plant is brought up to full operation conforming to ASTM D75. Sample and test coarse aggregate each 400 cubic yards of concrete. The samples shall be taken so that a uniform cross section, accurately representing the materials on the belt or in the bins, is obtained.

4. FINE AGGREGATE: Samples shall be taken as specified for coarse aggregate. Sample and test fine aggregate each 200 cubic yards of concrete. The samples shall be taken for sieve analysis of fine aggregate and specific gravity tests. Samples of sand shall be taken when the sand is moist.

G. STRUCTURAL STEEL:

1. Shop Weld Inspection for Structural Steel, and Steel Fabrications: AWS Certified Welding Inspector shall visually inspect 100 percent of structural welds and will inspect 25 percent of fillet welds greater than 5/16 inch, 100 percent of butt welds, moment connection welds, and full penetration groove welds by ultra-sonic or magnetic particle inspection. Acceptance Criteria: AWS D 1.1. Paragraph 8.15.1 for visual inspection and

Paragraphs 8.15.2.1 and 8.15.2.2 for ultra-sonic or magnetic particle inspection.

2. Shop Inspection of High-Strength Bolted Connections: Inspect 100 percent of high-strength bolted connections according to AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts." All such bolts shall be fully tensioned unless otherwise noted on the drawings.

3. Materials' Conformance to Specifications: Testing Laboratory shall sample and test such items to ensure Standard Compliance for any specified steel materials, connection hardware, and details for which mill certificates or other required certificates have not been submitted. Contractor shall pay for the cost of such sampling, additional testing, and reporting.

H. MISCELLANEOUS METALWORK AND GUARDRAILING:

Provide sampling and testing requested by Construction Manager or additional testing as requested by Contractor to verify materials proposed for use conform to specification Sections 05 50 00 and 05 52 00.

I. COATING SYSTEMS:

Provide sampling and testing requested by Construction Manager or additional testing as requested by Contractor to verify materials proposed for use conform to specification Section 09 90 00.

J. CHEMICAL RESISTANCE (PICKLE JAR) TEST.

This test is used to determine the physical properties and weight change of specimens of materials used in sewers after exposure to chemical solutions. Specimens of composite materials shall be seal coated on 2 adjacent edges of their 4 edges and not seal coated on the inner or outer surface. Specimens of non-composite materials shall not be seal coated. Test specimens shall be conditioned in a mechanical convection oven for 7 Days at a constant weight and at a temperature of 110° F ± 3° F (43° C ± 3° C) and subsequently cooled for 3 hours in a desiccator. This conditioning shall be performed before and after submersion of the test specimens in the solutions shown in Table 211-2 (A) for a period of 28, 56, 84 and 112 Days at 77° F ± 5° F (25° C ± 3° C). Test specimens shall be provided as follows, unless otherwise approved by the Engineer.

a) Specimens For Non-Composite Materials - Provide 55 each ASTM D638 specimens and 164 each ASTM D543 specimens measuring 1 inch x 3 inches x 0.125 inch thick (25 mm x 75 mm x 3 mm).

b) Specimens For Composite Materials - Provide 55 each ASTM D638 specimens and 164 each ASTM D543 specimens measuring 1 inch x 3 inches x 0.125 inch to 0.25 inch thick (25 mm x 75 mm x 3 mm to 6 mm).

The allowable percent weight gain or loss for these specimens shall be as specified for the respective type of material.

TABLE 211-2 (A)

Chemical Solution	Concentration [1]	Tolerance	Check Concentration	Replace Chemical Solution
Sulfuric Acid (H2SO4)	20%	± 0.1%	NA2	NA
Sodium Hydroxide (NaOH)	5%	± 0.2%	56 Days	When < 4.8%
Ammonium Hydroxide (NH4OH)	5%	± 1.0%	28 Days	When < 4.0%
Nitric acid (HNO3)	1%	± 0.1%	28 Days	When Turbid
Ferric Chloride (FeCl3)	1%	± 0.2%	28 Days	When Turbid
Sodium Hypochlorite (NaOCl)	1%	± 0.1%	NA	28 Days
Soap	0.10%	NA	NA	28 Days
Detergent (Linear alkyl benzyl sulfonate or LAS)	0.10%	NA	NA	28 Days
Bacteriological (BOD)	≥ 700 ppm	NA	NA	7 Days

1. Volume percentages – Actual concentration of reagent must be corrected to 100%.
2. NA – Not Applicable.

If required by the type of material and the manufacturer, specimens thicker than 0.25 inch (6 mm) will be accepted and evaluated. The same number of ASTM D638 AND D543 specimens, as specified in 211-2a or 211-2b above, will be required. The allowable weight change value for the 112-Day test period for these thicker specimens shall conform to the values shown in Table 211-2 (B).

At 28-Day intervals, specimens shall be removed from each chemical solution and tested. If any specimen fails to meet the 112-Day requirement specified for the material being tested before completion of the 112-Day exposure, the material will be rejected.

TABLE 211-2 (B)

Thickness of Sample Inches (mm)	Weight Change1,2
0.375 (9.5)	± 0.75 %
0.50 (12.7)	± 0.63 %
0.75 (19.1)	± 0.50 %
1.0 (25.4)	± 0.44 %
1.5 (38.1)	± 0.38 %

1. With respect to initial test results.
2. Allowable percent weight gain or loss for the thickness between the designated values can be a straight line interpretation.

If required by the type of material being evaluated, additional size and quantity specimens may be required in order to meet the testing and ASTM requirements in the section for the material.

Five of the ASTM D638 specimens and 16 of the ASTM D543 specimens for the type of material being tested shall be submersed in each of the 9 solutions listed in Table 211-2 (A). At 28-Day intervals, 4 specimens shall be removed from each chemical solution, tested for weight change and the percent weight gain or loss shall be recorded. Required physical property testing shall be obtained at 0 and 112 Days. The chemical strength of each solution shall be tested and replaced if not in compliance with the required values shown in Table 211-2 (A). If

any specimen fails to meet the 112-Day requirement specified for the material being tested before completion of the 112-Day exposure, the material will be rejected.

The Contractor shall furnish a Certificate of Compliance, signed by an authorized representative of the testing laboratory, identifying the product, the test results for each of the 9 solutions and confirming conformance with the Specifications. Supporting test data shall be furnished upon request by the Engineer.

The chemical resistance test is a qualification test only. Requalification is required only when the compound formulation changes.

PART 3--EXECUTION

3.01 FIELD QUALITY CONTROL

A. GENERAL:

Field quality control is defined in Section 01 45 00. This Section provides general guidelines as to the sampling, tests, and inspections required of work in progress or completed in the field and should be considered a minimum. Additional information and requirements are provided in each technical specification Section and those requirements shall control over this Section when in conflict. Absence of a test, inspection or requirement listed herein from a subsequent specification Section does not relieve the Testing Laboratory or the Contractor from their respective responsibilities specified in this Section.

B. REFERENCE STANDARDS IN OTHER SECTIONS:

Codes, standards, and other references called out below, but which are not listed in paragraph 1.02 are described in other specification Sections and not repeated herein.

C. EARTHWORK AND FILL:

1. GENERAL: The Construction Manager will coordinate the taking of samples and making tests to check compliance with these specifications. The Contractor shall remove surface material at locations designated by the Construction Manager and provide such assistance as necessary for sampling and testing. The Construction Manager may direct the Contractor to construct inspection trenches in compacted or consolidated backfill to determine that the Contractor has complied with these specifications. Payment for inspection trenches shall be as specified in paragraph 01 45 00 – 1.04(7)

2. Subgrade Preparation and Compaction: Verify depth of scarification, moisture content is within optimal limits for compaction, and degree of compaction achieved. Frequency of testing shall generally conform to 25 foot maximum spacing for strip footings, each isolated pad footing, every 900 square feet for slabs and mat foundations, or as directed by the Construction Manager in light of actual geometry and conditions extent.

3. Structure Fill: Verify material provided, lift thickness, and compaction density. Frequency of sampling and testing shall be the same as for Subgrade Preparation and Compaction.

4. Structure Backfill: Verify material provided, lift thickness, and compaction density. Frequency of sampling and testing shall be as directed by the Construction Manager but not less than every 2 feet vertical lifts and every 1600 square feet of filled area.

5. Other Fill Materials: Verify material used, lift thickness, and compaction density. Frequency of sampling and testing shall be as directed by the Construction Manager.

D. PAVING:

1. EARTHWORK AND BASE AGGREGATE: Provide sampling and testing same as Fill described above and specified in Section 32 00 00. Frequency shall conform to Asphalt Concrete Pavement, below.

2. HOT MIX ASPHALT PAVEMENT: Sample and test pavement thickness and installation per Caltrans Standard Specifications. Thickness verification shall be made at a frequency not to exceed 1600 square feet of roadway or parking zones or as directed by the Construction Manager.

3. SITEWORK CONCRETE AT PAVEMENT: Sitework concrete at pavement consists of curbs, gutters, monolithic curb/sidewalk, inlet structures, catch basins, and other concrete construction in contact with paving or necessary for a complete paving job but not associated with buildings or structural work controlled by the IBC. Testing Laboratory shall conduct sampling and testing the same as specified for cast-in-place concrete in Section 32 00 00, except strength cylinder testing shall occur at one-half the frequency (placing rate) as for structural concrete.

E. CONCRETE REINFORCING:

1. Provide Special Inspection for all structural reinforcing in concrete per IBC Section 1704.4.

2. Provide Special Inspection for mechanical reinforcing connectors and splicing systems as required by that product's ICBO Evaluation Report, or equivalent.

F. CAST-IN-PLACE CONCRETE:

1. Sample the first daily truckload of ready mixed concrete and every 50 cubic yards thereafter, complying with ASTM C172.

2. Perform one slump test for each truck load of ready mixed concrete, complying with ASTM C143.

3. Perform one air content test for each set of compressive strength specimens, complying with ASTM C31.

4. Fabricate compressive strength specimens, complying with ASTM C39.

5. Make one set of 6 of compressive strength specimens for each day of structural concrete placing or each 50 cubic yards or fraction thereof for each class of concrete.

6. Test two specimens after curing 7 days, two specimens after curing 28 days, and retain two specimens for later testing if required.

7. Comply with ACI 214 for evaluation and acceptance of concrete.

8. Certified reports of the test results shall be provided directly to the Construction Manager. Test reports shall include sufficient information to identify the mix used, the stationing or location of the concrete placement, and the quantity placed. Slump, air content, temperature of concrete, and ambient temperature shall be noted. Quality control charts showing field test results shall be included with the test results for each class of concrete in each major structure. Charts shall be prepared in accordance with ACI 214. Quality control charts shall be maintained throughout the entire job and shall be available for the Construction Manager's inspection at any time.

9. If the 28-day test results fall below the specified compressive strength for the class of concrete required for any portion of the work, adjustment in the proportions, water content, or both, shall be made as necessary at the Contractor's expense. Changes and adjustments shall be reported in writing to the Construction Manager.

10. If compressive test results indicate concrete in place may not meet structural requirements, tests shall be made to determine if the structure or portion thereof is structurally sound. Tests may include, but not be limited to, cores in accordance with ASTM C42/C42M and any other analyses or load tests acceptable to the Construction Manager. Costs of such tests shall be borne by the Contractor.

G. ANCHOR BOLTS AND ANCHORS:

1. Provide Special Inspection for wedge anchors, undercut anchors, adhesive anchors, epoxy anchors, and all other anchoring systems installed in hardened concrete as required by that product's ICBO Evaluation Report, or equivalent.

2. Site Inspection of Structural Anchor Bolts: Visually inspect all structural anchor bolts for grade, diameter, embedment, geometry, or type ("J" bolt or hex-head), quantity, and general location. Contractor shall assume all responsibility for detailed dimensions locating each individual bolt, each bolt group in total, and locations of bolts within each group (template).

H. GROUT:

1. CEMENTITIOUS GROUT FOR STRUCTURAL BEARING: Visually inspect all column baseplates, and grouted zone between structural struts/beams and their supporting wall elements. Determine complete fill beneath baseplate by tapping with hammer and noting hollow reports. Verify grout conforms to specification by observing empty bags, which Contractor shall leave visible adjacent to area used until inspection complete.

2. EPOXY GROUT FOR EQUIPMENT BASES: Provide inspection conforming to applicable specification Sections and their reference standards, details on the Drawings, and the requirements of the epoxy grout manufacturer.

I. STRUCTURAL STEEL:

1. SITE WELD INSPECTION FOR STRUCTURAL STEEL AND STEEL FABRICATIONS: Visually inspect 100 percent of structural welds. Inspect 25 percent of fillet welds greater than 5/16 inch, 100 percent of butt welds, moment connection welds, and complete penetration groove welds by ultra-sonic or magnetic particle inspection.

2. ACCEPTANCE CRITERIA: AWS D 1.1. Paragraph 8.15.1 for visual inspection and paragraphs 8.15.2.1 and 8.15.2.2 for ultra-sonic or magnetic particle inspection.

3. FIELD INSPECTION OF HIGH-STRENGTH BOLTED CONNECTIONS: Inspect 100 percent of high-strength bolted connections according to AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts." All such bolts shall be fully tensioned unless otherwise noted on the drawings.

4. BEND TESTS: Perform bend test on 10 percent of welded shear connectors. Modify test method and frequency if alternate (non-welded) shear connectors utilized by Contractor.

J. MISCELLANEOUS METALWORK AND GUARDRAILING:

1. MISCELLANEOUS METALWORK: Provide field inspections and testing if requested by Construction Manager for the work specified in Section 05 50 00. Sampling and testing shall conform to the applicable Reference Standard or Code listed in that section.

2. GUARDRAILING: Provide field inspections and testing if requested by Construction Manager for the work specified in Section 05 52 00. Sampling and testing shall conform to the applicable Reference Standard or Code listed in that section.

K. COATING SYSTEMS:

1. COATING SYSTEMS: Provide inspection as requested by Construction Manager, and additional inspections as requested by Contractor.

3.02 EVALUATION AND CORRECTION

A. EVALUATION:

Satisfactory completion of work will be judged on results of laboratory, shop, and site tests and inspections.

B. CORRECTIONS:

If results of tests and inspections indicate work is below requirements of Contract Documents, that portion of work is defective and shall be repaired or replaced by the Contractor at no additional expense to the Owner by methods specified in each material or system's Section. Corrective action shall continue until such work meets the requirements of the Contract Documents.

3.03 SCHEDULE OF INSPECTIONS AND TESTS

Form A below shall be used to coordinate sampling and testing provided by Testing Laboratory, Construction Manager, Contractor, and other parties, if any. Testing Laboratory shall fill out Form A with anticipated inspections, sampling, and testing, submit for review by Construction Manager and for information to Contractor, and revise as directed. After receipt of Testing Laboratory's Form A submittal, Contractor shall submit Form A to identify sampling and testing requested for submittal preparation, and with an allowance for additional inspections. Such allowance shall not be less than five percent (5 percent) of the anticipated Field Quality Control budget for the Testing Laboratory, but shall not contractually commit Contractor to such expenditure, unless additional inspections requested and then only to their extent.

Form A: Anticipated sampling, testing, and inspections by Testing Laboratory and Contractor. Prepared by ___ Testing Laboratory ___ Contractor (check one). Electronic version available upon request. Expand each cell as necessary to provide a complete scope description.

Specification Section	Source Quality Control	Field Quality Control
31 20 00 Earthwork		
32 00 00 Paving		
03 20 00 Concrete Reinforcement		
03 30 00 Cast-in-Place Concrete		
03 15 19 Anchor Bolts		
05 50 00 Miscellaneous Metalwork		
05 52 00 Guardrailing		
09 90 00 Coating Systems		

3.04 FINAL LABORATORY REPORT:

A final report, prepared by the testing laboratory, shall be provided at the completion of all concreting. This report shall summarize the findings concerning concrete used in the project and provide totals of concrete used by class and structure. Final quality control charts for compressive strength tests for classes of concrete specified in each major structure shall be included. The report shall also include the concrete batch plant's coefficient of variation and standard deviation results for each class of concrete as determined in accordance with ACI 214.

END OF SECTION

SECTION 01 55 26

TEMPORARY TRAFFIC CONTROL

PART 1--GENERAL

1.01 DESCRIPTION

Work covered in this section consists of all labor, materials, and equipment required to provide adequate traffic control and regulation through construction areas and street affected by the work.

1.02 QUALITY ASSURANCE

A. QUALIFICATIONS OF WORKERS:

Provide Sufficient Skilled workers and supervisors who shall be present at all times during execution of this portion of the work and shall be thoroughly familiar with traffic regulations, permits, etc., and the materials and techniques specified.

B. CODES AND STANDARDS:

1. Where reference is made to the State Standard Specifications, reference shall mean State of California, Department of Transportation, Standard Specifications, latest edition.

2. Lights, flags, and other warning and safety devices for street and highway work shall conform to the requirements set forth in the current "Manual of Traffic Controls for Construction and Maintenance Work Zones," issued by the California State Department of Transportation.

1.03 TRAFFIC CONTROL PLAN AND PERMITS

The Contractor shall submit a complete traffic control plan indicating how construction will be sequenced and traffic will be handled during construction. The Construction Manager will review this plan for conformance to the Specifications and to ensure adequate thought has gone into the handling of traffic. The plan shall clearly identify work which will interfere with traffic on public roadways, and the estimated duration of work. This plan shall be in conformance with the Contractor's schedule.

Contractor shall obtain encroachment permits at his own expense for any work or traffic control to be performed in public roads. Permit is not required when road is owned and controlled by this project's Owner.

1.04 PRODUCT HANDLING

No material or equipment shall be stored where it will interfere with the free and safe passage of public traffic. At the end of each day's work and at other times when construction operations are suspended for any reason, Contractor shall remove all equipment and other obstructions from that portion of the roadway open for use by the public traffic.

PART 2--PRODUCTS

2.01 EQUIPMENT

Contractor shall furnish, erect, and maintain, at his or her expense and without cost to the Owner, such fences, barricades, lights and signs, and other devices as are necessary to prevent accidents or damage or injury to the public. Contractor shall also furnish such flagpersons and guards as are necessary to give adequate warning to traffic of any dangerous condition to be encountered. Equipment shall be furnished and kept clean and in good repair by the Contractor at his own expense.

PART 3--EXECUTION

3.01 TRAFFIC CONTROL

A. MAINTAINING TRAFFIC:

Contractor shall expedite the passage of public traffic through and around the work. The Contractor shall furnish and install signs, detours, lights, flares, barricades, and shall furnish flag persons and other facilities for the convenience and direction of public traffic. The cost of maintaining traffic, including conforming with the requirements stated herein, furnishing such signs, detours, lights, flares, barricades, flag persons, and other facilities shall be considered as part of the contract price and no extra payment will be made therefore.

B. PUBLIC CONVENIENCE:

1. Contractor's operation shall be conducted so that they offer the least possible obstruction and inconvenience to the public. Contractor shall have under construction no greater amount of work than can be executed properly with due respect to the rights of the public. Contractor shall provide personal advance notice to each affected resident informing them of impending work and provide ample time to remove vehicles and estimated time of driveway closure.

2. Spillage resulting from hauling or ditching operations along or across any public traveled way shall be removed daily.

3. Construction operation shall be conducted in such a manner as to cause as little inconvenience as possible to abutting property owners and tenants. Convenient access to driveways, houses, and buildings along the line of the work shall be maintained and temporary approaches to crossing or intersecting streets shall be provided and kept in good condition.

C. PUBLIC SAFETY:

1. Whenever the Contractor's operations create a condition hazardous to the public, Contractor shall furnish, erect, and maintain such fences, barricades, lights, signs, and other devices as are necessary to prevent accidents or damage or injury to the public.

2. Should the Contractor appear to be neglectful or negligent in furnishing warning and protective measures as above specified, the Construction Manager may direct attention to the existence of hazard, and the necessary warning and protective measures shall be furnished and installed by the Contractor at Contractor's expense, without cost to the Owner. Should the Construction Manager point out any inadequacy or warning and protective measures, such action on the part of the Construction Manager shall not relieve the Contractor from responsibility for public safety or abrogate Contractor's obligation to furnish and pay for these devices.

D. DETOURS:

~~Comply with conditions issued with the Encroachment Permit.~~

E. TRAFFIC CONTROL PLAN SUBMITTAL:

The Contractor shall submit a traffic control plan indicating the preferred method of construction and traffic control plan which complies with these Specifications. Before closing any street to through traffic, the Contractor shall obtain prior approval from the Construction Manager 14 days in advance of closure. Street closures and detours shall allow for access to public facilities and shall allow for passage of emergency vehicles.

F. NOTICES:

Contractor shall expedite the passage of public traffic through and around the work. The Contractor shall furnish and install signs, detours, lights, flares, barricades, and shall furnish flag persons and other facilities for the convenience and direction of public traffic. The costs of maintaining traffic, including conforming with the requirements stated herein; public notification; and furnishing such signs, detours, lights, flares, barricades, flag persons and other facilities shall be considered in the total bid.

END OF SECTION

SECTION 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Requirements:

1. Section 31 10 00 "Site Clearing" for removing existing trees and shrubs.

1.3 DEFINITIONS

A. Caliper (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape at a height 54 inches above the ground line.

B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or video recordings.

2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.5 FIELD CONDITIONS

A. Do not store equipment or allow access within protection zones as indicated on Drawings. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Cleaning of materials or equipment.
3. Moving or parking vehicles or equipment.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.
8. Attachment of signs to or wrapping materials around trees or plants.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Keep trees free of nails, screws, fasteners, or other devices.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wood Chip Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood

2. Size Range: 3 inches maximum, 1/2 inch minimum

3. Color: Natural.

B. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements: Previously used materials may be used when approved by Owner's Representative.

1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.

a. Height: 48 inches

b. Color: High-visibility orange, nonfading.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Tie a 1-inch blue vinyl tape around each tree trunk at 54 inches above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.3 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

B. Maintain protection zones free of weeds and trash.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Owner's Representative and remove when construction operations are complete and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.

2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

END OF SECTION

SECTION 01 57 23

WATER POLLUTION PREVENTION

PART 1 – GENERAL

The work to be done under this section includes the furnishing of all labor, materials, equipment, tools and incidentals as required to prevent the pollution of surface or groundwater from the effects of construction of the Project. Contractor shall comply with the Construction General Permit Order 2009-0009-DWQ.

PART 2 - PRODUCTS

A Storm Water Pollution Prevention Plan (SWPPP) is being provided by the City of Crescent City as a requirement of the Coastal Development Permit. This SWPPP will be provided to contractor either via a pre-bid addendum or as a Change Order to the Contractor post award. The City will have it uploaded into the SMARTS system. **It will be the contractor's responsibility to maintain and update the SWPPP in the SMARTS system.**

All reporting and inspections of the SWPPP will be performed by the Contractor. The City is not providing support or direction as how to comply with Permitting.

PART 3 – EXECUTION

The Contractor will provide all labor, materials, tools, equipment, and necessary incidentals to implement the Storm Water Pollution Prevention Plan (SWPPP) and the Erosion and Runoff Control Plan and as otherwise necessary to prevent surface water or groundwater pollution from the effects of the Project construction. Contractor shall have a qualified SWPPP Practitioner overseeing the implementation of the SWPPP in accordance with the statewide general permit.

Contractor shall upload all required reports, submittals, another required documentation in accordance with the statewide general permit to the SMARTS system. City will certify reports as required.

END OF SECTION

SECTION 01 74 23

FINAL CLEANING

1.0 GENERAL

A. At the completion of work and immediately prior to final inspection, cleaning of the entire project shall be accomplished according to the following provisions:

1. The Contractor shall thoroughly clean, sweep, wash, and polish all work and equipment provided under the contract, including finishes. The cleaning shall leave the structures and site in a complete and finished condition to the satisfaction of the Construction Manager.

2. All subcontractors shall similarly perform, at the same time, an equivalent thorough cleaning of all work and equipment provided under their contracts.

3. The Contractor shall remove all temporary structures and all debris, including all nails, dirt, sand, gravel, rubbish and waste material.

4. Should the Contractor not remove rubbish or debris or not clean the facilities and site as specified, the Owner reserves the right to have the cleaning done at the expense of the Contractor.

5. Only experienced workers, or professional cleaners, shall be employed for final cleaning.

6. Only cleaning materials recommended by the manufacturer of surface to be cleaned shall be used.

7. Cleaning materials shall be used only on surfaces recommended by the cleaning material manufacturers.

8. In preparation for substantial completion or occupancy, a final inspection of sight-exposed surfaces, and of concealed spaces, shall be conducted.

9. Grease, dust, dirt, stains, labels, fingerprints, and other foreign materials shall be removed from sight-exposed finished surfaces. Polish surfaces so designated to shine finish.

10. Marred surfaces shall be repaired, patched, and touched up to specified finish, to match adjacent surfaces.

11. Materials shall be handled in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.

2.0 OWNER OCCUPANCY

As a condition precedent to final acceptance or release of a portion of the facility for use by the Owner, the Contractor and all subcontractors shall thoroughly clean all surfaces to leave same in first-class condition.

3.0 POST-CONSTRUCTION REPAIRS

The Contractor shall make such minor repairs and alterations as may be necessary to make any structure or component ready for occupancy. This section shall not apply after or to the extent that the Owner has taken possession of a portion of the facilities on which the Contractor has performed work.

4.0 SITE CLEANUP

For all roadway work, the Contractor shall conform the work to acceptable line and grade, as determined by the Engineer. In addition, the Contractor shall have the sidewalks and streets affected by the work swept by a street or sidewalk cleaner as determined by the Construction Manager. Other surfaces of the grounds shall be rake cleaned. The Owner will not authorize final payment until the Contractor has removed all rubble and debris from the street and adjoining work areas, including all temporary storage and parking areas used by the Contractor.

For pipelines, storm sewers, catch basins and manholes, prior to their activation or at the conclusion of the project, the Contractor shall thoroughly clean all of the new pipes by flushing with water for fluid lines. Debris cleaned from the lines shall be removed from the lowest access point.

All temporary utility drops, fencing, and water supply outlets shall be removed.

All plant gate identification signs, barricades, tools, rubbish collection receptacles and other such items shall be removed by the Contractor.

END OF SECTION

SECTION 02 00 00

EXISTING CONDITIONS

PART 1 – GENERAL

1.01 RELATED INFORMATION

Related information and requirements are included in the individual Sections of the Specifications and the project Permits.

1.02 INFORMATION ON SITE CONDITIONS

Information obtained by the Engineer regarding site conditions, existing facilities, and similar data are shown on the Plans.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall satisfy himself as to the nature and location of the work, the general and local conditions, particularly those bearing upon availability of transportation, disposal, handling, and storage of materials, availability of labor, water, electric power, roads, work in sensitive environment and uncertainties of weather, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment facilities needed preliminary to and during the prosecution of the work and all other matters which can in any way affect the work or the cost thereof under this contract.

B. The Contractor further shall satisfy himself as to the character, quality, and quantity of surface and subsurface materials to be encountered from inspecting the site, any exploratory work done by the City, as well as from information presented by the Plans and Specifications made a part of this contract. Any failure by the Contractor to acquaint himself with all the available information will not relieve him from responsibility for properly estimating the difficulty or cost of successfully performing the work.

C. The Contractor shall anticipate underground obstructions such as utility lines, concrete, water table, soil conditions and debris. No extra payment will be allowed for the removal, replacement, repair, or possible increased cost caused by underground obstructions. Any such lines or obstructions indicated on the map show only the approximate location and must be verified in the field by the Contractor. The District and Engineer will endeavor to familiarize the Contractor with all known underground obstructions, but this will not relieve the Contractor from full responsibility in anticipating and locating all underground obstructions.

D. The Contractor shall note that heavy truck and equipment operations may cause roadway and parking lot damage in excess of normal usage.

Damage caused to the streets by Contractor's operations shall be repaired by the contractor at no additional cost to the City. A series of photographs shall be logged by the Contractor for approval by the Engineer to establish existing conditions prior to construction.

END OF SECTION

SECTION 02 01 00

MAINTENANCE OF EXISTING CONDITIONS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Related requirements specified elsewhere:

See Division 01 regarding general conditions specific to the Contract. See also Section 02 00 00 regarding site conditions.

See Plans for the locations of utilities.

1.02 CALIFORNIA ADMINISTRATIVE CODE

A. Section 1540(a)1 of Construction Safety Orders (Title 8) California Administrative Code, Section 1540 states:

1. "Prior to opening an excavation, effort shall be made to determine whether underground installations; i.e., sewer, water, fuel, electric lines, etc., will be encountered and, if so, where such underground installations are located. When the excavation approaches the approximate location of such an installation, the exact location shall be determined by careful probing or hand digging; and, when it is uncovered, adequate protection shall be provided for the existing installation. All known owners of underground facilities in the area concerned shall be advised of proposed work at least 48 hours prior to the start of actual excavation."

B. In line with California's Administrative Code, Section 1540, Contractor shall make the effort to determine the exact location of underground installations.

PART 2 – PRODUCTION – OWNERS

2.01 UTILITIES AFFECTED

A. GENERAL:

Underground Service Alert (USA) North 811 shall be contacted at least 72 hours before any work commences. USA North 811 can be contacted at (800) 642-2444.

B. ELECTRICAL

In the project area, Pacific Power has control of overhead and underground power. Where overhead power service to a structure known to require electrical service does not exist, then underground power

service shall be assumed to exist. Pacific Power can be contacted at (888) 221-7070.

C. WATER SERVICE

City of Crescent City Water/Sewer Department can be contacted at (707) 464-6517.

D. SEWER SERVICE

City of Crescent City Water/Sewer Department can be contacted at (707) 464-6517.

E. ROADS / STREETS / DRAINAGE

The City of Crescent City has jurisdiction over roads, streets, and drainage in the City. City Public Works can be contacted at (707) 464-9506.

F. TELEPHONE

Frontier Communications can be contacted at (541) 269-3375.

G. CABLE TELEVISION / INTERNET

Charter Communications (Spectrum) can be contacted at (866) 874-2389. (This is the public-facing customer service number).

PART 3 – EXECUTION

3.01 CONTRACTOR RESPONSIBILITY

A. It may be expected that there will be some variation in location of existing utilities from that as shown on the Plans. Contractor is also hereby notified that there are likely additional irrigation lines in the project area that are not shown on the plans. Actual location can best be determined in the field after pre-marking by the various utilities affected. Contractor is required to contact Underground Services Alert (USA), also known as "USA North 811" before beginning any excavations.

B. The Contractor shall be responsible for determining the location of existing service laterals, irrigation lines, or appurtenances whenever the presence of such utilities on the site of the construction can be inferred from the presence of other visible facilities, such as building, meter and junction boxes, located on or adjacent to the site.

C. The Contractor shall promptly notify the Engineer in writing in the event that the Contractor discovers utility facilities not identified by the Engineer in the Contract Plans or Specifications.

D. It should be understood that the various utilities are indicated on the Plans to show only the approximate location and must be verified in the field by the Contractor. It may be expected that there will be variation in location from that as shown on the Plans to the actual location. Actual location can best be determined in the field after pre-marking by the various utilities affected. The various utilities will cooperate with the Contractor to endeavor to familiarize the Contractor with all known underground utilities, obstructions, but this will not relieve the Contractor from assuming full responsibility in anticipating and locating their actual location with respect to utilities which the Contractor must locate and identify under the provisions hereof.

END OF SECTION

SECTION 02 01 20

PROTECTING EXISTING UNDERGROUND UTILITIES

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials and procedures for protecting existing underground utilities.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: 31 23 00

B. Trenching, Backfilling, and Compacting: 31 23 16

PART 2 - MATERIALS

2.01 REPLACEMENT IN KIND

Except as indicated below or as specifically authorized by the Owner's Representative, reconstruct utilities with new material of the same size, type, and quality as that removed.

PART 3 - EXECUTION

3.01 GENERAL

A. Replace in kind street improvements, such as curbs and gutters, barricades, traffic islands, signalization, fences, signs, etc., that are cut, removed, damaged, or otherwise disturbed by the construction.

B. Where utilities are parallel to or cross the construction but do not conflict with the permanent work to be constructed, follow the procedures given below and as indicated in the drawings. Notify the utility owner 48 hours in advance of the crossing construction and coordinate the construction schedule with the utility owner's requirements. For utility crossings not shown in the drawings, refer to the General Conditions and the instructions of the Owner's Representative for guidance.

C. Determine the true location and depth of utilities and service connections which may be affected by or affect the work. Determine the type, material, and condition of these utilities. In order to provide sufficient lead-time to resolve unforeseen conflicts, order materials and take appropriate measures to ensure that there is no delay in work.

D. Expose utilities in advance of the pipeline construction.

3.02 PROCEDURES

A. Protect in Place: Protect utilities in place, unless abandoned, and maintain the utility in service, unless otherwise specified in the drawings or in the specifications.

B. Cut and Plug Ends: Cut abandoned utility lines and plug the ends. Plug storm drains and sewers with an 8-inch wall of brick and mortar. Cap waterlines with a cast-iron cap or install a 3-foot-long concrete plug. Dispose of the cut pipe as unsuitable material.

C. Remove and Reconstruct: Where so indicated in the drawings or as required by the Owner's Representative, remove the utility and, after passage, reconstruct it with new materials. Provide temporary service for the disconnected utility.

3.03 COMPACTION

A. Utilities Protected in Place: Backfill and compact under and around the utility so that no voids are left.

B. Utilities Reconstructed: Prior to replacement of the utility, backfill the trench and compact to an elevation 1 foot above the top of the ends of the utility. Excavate a cross trench of the proper width for the utility and lay, backfill, and compact.

C. Alternative Construction--Sand-Cement Slurry: Sand-cement slurry consisting of one sack (94 pounds) of portland cement per cubic yard of sand and sufficient moisture for workability may be substituted for other backfill materials to aid in reducing compaction difficulties. Submit specific methods and procedures for the review of the Owner's Representative prior to construction.

END OF SECTION

SECTION 02 22 10

TRENCH EXCAVATION AND BACKFILL

PART 1 – GENERAL

1.01 DESCRIPTION

A. WORK INCLUDED:

The work covered in this Section consists of performing all operations necessary to excavate all earth, regardless of character and subsurface conditions, from the trench or adjacent thereto, and to place stabilization, bedding, cover, water removal, backfill, base, and compaction as shown on the Plans and as specified or as may be ordered by the Engineer.

B. GENERAL INTENT:

1. It is the general intent of these Specifications to specify conduct of the Work in such manner as to cause the general public a minimum of inconvenience with no exposure to unsafe conditions during construction and to provide a trench that will properly support and protect the pipe and have no settlement on improved streets and only minor settlement in other areas where such settlement will not be noticed, or compensation made for any expected settlement. The degree of compaction and type of material will vary in accordance with type of pipe, and soil and surface conditions.

2. The Contractor shall obtain compaction and install base and temporary paving promptly.

3. If the Contractor does not properly clean up (in the opinion of the Engineer and District) then the Engineer shall have the option of using outside equipment and labor to perform the work and such costs will be withheld from the contract.

4. It is the general intent to use material as shown on the Plans where proper compaction and a stable surface can be obtained. Stabilization material and import will be provided only where directed by the Engineer.

5. No backfilling shall be done until the installation to be covered has been inspected, tested, and approved for covering. Compaction of backfill shall proceed immediately after backfilling.

1.02 QUALITY ASSURANCE

A. QUALIFICATIONS OF WORKMEN:

Provide sufficient skilled workmen and supervisors who shall be present at all times during execution of this portion of the Work and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.

B. CODES AND STANDARDS:

1. Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials as listed below:

Specific Gravity: ASTM D854

Laboratory Compaction: ASTM D1557, Method A or C. In-place Density: ASTM D1556 or ASTM D2922.

Particle Size Analysis of Soils: ASTM D422. Plastic Limit and Plasticity Index: ASTM D4318. Soil Classification: ASTM D2487.

In-place Moisture Content: ASTM D3017.

2. Where reference is made to the State Standard Specifications, reference shall mean: State of California, Business and Transportation Agency, Department of Transportation (Caltrans), Standard Specifications, most recent edition, excluding measurement and payment items.

1.03 GUARANTEES

The Contractor shall guaranty his work against settlement for a period of one year after the Notice of Completion has been filed and shall repair all damage caused by settlement within that time. For the purpose of this Specification, settlement will be deemed to have occurred if the following conditions exist:

A. On paved areas, the depression of 3/8-inch below the average of the sides of the uncut portion shall be deemed a settlement.

B. Along shoulder areas and unpaved portions of the site, a depression of ¾ -inch below the average of the sides of the uncut portion shall be deemed a settlement.

C. Across all fields, pastures, or areas untraveled by automotive equipment, a depression of 1½ inches below the average of the sides of the uncut

portion shall be deemed a settlement. In this regard, any settlement that causes drainage problems or concentration causing water to run along the ditch way shall be subject to correction immediately during the entire guaranty period.

PART 2 – PRODUCTS

2.01 EXCAVATION

Excavation is unclassified. The Contractor shall complete all excavation regardless of type, nature, or condition of the materials encountered. The Contractor shall make his own estimate of the kind and extent of the various materials to be excavated in order to accomplish the work. The Contractor should note specifications for native backfill and determine where excavated material can be used for that purpose.

2.02 STABILIZATION MATERIAL

Stabilization material shall consist of uniformly graded coarse aggregate of which at least 90 percent by weight shall be crushed particles. The percent composition by weight shall conform to the following grading:

SIEVE SIZE	PERCENT PASSING
3"	100
1"	0-10

Stabilization material shall be free from excessive dirt or other organic material.

2.03 BEDDING AND COVER MATERIAL

Bedding shall be crushed rock aggregate uniformly graded from No. 4 to ¾-inch particle size. One hundred percent shall pass the ¾-inch sieve and 95% shall be retained on the No. 4 sieve. Material shall have a minimum durability index of 35. Material shall be free of loam, organic material, or vegetable matter. A minimum of 25% by weight shall be crushed particles.

2.04 CRUSHED WASHED STONE

Crushed washed stone shall be 2 inches minus, well graded, free of fines and with not more than 10% passing the ¾" sieve.

2.05 SAND BEDDING AND COVER MATERIAL

Shall have a minimum sand equivalent of 45 and shall be uniformly graded from No. 4 to 200 mesh screen. Not more than 8 percent of the material shall pass the 100-mesh screen. The material may be screened from the 3/4-inch minus gravel bedding and cover noted in paragraph 2.03, providing it meets these specifications.

2.06 NATIVE BACKFILL

Shall be selected material excavated from the trench. In all cases it must be capable of compaction to at least the relative compaction required with in-place moisture, must not have a moisture content of 5 percent over optimum if silty or clayey material where it will not provide a stable subsurface. Native material over 6 inches from the pipe may have rocks or stones up to 6 inches in diameter provided they can be incorporated in the trench without bridging.

2.07 STRUCTURE BACKFILL

Shall conform to the State Standard Specifications and shall have a minimum sand equivalent of not less than 20. 100 percent shall pass a 3-inch sieve, 35 to 100 percent shall pass a No. 4 sieve and 20 to 100 percent shall pass the 30-mesh screen. It shall be free from organic matter and unsatisfactory material.

2.08 NATIVE TOPSOIL

Shall be native material collected within the top 12 inches of the original grade.

2.09 IMPORTED BACKFILL

Where specified may be any of the above (2.02 through 2.08) except native material from the immediate area. It shall have a minimum sand equivalent of 30. One hundred percent shall pass the 3-inch sieve; no more than 80% shall pass the 100-mesh sieve screen. If sand is to be utilized as import, no more than 30% shall pass the 100-mesh screen.

2.10 CLASS II AGGREGATE BASE

Class II aggregate base shall be ¾ inch minus conforming to Section 26 of the State Standard Specifications. This material may be used at the Contractor's option for pipe zone bedding and cover material and as imported backfill.

2.11 DRAIN ROCK

Shall be Class 2 Permeable material and conform to Section 68-2 of the State Standard Specifications.

2.12 RESEEDING WORK REQUIRED

A. The general intent is for the finished worksites to resemble the areas as they existed in the native condition. The restoration is to be accomplished through the implementation of the following efforts.

1. The preservation of the native environment including trees, rocks, and general topographic features through care in planning and workmanship during the construction of the facilities.

2. The replacement of physical objects that must be removed for the construction.

3. The provision of a finished site that will provide for the rapid re-vegetation of areas to their natural site.

B. GENERAL

All cut areas and all fills and all areas through fields or "open areas" shall be fertilized and seeded back to that area where undisturbed material exists. Fertilizing and seeding shall be as follows:

1. Fertilizer, seed mix and mulch shall be subject to the approval of the Engineer and as noted on the plan set.

PART 3 – EXECUTION

3.01 GENERAL

A. The Contractor shall do all excavation of whatever substance is encountered to the lines and grades shown on the Plans. All materials suitable for use as backfill shall be piled in an orderly manner a sufficient distance from the edge of the trench to avoid overloading and to prevent sliding into the trench. The Contractor shall do such grading or work as is necessary to prevent surface water from entering the excavation.

B. No more than 200 feet of open trench shall be excavated in advance of laying the pipe. Not more than 50 feet of excavated trench shall remain un-backfilled at the end of each day's work. The remainder of the trench shall be backfilled, initially compacted, and opened to traffic. All operations shall be carried out in an orderly fashion. Backfilling, compacting, base and cleanup shall be accomplished as sections of the pipe are installed. Traffic through the work area shall be impeded or obstructed as little as possible.

3.02 WIDTH OF TRENCH

A. Except where otherwise specifically permitted, sides of trenches shall be vertical, shored as required, and shall be of uniform width from top to bottom. Trenches for small diameter laterals may be installed in narrow "Ditch-Witch" type of trench.

B. The maximum width of trench measured at the top of the pipe shall not exceed the width allowed for various classifications of pipe or if none are given, they shall not exceed the dimensions shown on the plans.

C. If trench widths exceed those shown on the plans, install all additional stabilization material, bedding, cover, backfill, base, and paving in conformance with these specifications at no

additional cost to the District.

3.03 PAVING REMOVAL

A. Asphalt concrete shall be cut with a suitable tool before excavation. Cutting with a spade or jackhammer will be allowed as will cutting with a suitable grader-mounted wheel provided that a neat orderly result is accomplished. Breaking of concrete or seal coats with excavation equipment will not be permitted.

B. All edges of asphalt, armor coats or seal coats shall be cut vertically, with a neat, square edge.

C. In all cases existing paving shall be cut out after construction and just prior to final paving, to a point 6 or more inches wider than each side of the trench line.

3.04 GRADE AND ALIGNMENT CONTROL

A. Contractor shall construct the trench to the line and grades as established by the Engineer. Proper allowance shall be made for pipe thickness, bedding material and stabilization material.

B. Any part of the trench excavated below grade shall be backfilled with stabilization or bedding material and compacted to a density equal to the undisturbed trench bottom at Contractor's expense.

C. The pipe shall be accurately centered on alignment and shall be laid neat and true to provide good hydraulic characteristics in keeping with the grade and pipe size specified. The pipe shall be laid to provide a continuous slope so that any air pockets created are relieved with an air release valve.

3.05 SHORING, SHEETING AND BRACING

The Contractor shall furnish and install all shoring, sheeting, and bracing required to support adjacent earth banks and structures for the protection and safety of all personnel working in the trench. All shoring, sheeting, and bracing shall conform to the requirements of the State or local agents having jurisdiction over such matters. Remove shoring, sheeting, and bracing in a manner that will protect the workman and prevent caving of banks and damage to the pipe, excavation, backfill or adjacent property. See specific details elsewhere in these Specifications and in Cal OSHA requirements.

3.06 STABILIZATION

If unstable trench bottoms are encountered, additional excavation shall be performed to the depth ordered by the Engineer. Trench stabilization material shall then be placed up to the bottom plane of the bedding material. See Bid

items for payment if any. If separate payment is authorized as a Bid item, the amounts shall be calculated by the theoretical quantity obtained by multiplying the trench width, up to the maximum widths shown on the Plans times the depth requested times the length, all as authorized by the Engineer.

3.07 TRENCH BACKFILL IN THE PIPE ZONE

A. The Contractor shall backfill the pipe zone with the bedding and cover material specified to the dimensions shown on the Plans. Bedding material shall be added to the trench so that it will extend up on the pipe to 1/3 of its depth. The trench shall then be final graded by hand to provide a secure bedding full length with hand excavations made for bells or collars. Additional bedding shall then be installed and the sides of the pipes tamped to not less than 90 percent compaction to secure full length bedding and proper pipe wall support. After this, cover material shall be added and mechanically compacted to a relative compaction not less than 90 percent.

B. In trench bottoms that are wet with running water or rapidly infiltrating water, gravel bedding shall be used. In deep or wide trenches where pipe support is critical or near the allowable strength of the pipe, gravel bedding shall be used. In dry trenches or where pipe support is not as critical, sand bedding material may be used. These materials must be provided up to just over the mid-point of the pipe or in critical areas (deep-wide) shall be carried up to a point of two-thirds of the pipe depth.

3.08 TRENCH BACKFILL

A. CLASS 2 AGGREGATE BASE:

Class 2 Aggregate Base shall be compacted to relative compaction not less than 90 percent relative compaction in gravel road areas, and 95 percent relative compaction under paved area (flexible or rigid pavement).

B. NATIVE:

Trench shall be backfilled with native material which may be placed by machine. Materials may be settled by, mechanical tamping, grading or other approved method, taking care not to float the pipe, all depending on existing soil conditions. When the topsoil has been stripped this material shall be placed in the upper portion of the trench. Top of the trench will be neatly finished as detailed on the Plans with a crown to accommodate future settlement in the areas where this can be allowed due to lack of traffic, drainage problems, unsightliness or the like.

Native backfill shall be compacted to a relative compaction of not

less than 90 percent.

3.09 JETTING

Jetting shall not be allowed.

3.10 COMPACTION

All compaction shall be to the densities specified. Pipe zone materials (bedding and cover materials) shall be compacted to a relative density of not less than 90 percent. The depth of each lift shall not exceed 12 inches of loose material and will be limited to such depth as can be compacted to the specified density with the equipment being used. The top of the trench shall be final compacted (where necessary) by the use of a pneumatic or drop hammer taking care not to damage sewer line or other utilities.

3.11 TESTING

A. Relative compaction shall be the densities specified hereinbefore. In clay materials of higher moisture content dry densities shall be used.

B. The District's Testing Laboratory will make all tests when advised by the Contractor that in his opinion sufficient densities have been achieved. Engineer shall determine the number and location of tests required. Contractor shall furnish a backhoe and operator upon request to the Testing Laboratory, at no cost to the District. Compaction Testing shall occur only if required by the District and be certified by the Contractor as meeting Project requirements.

END OF SECTION

SECTION 02 30 00

EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

A. SECTION INCLUDES:

Clearing, grubbing, excavation, aggregate materials for fill and grading purposes, compaction and grading necessary or required for the construction of the work as covered by these Specifications and indicated on the Drawings. Clearing shall normally be performed in advance of other construction operations in accordance with requirements of these Specifications. The excavation shall include, without classification, the removal and disposal of all materials of whatever nature encountered, including water and all other obstructions that would interfere with the proper construction and completion of the required work.

B. RELATED SECTIONS:

1. Section 02 05 00 Demolition and Removal
2. Section 02 22 10 Trench Excavation and Backfill

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

American Society for Testing and Materials (ASTM) Publications:

ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates ASTM D 422 (1963; R 1998) Particle-Size Analysis of Soils
ASTM D 1140	(1997) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft-lbf/cu. ft.
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

ASTM D 4318 (1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 00.

B. SUBMIT THE FOLLOWING:

1. Contractors Testing Laboratory Qualifications: Submit qualifications of contractor's in-house material testing laboratory.

2. Samples and Test Results: Furnish, without additional cost to the Owner, such quantities of import materials as may be required for test purposes. Cooperate with the Engineer and furnish necessary facilities for sampling and testing of all materials and workmanship. Submit test results from Contractor's Quality Control Laboratory for import materials. Tests shall be performed within 60 days of the submission. All material furnished and all work performed shall be subject to rigid inspection and no material shall be delivered to the site until it has been favorably reviewed by the engineer or used in the construction work until it has been inspected in the field by the engineer.

1.04 QUALITY ASSURANCE

A. SOURCE QUALITY CONTROL:

Test import materials proposed for use to demonstrate that the materials conform to the specified requirements. Tests shall be performed by contractor's in-house quality control organization.

B. FIELD QUALITY CONTROL:

1. The Contractor shall:

a. Review and test materials proposed for use.

b. Inspect placement and compaction of fill.

c. Test soils during placement of fill.

2. Contractor shall excavate holes for in-place soil sampling. Contractor shall be responsible for costs of additional inspection and re-testing resulting from non-compliance.

C. STOCKPILE CLEANUP

1. The Contractor shall remove stockpile, leave area in clean and neat condition.

D. TESTING METHODS:

1. Specific Gravity: ASTM D854
2. Laboratory Compaction: ASTM D1557, Method A or C.
3. In-place Density: ASTM D1556 or ASTM D2922.
4. Particle Size Analysis of Soils: ASTM D422.
5. Plastic Limit and Plasticity Index: ASTM D4318.
6. Soil Classification: ASTM D2487.
7. In-place Moisture Content: ASTM D3017.

E. DEFINITION:

Relative Compaction: In-place density divided by the maximum dry density laboratory compaction expressed as percentage.

1.05 PRESERVATION OF PROPERTY

A. Where construction is to be performed in the vicinity of trees and shrubbery, the work shall be carried on in a manner which will cause minimum damage.

B. All damage shall be immediately reported to the Engineer who will file a report so that penalties may be determined.

1.06 EXPLOSIVES

The Contractor shall not use explosives of any kind on the premises.

1.07 ADDITIONAL SAFETY RESPONSIBILITIES

A. The Contractor shall be responsible for ensuring such measures:

1. Comply fully with 29 CFR Part 1926 OSHA Subpart P Excavations and Trenches requirements.
2. Provide necessary support to the sides of excavations.
3. Provide safe access to the Engineer's sampling and testing within the excavation.
4. Provide safe access for backfill, compaction, and compaction testing.
5. Maintain excavations in a safe manner that shall not endanger property, life, health, or the project schedule. All earthwork shall be performed in strict accordance with applicable law, including local ordinances and applicable OSHA requirements.

~~1.08 ARCHAEOLOGICAL MONITORING~~

A. ~~The Contractor shall notify the Engineer a minimum of 72 hours in advance of any excavation and will not proceed with any excavation work until cleared to do so by the Engineer. A Tribal monitor or archaeologist may be on site during construction activities. The contractor is advised that if any archaeological findings are discovered during construction that the monitor or archaeologist has the authority to slow or stop construction activities as they deem necessary~~.

PART 2 – PRODUCTS

2.01 MATERIALS

A. CLASS 2 AGGREGATE BASE

Class 2 aggregate base shall be ¾" minus conform to Section 26 of the State Standard Specifications.

B. DRAIN ROCK

Shall be Class 2 Permeable material and conform to Section 68-2 the State Standard Specifications.

C. STRUCTURE BACKFILL

Shall conform to Section 21 of the State Standard Specifications and shall have a minimum sand equivalent of not less than 20. 100 percent shall pass a 3-inch sieve, 35 to 100 percent shall pass a No. 4 sieve and 20 to 100 percent shall pass the 30-mesh screen. It shall be free from organic matter and unsatisfactory material.

D. TOPSOIL

Shall conform to the State Standard Specifications and shall be a natural friable surface soil without admixtures of undesirable subsoil, refuse, asphalt, oils, metals, or foreign materials. It shall be reasonably free from roots, hard clay, coarse gravel, stones larger than one inch in any dimensions, noxious weeds, tall grass, brush, sticks or other material which would be detrimental to the proper development of vegetative growth.

E. ROCK SLOPE PROTECTION

Shall conform to Section 72 of the State Standard Specifications, size to be as indicated on the Plans.

F. EMBANKMENT / IMPORT BORROW

Shall conform to Section 19-7 of the State Standard Specifications.

PART 3 – EXECUTION

3.01 CLEARING AND GRUBBING WORK REQUIRED

A. LOCATIONS

Where required and directed by the engineer and per Section 02 10 00.

B. REMOVAL AND DISPOSAL OF MATERIAL:

All of the debris type material resulting from the above clearing and other miscellaneous site clearing required by the work or any excavation shall be removed from the site of the work and deposited at the Contractor's disposal site (see Section 01 74 23).

3.02 CONTROL OF WATER

The Contractor shall be responsible for furnishing temporary drainage facilities to convey and dispose of surface water falling on or passing over the site. Contractor shall comply with all best management practices for prevention of water pollution as described in Section 01 57 23.

3.03 EXISTING UTILITIES

GENERAL:

The known existing utilities are shown on the Drawings in their approximate location. The Contractor shall exercise care in avoiding damage to all utilities, as they will be held responsible for their repair if damaged. There is no guarantee that all utilities or obstructions are shown, or that locations indicated are accurate. Utilities are piping, conduits, wire, cable, ducts, manholes, pull boxes and the like, located at the project site and adjoining said site.

Excavations around underground electrical ducts and conduits shall be performed using extreme caution to prevent injury to workmen or damage to electrical ducts or conduits. Similar precautions shall be exercised around gas lines, telephone, and television cables.

3.04 EXCAVATING

A. Excavate subsoil to accommodate formwork for paving, and site structures.

B. Slope banks to angle of repose or flatter, if shown on the plans, unless shoring is used.

C. Grade top perimeter of excavation to prevent surface water from draining into excavation.

D. Hand trim excavation. Remove loose matter.

E. Notify Owner's Representative of unexpected subsurface conditions.

F. Correct areas over excavated with appropriate backfill and compact as specified or as directed by Engineer.

G. PROTECTION:

1. Prevent displacement or loose soil from falling into excavation; maintain soil stability

2. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

3.05 FILL

A. Compact subgrade as necessary to support density requirements of subsequent layers of fill.

B. Use Class 2 aggregate base to raise the existing grades to final subgrades, or as shown on the plans.

C. Compact all fill materials to a minimum of 95% of its maximum dry density, unless otherwise indicated in the Plans or Specifications.

D. Fill in lifts allowing time for Contractor's materials tester to test each lift for compaction.

3.06 DITCHES:

Cut ditches accurately to the cross sections and grades shown. Take care not to over excavate ditches and backfill excessive excavation to grade. Trim all roots, stumps, rock, and other foreign matter from the sides and bottom of the ditches. Compact the surfaces of ditch slopes and bottom.

3.07 TESTING:

Where required, all testing shall be performed by an approved testing laboratory. When test results indicate, as determined by the Engineer, that compaction is not as specified, the material shall be removed, replaced and re-compacted to meet specification requirements. Tests on re-compacted areas shall be performed at Contractor's expense to determine conformance with specification requirements. Inspections and test results shall be certified by the Contractor's laboratory. These certifications shall state that the test results are representative of the materials or conditions being certified by the tests.

3.08 TRENCH EXCAVATION

A. Excavation for pipe and other utilities shall be in open cut. The trench shall be as wide as necessary for sheeting and bracing and the proper

performance of the work up to the maximum width permitted by the typical cross-sections shown on the Drawings. The sides of the trenches shall be vertical in paved areas. The bottom of the trench shall be constructed to the grades and shapes indicated on the Drawings. Should the Contractor desire to use other equivalent methods, he shall submit his method of construction to the Engineer for favorable review prior to its use.

B. Take care not to over excavate. Accurately grade the bottom of the trenches to provide uniform bearing and support for each section of the pipe or conduit at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for bell holes and for the proper sealing of pipe joints, and as hereinafter specified. Dig bell holes and depressions for joints after the trench bottom has been graded. In order that the pipe rests on the bedding for as nearly its full length as practicable. Bell holes and depressions shall be only of such length, depth, and width as required for properly making the joint. Remove stones as necessary to avoid point bearing.

C. Backfill and compact over-excavations to 95% relative compaction with bedding material. There shall be no additional payment to the Contractor for over-excavations not directed by the Engineer. Remove unsatisfactory material encountered below the grades shown as directed by the Engineer and replace with bedding material. Payment for removal and replacement of such unsatisfactory material directed by the Engineer shall be made in accordance with the provisions of the General Conditions.

D. Provide ladders for access to the trench by construction and inspection personnel.

3.09 SUPPORT OF EXCAVATIONS

A. Adequately support excavation for trenches and structures to meet all applicable requirements in the current rules, orders, and regulations. Excavation shall be adequately shored, braced, and sheeted so that the earth will not slide or settle and so that all existing structures and all new pipe and structures will be fully protected from damage. Keep vehicles, equipment, and materials far enough from the excavation to prevent instability.

B. Take all necessary measures to protect excavations and adjacent improvements from running, caving, boiling, settling, or sliding soil resulting from the high groundwater table and the nature of the soil excavated.

C. The support for excavation shall remain in place until the pipeline or structure has been completed. During the backfilling of the pipeline or

structure, the shoring, sheeting, and bracing shall be carefully removed so that there shall be no voids created and no caving, lateral movement, or flowing of the subsoils.

3.010 COMPACTION

A. Add water to the backfill material or dry the material as necessary to achieve specified compaction density of each layer of backfill being compacted. Employ such means as may be necessary to secure a uniform moisture content throughout the material of each layer being compacted.

B. After the material has been moisture conditioned, compact it with compaction equipment appropriate for the use to achieve specified compaction.

C. If the backfill material becomes saturated from rains or any other source because it was not compacted to the specified density or was not backfilled and compacted to surface grade, through negligence or otherwise, remove the faulty material and replace it with suitable material compacted to the specified density. No additional payment will be made for doing such work or removal and replacement.

D. Compaction of embankment and backfill materials by flooding, ponding, or jetting will not be permitted.

3.011 FINISH GRADING

Except where shown otherwise in the Drawings, restore the finish grade to the original contours and to the original drainage patterns. Grade surfaces to drain away from structures. The finished surfaces shall be smooth and compacted.

3.012 DISPOSAL OF EXCAVATED MATERIAL

Dispose of unsuitable material or excavated material in excess of that needed for backfill or fill offsite.

END OF SECTION

SECTION 02 41 00

DEMOLITION

QUALITY CONTROL PART 1 – GENERAL

1.01 WORK INCLUDED:

A. Removal and disposal of designated foundations, walls, concrete, utilities, mechanical, lighting, and other structures.

B. Removal and disposal of all other materials needed to accomplish the project.

1.03 QUALITY ASSURANCE:

A. Contractor Qualifications: Minimum of 5 years' experience in demolition of comparable structures.

B. Requirements of Regulatory Agencies:

1. Comply with requirements of codes.

2. Comply with requirements of local Public Health Authority.

3. Comply with local utility companies and/or utility districts.

1.04 SUBMITTALS:

A. Certificates of severance of utility services.

B. Permit for transport and disposal of debris.

C. Demolition procedures and operational sequence for review by Owner's Representative

1.05 JOB CONDITIONS:

A. Protection:

1. Erect barriers, fences, guard rails, enclosures, chutes, and shoring to protect structures, and utilities remaining intact.

2. Protect designated trees and plants from damage.

3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

B. Maintaining Traffic:

1. Ensure minimum interference with roads, street, driveways, sidewalks, and adjacent facilities.

2. Do not close or obstruct streets, sidewalks, alleys or passageways without permission from authorities having jurisdiction.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

1.01 PREPARATION:

A. Prepare adjacent areas to prevent injury, movement, or settlement of structures which are to remain.

B. Arrange for and verify termination of utility services to include removing meters and capping lines.

C. Examine the areas and conditions under which the work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

D. Remove items scheduled to be salvaged for Owner, and place in designated storage area.

3.02 DEMOLITION:

A. Remove designated foundations, walls, concrete, utilities, mechanical, lighting, and other structures and dispose of in accordance with rules and regulations. Stockpile ballast, gravel, and other pavement materials when required.

B. Coordinate removal and relocation of power poles, street lighting, telephone lines and site lighting, with the local electric utility and the Owner.

C. Remove existing water services, sanitary sewer, storm drainage pipe, and structures as indicated and as necessary to facilitate new construction.

D. Remove old foundations, cisterns, etc., which may be encountered within the construction area. Storm drains to be abandoned shall have each open end filled with concrete that is vibrated into place until no more concrete will flow into pipe end. A plywood form shall be constructed so that a minimum of 3-ft of head can be placed on the pipe end. Other openings in storm drains to be abandoned shall be filled in a similar fashion. City may camera lines to determine other locations to be filled.

3.03 SELECTIVE STRUCTURAL DEMOLITION

A. General:

1. Prior to the start of demolition, carefully study the drawings and these Specifications.

2. In company with the Owner or the Owner's representative, visit the site and verify the extent of demolition to be performed under this contract.

B. Observe all safety and health precautions as required for removal of hazardous materials when hazardous materials are identified as part of the demolition activity. Refer to specific work requirements associated with hazardous material removal.

C. Protect other components, materials, and landscaping in the vicinity of the demolition to prevent unintentional damage to components and materials that are not to be removed. Provide temporary support of structures that are to remain that are affected by the materials to be demolished and removed.

D. Remove materials as designated on the drawings.

E. Demolished materials that are not to be salvaged for reuse on this project shall be considered the property of the contractor and shall be completely removed from the jobsite and disposed of properly.

F. The contractor shall be responsible for repair of all components, materials, and landscaping damaged as part of the demolition process at no additional cost to the Owner.

G. Existing light pole foundations may be either entirely removed or chipped off at 36-inches below finished grade.

3.04 DEBRIS REMOVAL:

A. Promptly remove demolition debris from site.

B. Obtain permission from applicable regulatory authority for disposal of debris to waste disposal site.

C. Do not store or burn materials on site.

END OF SECTION

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected site elements.
2. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
3. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to City Corporation yard located at 900 10th Street, Crescent City, CA.

C. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 INFORMATIONAL SUBMITTALS

A. Engineering Survey: Submit engineering survey of condition of building.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.

C. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

D. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6

1.8 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, remove the following items:
2. Salvaging of monument to be monitored by City staff during operation and transport.

B. Notify Owner's Representative of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Owner's Representative. Hazardous materials will be removed by Owner under a separate contract.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey of Existing Conditions: Record existing conditions by use of measured drawings.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Arrange to shut off utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area.

B. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, and walkways.

B. Removed and Salvaged Items:

1. Store items in a secure area until delivery to Owner.
2. Transport items to Owner's storage area at 900 10th Street.
3. Protect items from damage during transport and storage.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Owner's Representative, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 03 10 00

CONCRETE FORMWORK

PART 1 – GENERAL

1.1 SCOPE

The work includes the furnishing and installing and removing of forms for all cast-in-place concrete work as shown and noted on the plans and specified herein.

1.2 CODES AND STANDARDS

The American Concrete Institute's "Recommended Practice for Concrete Formwork", ACI 347, and the Uniform Building Code, Section 2606, are hereby made a direct part of this specification, and all concrete formwork included in this contract shall conform with the applicable requirements therein except as specified otherwise herein.

1.3 RELATED WORK

A. Section 01 11 00: SUMMARY OF WORK

B. Section 03 20 00: CONCRETE REINFORCEMENT

C. Section 03 30 00: CAST-IN-PLACE CONCRETE

1.4 QUALITY ASSURANCE

A. Design of structures shown on drawings includes no allowance for imposed construction loads. Provide forms, shoring and falsework adequate for dead loads and live loads plus imposed loads during construction.

B. It shall be the Contractor's responsibility to design, construct and maintain safe forms, shoring, and falsework at all times in accordance with applicable Cal/OSHA regulations.

C. Tolerances of formwork shall comply with ACI 117-latest editions. Failure of finished concrete work to meet specified tolerances shall be remedied at Contractor's expense.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Boards for unexposed concrete, not otherwise scheduled or specified, shall be Douglas Fir, conforming to the "Standard Grading and Dressing Rules No. 16", most current edition, of the West Coast Lumber Inspection Bureau. Boards shall be S4S. Contractor, at his option, may use plywood for forms in lieu of boards. Plywood, if used shall be "B-B Plyform Class I Exterior" grade, conforming to U.S. Products Standard PS 1, 5/8" minimum thickness. Plywood used for exposed concrete shall be a high density overlay type especially manufactured for form work.

B. FORM TIES AND SPREADERS: Standard metal form clamp assembly, of type acting as spreaders and leaving no metal within 2" of concrete face. Inner tie-rod shall be left in concrete when forms are removed. Submit samples and manufacturer's specifications to Engineer for review and approval of Owner before using. Wood spreaders will not be permitted.

C. FORM COATING: Non-grain raising and non-staining type that will not leave residual matter on surface of concrete or adversely affect proper bonding of subsequent application of other material applied to concrete surface. Coatings containing mineral oils or other nondrying ingredients are not permitted.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. Earth Forms: Construct wood edge strips at each side of trench at top to secure reinforcing and prevent trench from sloughing. Form sides of footings where earth sloughs. Earth forms shall be tamped firm and cleaned of all debris and loose material before depositing concrete.

B. Formwork – General: The engineering and construction of all formwork, shoring and bracing shall be carried out by and under the direction of the Contractor, who shall be responsible for the engineering, construction, maintenance, and safety of all formwork during the entire construction period.

C. The formwork shall be designed for the loads and lateral pressures outlined in Part 3, Section 102, of ACI 347 latest edition.

D. Wood forms shall be constructed of sound material, shall be of the correct shape and dimensions, mortar tight, and of sufficient strength, and so braced and tied together that the movement of men, equipment, materials, or placing and vibrating the concrete will not distort the forms from their design shape under all imposed loads. The form shall be so constructed that they may be easily removed without damage to the concrete. Before concrete is placed in any form, the horizontal and vertical positions of the form shall be carefully verified, and all inaccuracies corrected. All wedging and bracing shall be completed in advance of placing of concrete.

E. Framing and Bracing: Framing bracing, supporting members, and centering shall be of ample size and strength to safely carry, without deflection, all dead and live loads to which forms may be subjected, and shall be spaced sufficiently close to prevent any bulging or sagging of forms. Concrete out of line, level, or plumb will be cause for rejection of the whole work affected.

F. Tolerances: Variation from plumb in lines, surfaces, and arises shall not exceed 1/8" in 10 feet.

G. Chamfered Corners: All exposed corners shall be chamfered ¾", unless shown otherwise on plans. Provide molding in forms for all chamfering required.

H. Form Ties: Form ties shall be of sufficient strength and used in sufficient quantities to prevent spreading of the forms. Ties shall be placed at least 2" away from the finished surface of the concrete.

I. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

J. Embedded Items: Provisions shall be made for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, and other features. No wood other than necessary nailing blocks shall be imbedded in concrete. Complete cooperation shall be extended to suppliers of imbedded items from other trades as required. All imbedded items shall be securely anchored in correct location and alignment prior to placing concrete. All imbedded items shall be subject to Engineer's review, inspection, and approval.

K. Coating of Forms: Thoroughly clean forms and coat with specified form coating before each use. Do not reuse any form for exposed work which cannot be reconditioned to "like new" condition. Apply form coating to all forms before placing reinforcing steel.

L. Inspection: Prior to placing of any concrete, and after placement of reinforcing steel in the forms, Contractor shall notify Owner so that proper inspection may be made. Such notification shall be made at least 24 hours in advance of placing concrete to permit proper arrangements to be made for inspection.

M. Rejection of Defective Work Due to Improper Forms: Any movement or bellying of forms during construction or variations in excess of the tolerances specified will be considered just cause for the removal of such forms and, in addition, the concrete work so affected. Reconstruction of forms and new concrete (including disposal of rejected materials) shall be furnished at no additional cost to the Owner.

3.2 REMOVAL OF FORMS

A. Do not remove forms of shoring until concrete has attained sufficient strength to support its own weight and all imposed construction and permanent loads. Any damage to the Work resulting from early removal of forms or shoring or early imposed loading shall be corrected at no added expense to the Owner.

B. The minimum time for forms and shoring to remain in place for slabs on grade and sides of footings shall be 24 hours.

C. During the period that forms are in place on the concrete work, forms shall be kept wet at all times.

D. Re-use of Forms: Clean and recondition form material before each re-use. Unsatisfactory material shall be rejected and removed from the site.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1--GENERAL

1.01 DESCRIPTION

This section specifies reinforcing steel for use in precast and cast-in-place reinforced concrete.

1.02 QUALITY ASSURANCE

A. GENERAL:

Quality assurance and quality control (QA/QC) activities are generally described in specification Sections 01 45 00 and 01 45 29. Additional requirements are described herein and intended to be complementary to these referenced Sections.

B. REFERENCES:

This section contains references to the documents listed below. They are a part of this section as specified and modified. Where a referenced document cites other standards, such standards are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, has been discontinued or has been replaced.

Reference	Title
SP-66	Details and Detailing of Concrete Reinforcement (ACI 315)
ASTM A1064 / A1064M	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A615 / A615M	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A996 / A996M	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A706/A706M	Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
ASTM E329	Agencies Engaged in Construction Inspection, Testing, or Special Inspection
AWS D1.4	Structural Welding Code--Reinforcing Steel
CRSIPRB	Placing Reinforcing Bars
CRSIMSP	Manual of Standard Practice
ASTM A853	Steel Wire, Carbon, for General Use
IBC	2013 California Building Code

1.03 SUBMITTALS

A. The following submittals shall be provided as specified in Section 01 33 00:

1.04 REGULATORY REQUIREMENTS, SPECIAL INSPECTION

Conform to requirements in Sections 01 45 00 and 01 45 29.

PART 2--PRODUCTS

2.01 BAR REINFORCEMENT

Reinforcing bars shall be deformed billet steel in conformance with ASTM A615/A615M, including supplementary requirements. Bars shall be Grade 60, except ties or field-bent bars where specified shall be Grade 40. Bars to be welded shall be Grade 40 or shall be deformed billet steel conforming to ASTM A706/A706M. ASTM A616/A616M or ASTM A617/A617M steel shall not be used.

2.02 WIRE FABRIC

Wire fabric shall be welded steel mesh conforming to ASTM A1064/A1064M.

2.03 WIRE AND PLAIN BARS

Wire used as reinforcement and bars used as spiral reinforcement in structures shall be cold drawn steel conforming to ASTM A1064/A1064M.

2.04 TIE WIRE

The wire shall be minimum 16 gage annealed steel conforming to ASTM A853.

2.05 BAR SUPPORTS

Bar supports coming into contact with forms shall be CRSI Class 1 plastic protected or Class 2 stainless steel protected and shall be located in accordance with CRSI MSP and placed in accordance with CRSI PRB. Concrete block supports shall be provided for footing and slabs on grade. Stainless steel or plastic protected plain steel supports shall be provided for other work.

2.08 PRODUCT DATA

The following product data shall be provided prior to installation in accordance with Section 01 30 00:

1. Certified mill test reports
2. Welder qualification certificate in accordance with AWS D1.4.

PART 3--EXECUTION

3.01 FABRICATION

Reinforcing steel shall not be bent or straightened in a manner which will injure the material. Bars with kinks or with bends not shown shall not be used. Heating or welding bars shall be performed in accordance with AWS D1.4 and shall only be permitted where specified or approved by the Construction Manager. Bars shall not be welded at the bend.

3.02 PLACEMENT

Reinforcing steel shall be placed in accordance with CRSI PRB and CRSI MSP1.

Reinforcing steel shall be positioned accurately and secured against displacement by using annealed iron wire at intersections and shall be supported by concrete or metal chairs, spacers or metal hangers. Tack welding of cross bars is not acceptable. Bars shown on the drawings shall not be repositioned (buried) to act as support bars. Additional bars shall be provided as required for supports. Steel rods and pegs may be used to support reinforcing steel on rock foundations. Reinforcing steel shall be placed in such a manner as to not damage waterproofing membrane or plastic lining which has been previously applied or constructed. Reinforcing steel shall be shop-bent or slightly relocated where necessary to clear waterstop. Reinforcing steel shall not be placed on fresh concrete or forced into fresh concrete.

Supports for embedded items shall not be welded to the reinforcement. Additional reinforcement may be provided for this purpose.

3.03 SPLICING

Reinforcing steel shall be spliced as shown. Additional splices may be provided where approved by the Construction Manager.

In slabs, beams, girders and walls, reinforcing steel shall not be spliced in areas of maximum stress. Splices of adjacent bars shall be staggered at least one splice length, unless otherwise specified. Splices in welded wire fabric shall be at least 1 1/2 meshes wide.

3.04 PROTECTION OF THREADED INSERTS

Threaded steel inserts for two-part splicer systems and other similar applications, which are intended for removal in future construction shall be coated with a non-metallic anti-seize compound prior to installation. Coating and use shall conform strictly to manufacturer's written instructions. Provide sufficient coating thickness on insert piece to coat receiving piece thoroughly and result in visible excess beaded completely around joint. Do not remove beaded excess.

3.05 CLEANING

Reinforcing steel shall be cleaned of mill rust scale, dried concrete, or other coatings that may reduce bond. Reinforcement reduced in section is not acceptable. When concrete placement is delayed, reinforcement shall be cleaned by sandblasting if directed by the Construction Manager.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 DESCRIPTION

This section specifies cast-in-place concrete which consists of furnishing all material, mixing and transporting equipment, and performing all labor for the proportioning, mixing, transporting, placing, consolidating, finishing and curing of concrete in the structure.

1.02 QUALITY ASSURANCE

A. GENERAL:

Quality assurance and quality control (QA/QC) activities are generally described in specification Sections 01 45 00 and 01 45 29. Additional requirements are described herein and intended to be complementary to those referenced Section.

1.03 WORK INCLUDED:

Concrete required for this work is indicated on the Drawings and includes but is not limited to: Minor concrete work including curb ramps, sidewalks, crosswalks, curbs, valley gutters, streetlamp footings, and miscellaneous structures.

1.04 REFERENCE SPECIFICATIONS

A. All concrete in this section shall conform to the requirements of Section 90-2 "Minor Concrete", 2018 Standard Specifications by the State of California, Department of Transportation except as modified by the supplemental requirements herein, excluding measurement and payment items.

B. Design, detailing and fabrication of reinforcing steel shall conform to ACI 315-74 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" and ACI 318-71 "Building Code Requirements for Reinforced Concrete."

C. Form work and finishing as well as construction methods and miscellaneous materials shall conform to Section 51 "Concrete Structures" of 2018 Standard Specification excluding measurement and payment items.

1.05 SUBMITTALS

The following submittals shall be provided in accordance with Section 01 33 00:

A. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the CONTRACTOR, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The ENGINEER shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the CONTRACTOR with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

B. Each proposed mix design showing (a) the expected strength, (b) corresponding slump before and after the introduction of water-reducing and/or super plasticizing admixtures, (c) weights and test results of the ingredients, and (d) other physical properties necessary to review each mix design for conformance with these specifications.

C. Product literature and technical data for aggregates and pozzolan.

D. Product literature, technical data and dosage of all proposed admixtures including, but not limited to air entraining, water reducing and/or retarding admixtures.

E. Formwork layout, products, and design. Placing methods and sequence. Demonstrate general conformance with these specifications, and that mix design, placing methods and formwork all together will result in an acceptable final product for the Owner. Submittal information required in this paragraph includes a description of forming and placing equipment, techniques, and mix design effects.

F. Curing program description in sufficient detail to demonstrate acceptable strength, finish and crack control as specified.

G. Product literature and technical data for waterstops, curing compounds, bonding compounds, surface sealers and hardeners.

H. See Section 2.11 for additional requirements.

1.06 REGULATORY REQUIREMENTS, SPECIAL INSPECTION

Conform to requirements in Sections 01 45 00 and 01 45 29.

PART 2 – PRODUCTS

2.01 CONCRETE

A. Concrete shall comply with Caltrans Minor Concrete Standards with the minimum quantities or within the ranges listed below. Concrete structures shall conform to the provisions of section 51 "Concrete Structures" and section 90 "Portland Cement Concrete" of the Caltrans 2018 standard specifications, these special provisions, and contract drawings.

Concrete shall be air entrained (2% +/-1%).

Location	Minimum psi @ 28 days	Maximum Size Aggregate	Minimum Sacks of Cement/C.Y.	Slump Range
All driveways, Sidewalks, crosswalks, C&G	3,600	3/4	5.7	4-6

B. Additive color to be used in stamped sidewalks and stamped crosswalks only. Integral color to be Mountain Trail. Driveways, ADA Ramps, concrete pavement, and curbs and gutters to have no color added.

C. ADMIXTURES:

The use of admixtures shall be confined to those admixtures listed below. Admixtures shall be batched in strict accord with manufacturer's recommendations.

1. Any stabilizers or retarders added will be at the expense of the Contractor.

2.02 CEMENT

Cement shall be Portland, conforming to ASTM C-150, Type II.

2.03 AGGREGATES

Aggregates shall conform to Caltrans testing and gradations.

2.04 REINFORCING STEEL

Reinforcing steel shall conform to ASTM A615, Grade 40. Reinforcing to be placed in driveways, crosswalks, and concrete paving Alternative #2.

2.05 CHEMICAL BONDING AGENT

Chemical bonding agent shall be of aqueous phase, film forming, non-oxidizing composition.

2.06 GROUTS

A. Non-shrink type (handrails, equipment bases, etc.):

1. Compatible with handrail metal.

2. Premixed, one of the following or an approved equal:

a. "Quick Rok", Preco Chemical Corp., Plainview, N.Y.

b. "Masterflow 713", Master Builders Co., Cleveland, Ohio.

B. Ordinary "Dry Pack":

1. Ratio 1 part Portland cement, 2 parts sand (by weight).

2. Water to produce damp, formable consistency.

PART 3 – EXECUTION

3.01 GENERAL

A. Concrete structures shall conform to the provisions of section 51 "Concrete Structures" and section 90 "Portland Cement Concrete" of the Caltrans 2018 standard specifications, these special provisions, and contract drawings. Measurement and Payment sections are not applicable.

B. Concrete repairs of damaged sidewalks, driveways, curbs, gutters, and other concrete items shall be made to the same line and grade and with concrete of a similar finish, texture, and color to the adjoining concrete.

3.02 REINFORCING STEEL

A. Detail in accordance with ACI 315-74 and ACI 318-71.

3.03 FORM WORK

A. Design and engineering of form work, as well as construction of same is the responsibility of the Contractor.

B. Use 3/4-inch x 3/4-inch chamfers at all sharp edges.

3.04 FINISHES

A. **City will provide Contractor with a boardwalk stamp for use on all sidewalks and crosswalks as indicated on the plans.**

City will also provide Contractor with stencils for sandblast pattern at Cultural nodes. This item is currently excluded from this project, but will be addressed through Change Order.

B. Provide "ordinary surface finish" as defined in Section 51 of Caltrans Standard Specifications for all formed surfaces not specified otherwise.

C. All exterior concrete shall be sloped so as to drain without puddling, minimum 1/8 inch/foot where not shown. Slab finishes shall be defined as indicated in ACI 301 except that power floating or troweling versus hand finishing will be at the Contractor's option. Where not otherwise noted, flat and sloped surfaces shall be a broomed finish and all slab finishes shall be a fine broom finish.

3.05 BONDING AGENT

A. Prior to application, surfaces shall be cleaned of all dirt, dust, oil, grease, wax, effervescence, and loose base material.

B. After uniform application is allowed to dry until no longer tacky, then pour required concrete material.

3.06 PLACING

Placing of concrete shall be done immediately after mixing. No concrete shall be placed or used after it has begun to set and no re-tempering will be allowed. The method used in placing shall be such that concrete is conveyed to place and deposited without separation of the ingredients. No concrete shall be placed with a free unconfined fall in excess to ten (10) feet for concrete containing a high-range water-reducing admixture (superplasticizer) and five (5) feet for other concrete. Concrete shall not be allowed to cascade through reinforcing steel in such manner as to promote segregation. Do not support runways on reinforcing steel.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SCOPE

Provide and install, complete, all metal work as shown and specified. This work includes, but is not limited to, metal signs, fasteners, piling, hand rails and site concrete.

1.03 STANDARDS

The following standards are hereby made a part of this section and miscellaneous metal work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements or governing rules and regulations.

Section 75 of the Department of Transportation Standard Specifications, latest edition.

Steel Structures Painting Council Surface Preparation Specifications, Vol. 2, Painting Manual.

1.04 SHOP DRAWINGS

Provide shop drawings per Section 01 33 00 Submittal Procedures.

PART 2 – PRODUCTS

2.01 FASTENINGS

A. Intent of Drawings: The drawings are intended to show the number, size and spacing of nails, bolts, and screws, etc., required for structural strength. If any particular joint is not shown on the drawings, it shall be provided with bolts, screws, and/or nails, as required to be consistent with the fully detailed joints and shall be subject to the approval of the Owners Representative.

B. Furnish all hardware required for fastenings, as shown on the drawings, and as specified herein, and as required to complete the work. All

fasteners shall be stainless steel unless otherwise indicated. Fasteners shall include, but not be limited to, the following:

1. Nails: Unless otherwise noted, nails shall common wire of adequate size for type of fastening, ASTM-153.

2. Nuts and Bolts: Shall be machine nuts and bolts, lag bolts, or carriage bolts of structural grade stainless steel conforming to ASTM A-153, of sizes indicated on the drawings. Anchor bolts shall have cut threads.

3. Washers: Shall be of stainless steel, ASTM 153.

4. Lag Screws: Shall be of structural grade stainless steel, and shall be hex headed wherever possible, ASTM 153.

2.02 MATERIALS

A. Steel Fabrications

1. Steel tube: Cold-formed, conforming to ASTM A 500, Grade B.

2. Steel plates, shapes, bars: Conforming to ASTM A 36.

3. Concrete inserts: Malleable iron, ASTM A 47, or cast steel, ASTM A 27, inserts, with steel bolts, washers, and shims; hot dip galvanized.

4. Anchors and inserts: Furnish inserts and anchoring devices to be built into other work for installation of miscellaneous metal items. Coordinate delivery to job site to avoid delay. Use non-ferrous metal or hot dip galvanized anchors and inserts for exterior resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

5. Fasteners: Use fasteners made of the same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined. Provide exposed fasteners, if any, which match finish of fastened metal, unless otherwise indicated.

B. Aluminum fabrications shall include, but not be limited to, the following:

All aluminum shall be marine grade and corrosion resistant.

PART 3 – EXECUTION

3.01 GENERAL

A. Verify all measurements at site prior to ordering materials.

B. Coordinate all metal work with adjoining work for details of attachment, fitting, etc. Do all cutting, shearing, drilling, punching, threading, tapping, etc., required for miscellaneous metal or for attachment of adjacent work. Drill or punch holes; do not use cutting torch. Shearing and punching shall leave true lines and surfaces.

C. Conceal all fastenings where practicable. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Form joints exposed to weather to exclude water.

D. Provide all lugs, clips, anchors, and miscellaneous fastenings necessary for the complete assembly and installation.

E. Set all work plumb, true, rigid, and neatly trimmed out.

F. Where items must be incorporated or built into adjacent work, deliver to trade responsible for proper location of such items.

3.03 BOLTED, SCREWED AND RIVETED CONNECTIONS

A. In general, use bolts for field connections only as detailed. Provide washers under all heads and nuts. Draw all nuts tight and nick threads of permanent connections to prevent loosening. Use beveled washers where bearing is on sloped surfaces.

B. Each bolt hole shall be drilled 1/16 inch larger than the bolt diameter.

C. 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.

3.04 CLEAN UP

A. Protection and Cleaning: Remove all soiled and foreign matter from finished surfaces and apply such protective measures as required to prevent damage or discoloration of any kind until acceptance of project.

B. During construction, keep premises as clear as possible of materials and debris, and at the completion of work remove all tools, appliances, materials, and debris from the premises.

END OF SECTION

SECTION 09 97 13

PAINTING AND COATINGS

PART I - GENERAL

1.1 SUBMITTALS

A. All submittals and finish schedules shall include all exterior and interior items such as siding, doors, frames, trim, base, sills, walls, decks, and railings. Indicate color number and gloss required for each item.

B. At completion of the Project, provide a complete summary list of specific manufacturer's products and color identification numbers that were applied in this project. List shall compare each color number with each specified or selected color number. A copy of this list shall be given to the Owner.

1.2 RELATED DRAWINGS

A. Section 01 78 23 – Operation and Maintenance Data

1.3 EXISTING CONDITIONS

A. Any previously painted metal surface shall be inspected for the presence of lead.

1.4 EXTRA MATERIALS

A. Leave on the premises as directed by the Owner not less than 1 gallon of each standard color. All material shall be in one-gallon containers, clearly marked with manufacturer's name, color formula, and sheen.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide the best quality grade of coating as regularly manufactured by acceptable paint material manufacturers.

B. Materials not displaying the manufacturer's identification as a standard, best grade product will not be acceptable.

C. All paints and coatings shall be industrial grade as opposed to contractor grade. Listed manufacturers are for traditional paint products. Manufacturers for epoxy and urethane coatings must be pre-approved.

D. Material Safety Data Sheets shall be included for all products used.

2.2 MANUFACTURERS FOR TRADITIONAL PAINT PRODUCTS

A. Pratt and Lambert
B. Sherwin Williams
C. MAB Paints
D. Pittsburgh Paints
E. Benjamin Moore

2.3 MANUFACTURERS FOR SPECIALTY INDUSTRIAL COATINGS

A. Specialty industrial coatings shall be used for steel exposed on exterior or harsh environments.
B. Acceptable Manufacturers (or approved equal)
   1. Carboline
   2. Tnemec
   3. Dupont

2.4 FINISHES

A. Aluminum: Whether brushed, polished, or anodized aluminum shall have a factory finish or match the factory finish. This also includes storefronts, doors, and windows.

PART 3 - EXECUTION

3.1 PREPARATION

A. Steel Structures Painting Council: All preparation and painting shall be done according to the Steel Structures Painting Council (SSPC).
B. Rust Converter: Use of a rust converter in lieu of normal methods of cleaning is not allowed. [Note to AE: Any exception to this requires an approved project variance.]
C. Surface Preparation Standards:
   1. Solvent Cleaning: Remove oil, grease, dirt, soil, salts, and contaminants by cleaning with solvent, vapor, alkali, emulsion, or steam.
   2. Hand Tool Cleaning: Remove loose rust, mill scale, and paint to degree specified by hand chipping, scraping, sanding, and wire brushing.
   3. Power Tool Cleaning: Remove loose rust, mill scale, and paint to degree specified by power tool chipping, scraping, sanding, and wire brushing.
   4. White Metal Blast Cleaning: Remove all rust, mill scale, paint, and foreign matter by blast cleaning with wheel or dry or wet nozzle using sand, grit, or shot for very corrosive atmospheres where high cost of cleaning is warranted.
   5. Commercial Blast Cleaning: Blast clean until at least two-thirds of the surface area is free of all visible residues for rather severe conditions of exposure.
   6. Brush Off Blast Cleaning: Blast clean all surface area except tightly adhering residues of mill scale, rust, and coatings to expose numerous evenly distributed flecks of underlying metal.
   7. Near White Blast Cleaning: Blast clean nearly to White Metal cleanliness, until at least 95% of the surface area is free of all visible residues for high humidity, chemical atmosphere, marine, or other corrosive environments.
   8. Power Cleaning to Bare Metal: Completely remove all rust, scale, and paint by power tools with resultant surface profile.
D. Ferrous Metals: Remove all corrosive deposits down to a bright metal and sound surface. Loose scale and rust found on new or unquoted iron or steel surfaces shall be removed. If surface has been protected with a coating of oil or grease it shall be solvent washed as described in this section. Steel

exposed to abnormal conditions such as chemicals, condensation, frosting, and high humidity requires a primer with hard-drying characteristics and moisture resistance.

E. Non-Ferrous Metals:
   1. Aluminum: Aluminum that has not been painted and exposed to weather may have aluminum oxide, or white rust. On the surface it may be pitted or coated with raised nibs. This shall be removed by means of hand tool cleaning, power tool cleaning, and near white blast cleaning as stated previously in this section.
   2. Copper, Bronze, and Brass: These metals shall be treated in similar manner as aluminum. Copper may have oxidized to a deep bronze color, or if weathered for a long time, verdigris may have formed. These materials shall be removed in the same manner as described for aluminum in the previous paragraph and primed with a zinc chromate primer.
   3. Galvanized Steel: Galvanized steel shall be cleaned as in the same manner as aluminum, copper, and bronze or allowed to weather for 6 months. The manufacturer of the galvanized metal shall use a paintable white rust preventer. Conventional coatings containing oil or alkyd resins shall not be used. Only special primers made for the use of galvanized metal are permitted. In severe environments or in area of high humidity, or continuous condensation brush blasting is recommended to insure maximum adhesion and performance.

3.2 APPLICATION

A. Apply paint and coatings within an appropriate timeframe after cleaning when environmental conditions encourage flash rusting, rusting, contamination, or the manufacturer's specifications require earlier applications. Do not apply finishes that are not sufficiently dry unless manufacturer's directions state otherwise.

3.3 QUALITY CONTROL

A. All surfaces, preparation and paint application shall be inspected.
B. Painted surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent to the inspector.
   1. Runs, sags, hiding, or shadowing due to inefficient application methods.
   2. Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners, and re-entrant angles.
   3. Damage due to touching before paint is sufficiently dry, or any other contributory causes.
   4. Damage due to application on moist surfaces or due to inadequate protection from the weather.
   5. Damage or contamination of paint due to wind blown contaminates such as dust, sandblast materials, and salt spray.

3.4 CLEAN UP

A. Remove all paint where it is spilled, splashed, splattered, or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

PART 4 - SUBMITTALS

4.1 SCHEDULES

A. [Note to AE: Ensure schedules are submitted which will enable the replication or reorder of any manufactured product per Section 01 01 78 23 – Operation and Maintenance Data]

END OF SECTION

SECTION 10 14 53

TRAFFIC SIGNAGE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Furnishing and installing roadside traffic signage.

B. Install new signs on metal poles, unless otherwise indicated.

C. Preservative treatment for wood posts and bracing.

1.02 RELATED SECTIONS

A. Section 01 33 00 Submittal Procedures

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A36 – Carbon Structural Steel

2. ASTM A53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

3. ASTM A123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

4. ASTM A153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware

5. ASTM A167 – Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

6. ASTM A325 – Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

7. ASTM A653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

8. ASTM A1011 – Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

B. State of California, Department of Transportation (Caltrans)

1. Caltrans – California Manual on Uniform Traffic Control Devices (MUTCD), and Uniform Sign Chart

2. Caltrans – 2018 Standard Specifications and Uniform Sign Chart

C. California Redwood Association:

1. Redwood Inspection Service (RIS) - Grades of California Redwood Lumber

D. Western Wood Products Association (WWPA):

1. Western Lumber Grading Rules

E. West Coast Lumber Inspection Bureau (WCLIB):

1. Standard No. 17 – Grading Rules for West Coast Lumber

F. American Wood Protection Association (AWPA):

1. AWPA Book of Standards

a. AWPA U1 – Use Category System

b. AWPA M4 – Care of Preservative-treated Wood Products

1.04 QUALITY ASSURANCE

A. Comply with Project Quality Program Requirements (see 1.02 above).

B. Manufacturer and Applicator/Installer Qualifications:

1. Manufacturer's Qualifications: Minimum of 5 years' experience in manufacturing of specified materials/products, with record of successful in-service performance.

2. Applicator/Installer Qualifications: Engage applicator/installer with minimum 5 years' experience in installation of materials/products similar in material, design, and to extent indicated for this Project.

a. Installer Certification: Obtain written certification from manufacturer, certifying that installer is approved by, licensed, or certified by manufacturer for installation of specified materials/products or systems.

b. Provide list of minimum 5 projects similar in nature and size to that of this Project, where specified materials/products have been successfully installed/used.

C. Marker Panels: Type N, Type P, and Type R mounted on post with traffic sign are considered to be sign panels.

D. Sign Panels Furnished and Installed by Contractor: Reflectorized on aluminum sheeting material.

1. Conform to Caltrans Uniform Sign Chart for size, shape, color, and legend of each sign.

1.05 SUBMITTALS

A. Refer to Section 01 33 00 Submittal Procedures, for submittal requirements and procedures.

B. Material Safety Data Sheets (MSDS): Manufacturer's Material Safety Data Sheets for each type of material used in Work.

1.06 DEFINITIONS

A. VOC: Volatile Organic Compound, as defined in NCAQMD Rule 101 – Definitions:

1. Any volatile compound of carbon, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, ammonium carbonate, and exempt compounds.

B. NCAQMD: North Coast Air Quality Management District

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of Federal, State, and local authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 MATERIAL

A. Metal Posts:

1. Mountings for Traffic Signs: Installed on barriers or railings.

a. Fabricate from minimum 14 gage welded or seamless steel pipe conforming to ASTM A53 Grade B, and structural steel conforming to ASTM A36 or ASTM 1011, Grade 33.

b. Bolted Connections and Anchorages: Conform to provisions in Section 55-1.02D(6) and Caltrans 2018 Standard Specifications, Section 75-1.02.

c. Concrete Anchorage Devices: Conform to requirements in Caltrans 2018 Standard Specifications, Section 75-3.92C.

2. Mounting for Ground-Mounted Traffic Signs: Wide flange metal posts fabricated from structural steel conforming to ASTM A36 or ASTM 1011, Grade 33.

a. Provide bolts, nuts, and washers for breakaway connections at wide flange steel posts conforming to ASTM A325.

3. Galvanize metal parts of traffic sign mountings after fabrication.

    a. Apply galvanizing conforming to 2018 Caltrans Standard Specifications, Section 75- 1.02B.

B. Wood Posts and Braces: Posts of nominal four inches by four inches in size, and braces, constructed from of one of following:

    1. Construction Heart Grade Redwood, Highway Post Grade Redwood, or Heart Structural Grade Redwood, conforming to RIS - Grades of California Redwood Lumber

    2. Light Framing Construction Grade Douglas Fir, free of heart center; or Structural Light Framing No. 2 Grade Hem-Fir, free of heart center conforming to WCLIB Standard No. 17, or WWPA - Western Lumber Grading Rules

C. Sign Panel Fastening Hardware:

    1. Frame Assemblies for Multiple Sign Installations: Fabricate of structural steel conforming to ASTM A36, or of aluminum alloy, where indicated.

        a. Hot dip galvanized frames fabricated of structural steel after fabrication.

    2. Back Braces for Signs: Commercial quality, mild steel, hot dip galvanized after fabrication.

    3. Straps and Saddle Brackets: For mounting Sign Panels on electroliers, sign structure posts, and traffic signal standards.

        a. Corrosion resistant chromium nickel steel conforming to ASTM A167, Type 302.

        b. Theft proof bolts indicated to be stainless steel with chromium content of not less than 17 percent and nickel content of not less than eight percent.

    4. Lag Screws, Bolts (except theft proof bolts), Metal Washers, and Nuts: Commercial quality steel, hot dip galvanized after fabrication.

        a. Fiber Washers: Commercial quality.

    5. Galvanizing: Conform to provisions in 2018 Caltrans Standard Specifications, Section 75-1.02B for iron and steel hardware.

    6. Use stainless steel fastenings for wood preservative treated wood; do not use galvanized fastenings.

D. Wood Preservative Treated Materials:

1. Where lumber is indicated or specified to be preservative treated, comply with applicable requirements of AWPA U1 - Use Category System:

   a. Pressure treat wood members in contact with ground or fresh water with waterborne preservative to minimum retention of 0.40 lbs./cu. ft.

   b. Pressure treat above ground wood members with waterborne preservative to minimum retention of 0.25 lbs./cu. ft.

   c. After treatment, kiln-dry lumber to maximum moisture content of 19 percent.

2. Complete fabrication of treated items prior to treatment where possible.

   a. If cut after treatment, coat cut surfaces to comply with AWPA M4.

PART 3 - EXECUTION

3.01 CONSTRUCTION

A. Excavate holes to required depth for bottom of posts, as indicated

B. Place posts in holes excavated in ground.

C. Line between center of top of post and center of post at ground line to be plumb within tolerance not to exceed 0.02 foot in ten feet.

D. Backfill space around wooden posts to finished ground surface with selected earth or sand, free of rocks or other deleterious material.

1. Place backfill material in layers approximately 0.33 foot thick; moisten each layer and thoroughly compact.

E. Backfill metal posts with Class C Portland cement concrete conforming to provisions in Caltrans Standard Specifications, Section 90 or, at Contractor's option.

1. Backfill material may consist of Portland cement concrete produced from commercial quality aggregates and cement, containing not less than 470 pounds of cement per cubic yard.

F. Dispose of surplus excavated material as directed by City or its designee.

G. Carefully drill holes for bolts, threaded rods, or expansion anchorage devices in existing concrete by employing methods that will not cause spalling of concrete adjacent to holes.

H. Install traffic signs at locations indicated or where directed by City or its designee conforming to provisions in Section 56 – Signs, of Caltrans Standard Specifications and where indicated.

3.02 SIGN PANEL INSTALLATION

A. Sign Panels: Install in accordance with details shown or as directed by City or its designee.

1. Chipping or bending of sign panels is considered cause to require replacement.

B. Closure Inserts: Install into openings at edges of adjacent sign panel sections.

1. Adjacent edges of sign panels are to be in contact for their full length.

2. Mount overlapping letters and borders at sign panel joints on face of sign with blind, self-plugging type rivets.

C. Sign Panels: Attach to metal and wood posts, electroliers, sign structure posts, and traffic signal standards and mast arms with fastening hardware of types and sizes indicated.

D. Bore pilot holes with bit size equal to base of lag screw thread

1. Install lag screws by turning lag screw into pilot holes by use of wrench.

E. Furnish sign panels and fastening hardware.

F. Do not remove existing traffic signs until replacement signs have been installed or until existing signs are no longer required for direction of public traffic, unless otherwise directed by City or its designee.

END OF SECTION

SECTION 10 45 00

EXTERIOR ALUMINUM SIGNS

PART 1 – GENERAL

1.01 SUMMARY

A. Description of Work

Exterior sign, of aluminum construction, non-illuminated, with flat face.

B. Related Section

Section 05 50 00 – Metals and Hardware

1.02 QUALITY CONTROL

A. SUPPLIER

Obtain all products in this section from a single supplier.

B. REGULATORY REQUIREMENTS

Products shall meet requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and local amendments and modifications.

C. INSTALLER

Installation shall be performed by installer specialized and experienced in work similar to that required for this project.

D. REVIEWS

Contractor shall submit shop drawings and color samples for all sign faces to the Owners Representative prior to fabrication.

1.03 SUBMITTALS

Submit in accordance with requirements of Division 1.

A. PRODUCT DATA

Submit product data for specified products. Include material details for each sign specified.

B. SHOP DRAWINGS

Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.

C. SAMPLES

Submit supplier's standard color chart for selection purposes and selected colors for verification purposes.

D. INSTALLATION

Submit supplier's installation instructions.

E. CLOSEOUT SUBMITTALS

Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.

Submit warranty documents specified herein.

1.04 DELIVERY, STORAGE, AND HANDLING

Comply with requirements of Division 1.

Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.

Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.

Handle products in accordance with manufacturer's instructions.

PART 2 – PRODUCTS

2.01 SUGGESTED MANUFACTURERS OR APPROVED EQUIVALENT

A. Security Signs

2424 SE Holgate

Portland, Oregon 97202

Ph: 503.232.4172

www.securitysigns.com

B. Sea Reach Limited

146 NE Yamhill Street Sheridan, OR 97378

503·843·2005 phone

503·843·2744 fax

susan@seareach.com

2.02 SIGNAGE MATERIALS / COMPONENTS

A. Materials and Components:

1. Aluminum Panels: Alumalite plate, thickness and size as specified by plans. Dimensions as shown on drawings.

2. Surface Treatment Finish – Painted Surfaces: Apply Matthews Acrylic Polyurethane (MAP) as recommended by manufacturer specifications. Topcoat Matthews Acrylic Polyurethane 2.0 mils DFT. (min.) Use colors selected from manufacturer's standard colors.

3. Surface Treatment Finish – Vinyl: Vinyl applications to be 3M marine grade.

4. Fasteners: All fasteners must be corrosion resistant stainless steel.

2.03 FABRICATION – GENERAL

A. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

B. Allow for thermal movement resulting from a maximum ambient temperature change (range) of 100 °F (38 °C). Design, fabricate, and install sign assemblies to prevent buckling, opening up of joints, and over-stressing of welds and fasteners.

C. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration.

D. Preassemble signs in the shop to the greatest extent possible to minimize field assembly. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in a location not exposed to view after final assembly.

E. Conceal fasteners if possible; otherwise, locate fasteners to appear inconspicuous.

F. Form panels to required size and shape. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.

G. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.

H. Increase material thickness or reinforce with concealed stiffeners or backing materials as required to produce surfaces without distortion, buckles, warp, or other surface deformations.

I. Avoid seams in Alumalite panels when possible, if seams are unavoidable conceal them to the greatest extent possible.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.

B. Scheduling of installation by Owner or its representative implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.02 INSTALLATION

Install product in accordance with supplier's instructions.

Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance.

Install product level, plumb, and at heights indicated.

Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.

Install signs within the following tolerances and in accordance with manufacturer's recommendations:

Within ¼ inch vertically and horizontally of intended location.

3.03 CLEANING, PROTECTION, AND REPAIR

Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 10 feet as determined by Owner.

Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project in accordance with provisions in Division 1.

3.04 SIGN SCHEDULE

Schedule: Refer to signage schedule and Drawings for sizes, locations, and layout of signage types, sign text copy, and graphics.

PART 4 - MEASUREMENT AND PAYMENT

4.01 All work under this section shall be paid for at the lump sum price bid for exterior aluminum signs and shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in exterior aluminum signs, and related incidental work.

END OF SECTION

SECTION 11 68 00 - PLAY EQUIPMENT AND STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes:
1. Playground Equipment
2. GFRC Playground Features

B. Related Requirements:

1. Section 033000 "Cast-In-Place Concrete" for concrete footings and walls associated with freestanding and composite playground structures.
2. Section 312000 "Earth Moving" for preparation, compaction, and grading of aggregate bases.
3. Section 321313 "Concrete Paving" for concrete substrates.
4. Section 321816 "Playground Protective Surfacing" for shock absorbing (impact attenuating) surface material in use zones and other play areas.

1.3 UNIT PRICES

A. See Section 012200 "Measurement and Payment" for description of unit prices affecting items specified in this Section.

1.4 DEFINITIONS

A. Definitions in ASTM F1487 apply to Work of this Section.

B. Composite Playground Equipment: Two or more play structures attached or functionally linked, to create one integral unit that provides more than one play activity.

C. CPSC: U.S. Consumer Product Safety Commission.

D. Critical Height: The fall height below which a life-threatening head injury would not be expected to occur.

E. Fall Height: The vertical distance between the highest designated play surface on a piece of equipment and the protective surfacing beneath it.

F. IPEMA: International Play Equipment Manufacturers Association.

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G. Use Zone: The surface under and around a piece of equipment onto which a child falling from or exiting from the equipment would be expected to land. These areas are also designated for unrestricted circulation around the equipment.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site with owner's representative and playground representative.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of playground equipment including footing, foundations and attachment method that comply with manufacturer's recommendations, adhering to applicable state and local requirements.

1. Include plans, elevations, sections, and attachment details.
2. Include fall heights and use zones for playground equipment, coordinated with the critical-height values of protective surfacing specified in Section 321816 "Playground Protective Surfacing."

C. Samples for Initial Selection: For each type of exposed finish.

1. Manufacturer's color charts.
2. Include Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed finish

1. Manufacturer's color swatches or physical samples for all playground components.

E. Field quality control tests and inspection reports.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of playground equipment.

C. Sample Warranty: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For playground equipment and finishes to include in maintenance manuals.

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1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.

B. Installer Qualifications: An entity with at least five years' experience with installation of public playground equipment, that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer's supervisors shall be familiar with and adhere to the guidelines set forth in latest edition of the CPSC "Handbook for Public Playground Safety."

1.10 DELIVERY, STORAGE AND HANDLING

A. Playground equipment will be delivered to the Project site by the manufacturer. The Contractor shall be responsible for unloading and storage of the playground equipment on site.

B. It is the Contractor's responsibility to provide the necessary equipment to unload the playground equipment from the delivery truck and transport them to a protected storage area on site. Unloading equipment shall be all-terrain and capable to transport across all required surfaces.

1.11 PROTECTION

A. Contractor shall be responsible for maintaining system and protecting it from all damage at no cost to Owner until date of Final Acceptance. This shall include damage caused by vandalism or adverse weather conditions.

PART 2 - PRODUCTS

2.1 PLAYGROUND EQUIPMENT

A. All playground equipment work, materials and incidentals related to the playground equipment construction shall be provided by the Contractor, using the approved vendors noted below and certified installers in accordance with manufacturer requirements.

B. Approved vendor for all playground equipment and features, subject to compliance with requirements:
1. Ross Recreation. Contact: Nick Philbin, nickp@rossrec.com, (707) 538-3800.
2. Vendor to provide final design drawings and specifications and coordination for the following non-GFRC playground equipment.

C. Playground equipment:
1. Playground rules and information sign.
   a. Landscape Structures, Inc. playground rules and welcome sign
   b. Coated steel, color: to be selected by owner's representative
2. 5" Arch Swing Frame by Landscape Structures, 3-bay (Model #221292)
   a. 3-bay with two belt seats, two molded seats with harness, and two full bucket seats
   b. Arch Belt Swing - Stand-Alone Freestanding Swing Set

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3. We-Go-Swing by Landscape Structures with ramp extension (Model #277778)
   a. We-Go-Swing® - Inclusive Accessible Wheelchair Swing Set
4. We-Go-Round merry-go-round by Landscape Structures
   a. We-Go-Round - Inclusive Merry Go Round for All Kids
5. We-Saw Seesaw by Landscape Structures (Model #186490)
   a. We-saw™ - Multi-Seat Seesaw - Landscape Structures
6. Rhapsody Animato Metallophone by Landscape Structures (Model #214438)
   a. https://www.playlsi.com/en/commercial-playground-equipment/playground-components/rhapsody-animato-metallophone/
7. Rhapsody Ditty Metallophone by Landscape Structures (Model #228212)
   a. Rhapsody® Ditty® Metallophone for Toddlers & Preschoolers
8. Rhapsody Grandioso Chimes by Landscape Structures (Model #214442)
   a. Rhapsody® Grandioso® Chimes - Outdoor Instruments
9. Rhapsody Goblet Drum Junior (Model #228215)
   a. https://www.playlsi.com/en/commercial-playground-equipment/playground-components/rhapsody-goblet-junior-drum/
10. Rhapsody Kundu Drum Junior (Model #228218)
    a. https://www.playlsi.com/en/commercial-playground-equipment/playground-components/rhapsody-kundu-junior-drum/
11. Rhapsody Kettle Drum (Model #214445)
    a. https://www.playlsi.com/en/commercial-playground-equipment/playground-components/rhapsody-kettle-drum/

2.2 GFRC PLAYGROUND FEATURES

A. All playground work, materials and incidentals related to GFRC features shall be provided by the Contractor, using the approved manufacturer noted below and certified installers in accordance with manufacturer requirements.

B. Approved vendor for the GFRC playground features, subject to compliance with requirements:
   1. ID Sculpture, Contact: Colin MacDonald, Colin.MacDonald@idsculpture.com, 970.641.1747 x1004.

C. GFRC Features:
   1. Custom redwood tree climber by ID Sculpture, with ADA ramp by Playcraft
   2. Cast Concrete 4ft Modular Embankment Slide by ID Sculpture (Model #MES004)
      a. https://idsculpture.com/catalog/4ft-modular-embankment-slide
   3. Humpback Whale climber (Model #TC023)
      a. https://idsculpture.com/catalog/humpback-whale
   4. Large Morphe Dome with modifications by ID Sculpture (Model #SC218-3)
      a. https://idsculpture.com/catalog/morph-dome
   5. Lighthouse Rock climber by ID Sculpture
      a. Lighthouse Rock

2.3 PERFORMANCE REQUIREMENTS

A. Safety Standard: Provide playground equipment according to ASTM F1487.

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2.4 FABRICATION

A. Protective Barriers: Fabricate according to ASTM F1487. Extend barriers to height above the protected elevated surface according to requirements for use by age group indicated. Fabricate from one or more of the following:

B. Guardrails: Provide guardrails configured as indicated on the Drawings. Fabricate from welded metal pipe or tubing. Extend guardrails according to requirements for use by age group indicated.

2.5 CAST-IN-PLACE CONCRETE

A. Concrete Materials: Comply with requirements in Section 033000 "Cast-in-Place Concrete."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for earthwork, subgrade elevations, surface and subgrade drainage, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading, concrete substrates, shotcrete, and curbs required for placing playground equipment and protective surfacing is completed.

B. Use Zones: Use zones for all playground equipment shall be marked and verified to not conflict with adjacent site features and other use zones prior to playground equipment installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written installation instructions for each equipment type unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.

1. Maximum Equipment Height: Coordinate installed fall heights of equipment with finished elevations and critical-height values of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.

B. Post and Footing Excavation: Excavate holes for posts and footings to sizes indicated and directed by manufacturer's instructions in firm, undisturbed or compacted subgrade soil. Freestanding posts with toppers require deep concrete footing. Provisions shall be made for using blockouts or core drilling the concrete substrate for footing installation.

C. Post Set by Surface Mounting: Surface mount play equipment where indicated by manufacturer instructions. Verify use zones prior to setting anchors or drilling holes for anchors by installing

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as much of the play equipment as able without drilling. Once use zones are verified by Owner's Representative or Owner, proceed with drilling and installing anchors.

D. Follow equipment manufacturer's written instructions and drawings to ensure correct installation of anchorages for equipment.

E. Install play equipment and standalone posts per manufacturer's written installation instructions for each equipment/post type unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.

F. Upon completion of installation, the play equipment and standalone posts shall be inspected by a certified playground inspector, contracted by Owner, ensuring all components are installed per CSPC guidelines. Any part of the play structure that is not in compliance will be adjusted accordingly, at no additional cost to Owner.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative, unless directed otherwise.

1. Perform inspection and testing for each type of installed playground equipment according to ASTM F1487.

C. Playground equipment items will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

E. Notify Owner 48 hours in advance of date(s) and time(s) of testing and inspection.

END OF SECTION 11 68 00

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SECTION 22 14 00

STORM DRAINS

PART 1 – GENERAL

The work to be done under this section shall include the furnishing of all materials, labor, tools, equipment, and necessary incidentals to install new storm drainpipe complete and in place.

PART 2 – PRODUCTS

2.01 PIPE

Storm drainpipe shall be dual wall corrugated high density polyethylene pipe with smooth interior with integral bell conforming to AASHTO M294, Type S, such as manufactured by ADS, Inc. N-12 ST IB pipe, or equal. Joints shall be "watertight" meeting the requirements of ASTM D3212. Storm drainpipe shall be of the size designated on the Plans. Fittings shall meet the requirements of AASHTO M294.

Pipe shall use an integral bell and spigot joint meeting AASHTO M294. The joint shall be joined water tight. The outside diameter of the integral bell and spigot joint shall not be more than 2 inches greater than the average outside diameter of the pipe barrel.

Contractor shall submit manufacturer's and supplier's certification that pipe and fittings provided comply with these Special Provisions.

2.02 IMPORT MATERIALS

For any import materials the Contractor proposes to use in the backfill of any excavation, the Contractor shall submit test reports from a certified laboratory demonstrating the proposed material complies with these Special Provisions. Import materials include, stabilization material, bedding material, embedment material, backfill, slurry, concrete, and aggregate base material.

2.03 GEO-TEXTILE

Geo-textile shall be GEOTEX 2X2HF as manufactured by Propex, Marafi 600X as manufactured by TenCate, or equal woven polypropylene fabric grid fabric. Contractor shall submit manufacturer's data sheets for the geo-textile to be used according to Section 31 20 00.

PART 3 – EXECUTION

3.01 GENERAL

The Contractor shall provide all labor, materials, tools, equipment, and necessary incidentals, to install storm drainpipe as indicated on the Plans, described herein or as otherwise required for a complete job.

Before excavation for the installation of any storm drain near where there are buildings possibly connected to the sanitary sewer system, the Contractor shall locate, by "pothole" excavation, all existing sewer service laterals adequately to determine if there is any conflict with the storm drain installation.

Contractor shall bypass all storm water flows around his work. The bypassed flows shall be discharged to the existing storm drainage system. Bypasses shall not overload the capacity of the storm drainage system being used.

3.02 PIPE HANDLING

Care shall be taken during transporting of the pipe to ensure that the pipe is not cut or damaged in any manner. Pipe bowed, deformed, cut, or otherwise damaged during shipping or storage will be rejected.

Pipe stored on the job site shall be covered with canvas or other opaque material to protect it from the sun's rays. Air circulation shall be provided under the covering.

The pipe, especially the inside of the pipe and ends, shall be kept clean at all times, including while stored, during and after laying.

3.03 TRENCH EXCAVATION

The Contractor shall complete all excavation regardless of the type, nature, or condition of the materials encountered.

Existing buildings, power and telephone lines, fences, waterlines, storm drains or other conduits, curbs, sidewalks, and other structures in the vicinity of the work shall be supported and protected from injury by the Contractor during the construction and until the completion of the work. The Contractor shall repair, at his/her expense, any damage to such facilities.

Existing asphaltic pavement shall be saw cut, wheel cut or ground out to the limits shown on the Plans or, where not shown on the Plans to the anticipated limits of the excavation. The asphaltic concrete pavement edges must be saw cut prior to re-paving. Asphaltic concrete must be removed from the Project area.

Contractor shall "pothole" at each end of a section of storm drain that connects with existing storm drains before excavating the trench between ends in order to establish the alignment for the storm drain to be installed. The alignment shall be approved by the Engineer prior to trenching that section.

The Contractor shall control excavations and stockpiling in a manner to prevent water

from entering the excavations.

Contractor shall keep all excavations free of water during construction in accordance with the approved Dewatering Plan.

If the trench width or depth exceeds that shown on the Plans, the additional bedding, embedment and backfill materials required shall be supplied and installed at no additional cost.

Excavated pipe, fittings, manholes, organic debris, and material determined by the Engineer to be unsuitable shall be immediately removed from the Project area.

Where concrete pavement, including street pavement, sidewalks, and pedestrian walkways, are to be removed, it shall be saw cut or removed at existing full-depth joints. All concrete pavement shall be removed from the Project area.

Except where excavated soils will be used for backfill, the Contractor shall remove all excavated material from the Project site.

Disposal of excavated material is the responsibility of the Contractor. The Contractor shall be responsible for all costs associated with disposal of materials produced from excavation. The Contractor shall obtain the required permits for disposal of materials produced during excavation.

3.04 PIPE LAYING

The pipe shall be carefully lowered in the trench to prevent damage. Pipe shall not be dropped or dumped into the trench.

Pipe shall be placed online and grade in accordance with the Plans or as modified by the Engineer. Some deviation in the horizontal alignment may be required to properly connect with junction boxes.

The maximum deviation for storm drainpipe is 0.25 feet for horizontal alignment and 0.02 feet for flow grade.

The pipe shall be placed on an unyielding foundation true to the approved line and grade with uniform bearing under the full length of the pipe with hand excavation (bell holes) at the couplings. In no case shall the pipe be supported by the coupling or bell. Pipe shall be centered in the trench.

The pipe must not be placed in water. The trench must be dewatered as provided **in Section 31 23 19, "Dewater Excavations"** before placing any bedding material or stabilization material.

Cut pipe as recommended by the pipe manufacturer. Dress cut ends as recommended by the coupling and/or pipe manufacturer.

Pipe, especially the ends, shall be carefully cleaned before the pipe is joined. Whenever work ceases for any reason, the end of the pipe shall be closed with a watertight fitting, plug or cover. The interior of the pipe shall be kept free from dirt, foreign material or debris as the work progresses and the pipe shall be cleaned after completion.

Join pipe in accordance with the manufacturer's recommendations. Lubricant if required or recommended, shall be furnished by the pipe manufacturer, and no substitutes will be permitted.

Where specific items are not covered within these Special Provisions, reference shall be made to the manufacturer's suggested specifications and installation guides.

Pipe shall be connected at manholes and/or junction boxes by either a grouted connection or a precast connector as detailed in the Plans.

3.05 STABILIZATION MATERIAL

Where soft, wet, or spongy conditions are encountered in the trench at the pipe subgrade (or structure base sub-grade), and the soil is determined to be unsuitable by the Engineer as a foundation material, the trench (or structure base) shall be over excavated as directed by the Engineer and Stabilization Material shall be imported and installed.

The geotextile grid fabric shall be placed across the bottom of the excavation and up the sides. No lap or splice is allowed parallel to the pipeline; only transverse laps of at least 12 inches will be permitted. After placement of the geotextile, stabilization material can be placed and compacted.

Stabilization material shall consist of uniformly graded coarse aggregate of which at least 25% by weight shall be crushed particles. The percent composition by weight shall conform to the following grading:

Sieve Size	Percent Passing
3"	100%
¾"	0% - 5%

Stabilization material shall be compacted to a minimum of 90% relative compaction.

Payment for Stabilization Material will be made only if approved by the Engineer prior to installation.

3.06 BACKFILL

The Contractor shall be solely responsible for providing the correct compaction equipment

and techniques to achieve the compaction standards. All costs involved with achieving compaction standards shall be the Contractor's responsibility.

Except where designated on the Plans excavated soils may NOT be used as trench backfill. All backfill material shall be 3/4-inch maximum Class 2 Aggregate Base conforming to Section 26 of the Standard Specifications.

Backfill material, above the pipe embedment zone, up to within 24 inches of the finished surface, shall be placed in lifts not to exceed 12 inches and compacted to a relative compaction density as indicated on the Plans, but in no case less than 90%.

Backfill material around structures, such as but not limited to junction boxes, shall be compacted to 95%.

Backfill materials shall be manually or mechanically compacted. Jetting will not be allowed. Care shall be taken not to damage or displace any pipe, manholes or any structure or utility with compacting operation.

Stabilization, bedding, pipe embedment and backfill materials shall be placed and compacted in accordance with the requirements of 31 20 00, "Earth Moving", and as shown on the Plans.

The placement and compaction of embedment material and backfill shall be accomplished in a manner that does not disturb the pipe.

The moving and/or removal of shoring, sheeting, trench boxes or shields or any other means of trench support shall not disturb the pipe location, jointing or its surrounding embedment material. Any voids left in the embedment or backfill material shall be carefully filled and compacted to the requirements of the material surrounding the void.

The removal of shoring shall not disturb the pipe, junction box or other structure or utility or cause the loss of compaction of the bedding, embedment or backfill material. Voids created by removal of shoring shall be filled with material and compacted to the requirements of the adjacent trench backfill.

3.07 BEDDING MATERIAL

Bedding material shall be ¾ inch maximum Class 2 Aggregate Base conforming to Section 26 of the Standard Specifications. Bedding material shall be compacted to a minimum of 90% relative compaction.

3.08 EMBEDMENT MATERIAL

Embedment material (haunch and cover) shall be ¾ inch maximum Class 2 Aggregate Base conforming to Section 26 of the Standard Specifications. Embedment material shall be placed in layers, each layer not to exceed 8 inches and compacted before the placement of the next layer. Embedment material shall be worked under both sides of the pipe in the haunch area to provide uniform support. The embedment material shall be filled to an elevation of 12 inches above the top of the pipe. All materials placed in the pipe embedment zone shall be compacted by hand, light mechanical equipment or other means that will not damage or move the pipe. Embedment material shall be compacted to 90% relative density.

The Contractor's testing agent shall determine if the required compaction standards have been achieved according to the results of compaction testing per California Test 216 or 231. A failing test indicates that the required compaction standards have not been achieved. Trench or other fill areas that fail compaction tests shall be reworked or re-excavated and replaced, if necessary, at no additional cost to the City.

The Contractor's testing agent will make compaction tests when advised by the Contractor that the densities have been achieved. The Contractor shall give the Engineer at least 24 hours' notice that compacted material is ready to be tested. Failure to give adequate notice can result in testing delays which will be the responsibility of the Contractor. The Engineer shall determine the number and location of tests required. Contractor shall, at no cost to the City, make all excavations needed to perform the compaction tests. Excavations for compaction tests shall be backfilled with material similar to that excavated and compacted to the specified density.

It is estimated that approximately one compaction test will be taken for every 100 feet of trench. The quantity of tests does not include those tests that fail to meet the specified relative density. The number of tests may be increased or decreased based on Contractor performance in meeting compaction requirements (high failure rate means more tests; low failure rate means fewer tests).

The Contractor shall not proceed with placement of succeeding lifts of material until the previous lifts have achieved the specified compaction. Failure to comply with this requirement will result in the rejection of all lifts above the failing layer.

The Contractor will bear the cost of all compaction testing.

3.09 GUARANTEE

The Contractor shall guarantee his work against settlement for a period of one year after filing the Notice of Completion. The Contractor shall repair, at his expense, any settlement within that time. Settlement will be deemed to have occurred if:

1. City streets or concrete walkways: a depression of 0.05 foot below the lower edge of a 12-foot straight edge.
2. Unpaved areas: a depression of 1½ inches below the average of the sides of the uncut area.
3. Any settlement that causes drainage problems, such as ponding of water, or concentrates flowing water resulting in soil erosion.

3.10 CLEANING

The pipe shall be kept clean at all times. After backfill has been placed and junction boxes installed, the pipe (whether new or existing), junction boxes (whether new or existing), drainage inlets (whether new or existing), and all other components of the storm drain system shall be cleaned of any accumulated debris. No debris of any type shall be allowed to remain in the finished installation. Debris cleaned from the line shall be removed at each manhole, drainage inlet, or junction box. Debris shall be removed from the job site. Use of cleaning pig is required.

All existing storm drains that will remain in service at end of project shall be cleaned by mandrel or cleaning pig of an appropriate diameter within 60 days of notice to proceed.

3.11 INSPECTION

After initial cleaning of existing storm drains to remain, the City may preform inspections and make additional repair recommendations and requests.

After completion of the storm drainpipe, including junction boxes and the placement of backfill the storm drain pipe may be television inspected by the City. Any defects in the pipe, debris encountered, leaks observed, open joints, excessive deflection (5% of the average inside diameter), or any other defects in material or workmanship shall be corrected by the Contractor.

Where infiltration is observed, the Contractor shall make the necessary repairs to eliminate any visible infiltration. All visible leakages shall be repaired regardless of test results. Repairs shall be made at no cost to the City.

Any cracks, open joints or other defects shall be repaired by the Contractor at no cost to the City, even if no infiltration is observed.

For one year after Project completion, the City may, at its expense, conduct such additional inspections and tests it deems necessary, such as television inspection and mandrel deflection test. If any defect is observed, including but not limited to cracks, leaks, offset or separated joints or excessive deflection, the Contractor shall, at his/her expense, make the necessary repair(s) to correct the defect(s). (Excessive deflection is that exceeding 5% of the average inside diameter of the pipe.) The corrective work shall be commenced within 30 days of notification of the test results. The methods of correction shall be subject to the City's review and approval.

END OF SECTION

SECTION 22 26 22

PVC GRAVITY SEWER PIPE

PART 1 — GENERAL

1.01 SECTION INCLUDES

This section includes requirements to furnish, install, make the joints, and test PVC gravity sewer pipe and appurtenances as shown on the drawings and as required by these Specifications.

1.02 RELATED SECTIONS

A. Section 31 23 16: Trenching and Trench Backfilling

B. Section 03 48 00: Precast Concrete Manholes & Installation

C. Section 22 26 50: Testing for Acceptance of Sanitary Sewers

1.03 REFERENCES

A. ASTM D 2241 – Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series)

B. ASTM D 2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

C. ASTM D 3034 – Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe Fittings

D. ASTM F 679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings

1.04 SUBMITTALS

A. Submit for review completely detailed working drawings and schedules of all PVC pipe and fittings required.

B. Submit all product data

C. Submit for review the proposed exfiltration and/or infiltration testing method.

PART 2 - PRODUCTS

2.01 PVC GRAVITY SEWER PIPE

A. PVC pipe and fittings shall be solid wall PVC gravity sewer pipe conforming to ASTM D 3034, for Type PSM PVC, (SDR 35) in sizes 4-inch through 15-inch

and Section 22 26 22 PVC Gravity Sewer Pipe 22 26 22-2

ASTM F679 for Type PS46 PVC for 18-inch and larger. All piping shall be thoroughly inspected by the contractor and the Owner's Representative upon delivery, and any pipe not conforming to the above requirements will be rejected and shall be removed immediately from the Work Site by the Contractor. The Owner's Representative will apply all standard tests of the pipe necessary to assure conformity with the specifications. All such tests shall be made in accordance with the methods prescribed by, and the acceptance or rejection of PVC pipe shall be based upon the ASTM Standard Specifications referred to above.

B. Standard pipe lengths not greater than thirteen (13) feet shall be used on the Work.

C. Pipe out of round, or otherwise defective will be rejected even though it meets the strength requirements of the specifications. Rejected pipe shall be removed from the site at once.

D. Attention is called to the proper method of stacking integral bell gasketed joint pipe. To avoid stress in the bell end of the pipe due to a pipe resting thereon, the pipes shall be stacked with bell ends projecting from the stack in opposite directions for alternate rows. The bottom row of pipe shall be supported free of the ground.

E. Limitations:

- PVC pipe is not allowed under roadways
- beyond the edge of pavement, SDR 26 PVC is acceptable in or out of the R/W for mainline and laterals at depths up to 15 feet.

2.02 PVC FITTINGS

A. PVC gravity sewer fittings shall meet the requirements of ASTM D 3034 Type PSM Poly (Vinyl-Chloride) (PVC) Sewer Pipe and Fittings for sizes 4-inch through 15-inch, and ASTM F679 Poly (Vinyl-Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings in sizes 18-inch and larger.

B. All pipe and fittings shall have integral bell gasketed joints especially engineered for gravity sewer mains and laterals. Rubber gaskets conforming to ASTM F477 shall be factory installed in a precision formed recessed groove.

C. Laying instructions of the manufacturer of the pipe and joint shall be followed explicitly. Examine each bell and spigot end to determine whether the preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected.

PART 3 - EXECUTION

3.01 LAYING PVC PIPE

A. Gravity sewer lines shall be laid according to the details shown on the drawing or specified herein, and according to the applicable portions of ASTM D2321 – Section 22 26 22 PVC Gravity Sewer Pipe 22 26 22-3 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

B. The trench bottom shall be graded to the proposed elevation of the pipeline and the bottom shaped to fit the lower quadrant of the pipe. Holes shall be excavated at each bell so the pipe is supported along the barrel only. Pipe bedding shall be described in Section 31 23 16 – Trenching and Trench Backfilling.

C. Pipe shall be protected during handling against impact shocks and free fall. Pipe laying shall not precede backfilling by more than 100 feet unless limited further by the Owner's Representative.

D. Laying pipe in finished trenches shall be commenced at the lowest point, with the spigot ends pointing in the direction of flow. The interior of the pipe and the jointing seal shall be free from sand, dirt, and trash before installing in the line. Extreme care must be taken to keep the bells of the pipe free from dirt and rocks so joints may be properly assembled without overstressing the bells. Pipe jointing shall be done in strict accordance with the pipe manufacturer's instructions and shall be done entirely in the trench.

E. PVC pipe shall have tracer wire to be traced by electronic means. This can be achieved by placing twelve- (12-) gauge wire over the pipe in the trench and connecting it to the manhole frame. The tracer wire shall terminate at the cleanout, located in the right-of-way.

F. Each time the work on the sewer is halted for more than one (1) hour, the ends of the pipe shall be sealed by means of a commercially manufactured plug to prevent foreign material from entering the pipe.

3.02 Y-BRANCHES

A. PVC Y-branches shall be manufactured with watertight preformed joints suitable for use with PVC gravity sewer pipe. Each Y-branch shall be provided with a PVC plug. The Y-branches shall be installed as detailed on the plans at locations indicated by the Owner's Representative in the field.

B. The manhole drops, where indicated on the plans, shall be constructed of ductile iron pipe and fittings as detailed on the plans and encased in concrete.

C. Stubs for future pipe connections shall be installed from the main to the

property line (right-of-way) at locations as shown on the drawings. Stubs shall be PVC gravity sewer pipe with a PVC plug.

3.03 TESTING AND CLEANING

A. See Section 22 26 50 – Testing for Acceptance of Sanitary Sewers

B. Cleaning

1. At the conclusion of the work the Contractor shall thoroughly clean all of the pipe by flushing with water or other means to remove all dirt, stones, pieces Section 22 26 22 PVC Gravity Sewer Pipe 22 26 22-4 of wood, or other material entering during the construction period. Debris cleaned from the lines shall be captured and removed from the lowest outlet. If, after this outlet cleaning, obstructions remain, they shall be removed. After the pipe is cleaned and if the groundwater level is above the pipe, or following a heavy rain, the Owner's Representative will examine the pipe for leaks. If defective pipes or joints are discovered at this time, they shall be repaired by the Contractor.

END OF SECTION

SECTION 26 01 00

ELECTRICAL GENERAL REQUIREMENTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

Work of this Section is bound by General Conditions, Supplementary Conditions and Division 1 bound herewith in addition to this specification and accompanying drawings.

1.02 REGULATORY REQUIREMENTS

A. CODES AND STANDARDS

Conform to all Utility Company requirements and to all applicable codes, laws, ordinances, rules, and regulations. The apparatus, equipment, materials, and installation shall conform with standards of NEMA, UL IEEE, NEC, NFPA and all local codes, laws, or ordinances.

B. PERMITS

Contractor will pay all fees and charges required by utilities having jurisdiction over this work.

C. INSPECTIONS

Arrange for inspections and tests required by codes or ordinances during construction.

1.03 CUTTING AND PATCHING

Follow requirements specified in General and Supplementary Conditions.

1.04 VISIT SITE

Visit site of proposed work and become familiar with all job conditions affecting work. No additional allowances will be granted because of lack of such information.

1.05 COORDINATION WITH OTHERS

Examine Architectural, Structural, Civil, and Mechanical Plans and coordinate work to avoid conflicts, errors, and delays. Location of electrical outlets and

equipment shown on plans is approximate. Verify exact location of all outlets and equipment shown by taking measurements on job and checking other drawings.

1.06 MINOR CHANGES

Make minor changes in outlet and equipment locations as directed or required before rough in without cost to Owner.

1.07 GENERAL DESCRIPTION OF SYSTEM

Work specified under this Section relates to basic power distribution systems, pieces, and parts thereof and their installation through which power consuming devices obtain electricity, lighting, communication, and miscellaneous items.

Electrical Drawings are diagrammatic and do not necessarily show all raceways, wiring, number, and types of fittings required.

Provide all related Electrical Work specified herein diagramed or scheduled on Electrical Drawings, required by code, enforcing agencies, and as required for complete and operating electrical systems.

Provide a complete and operating project. Include all labor, materials, equipment, and transportation necessary for execution of work. By submitting a proposal, Contractor represents he has made thorough examination of site and existing conditions and limitation; he has examined contract documents and has determined the Drawings, Specification, and existing conditions are sufficient, adequate, and satisfactory for contract work.

1.08 QUALITY ASSURANCE

A. QUALIFICATIONS OF INSTALLERS:

1. For actual fabrication, installation, and testing of Work of this Section, use only thoroughly trained and experienced personnel familiar with requirements for this Work and with installation recommendations of Manufacturers of specified items.

2. In acceptance or rejection of installed electrical systems, no allowance is made for lack of skill on part of installers.

B. CRITERIA:

1. Conform Work with conditions shown and specified.

2. Where adjustments or modifications of Work, or of items used therein, are necessary for fabrication and installation of items, or for

resolution of conflicts between items, make such adjustments at no added expense to Owner.

3. Submit adjustments or modifications of Work affecting functional or aesthetic design of Work

4. Pay for all equipment relocations or modifications necessitated by failure to coordinate Work, or to advise Engineer of conflicts.

5. Obtain Engineer's approval before cutting, notching, or patching structure according to General Conditions.

6. Electrical Sleeves and Openings Through Concrete: Responsibility for this by Contractor, carefully coordinated with the General Contractor and the other trades involved. Patching and sealing around all openings shall be done by the contractor.

7. Select equipment to meet design conditions stated and be responsible for meeting technical data and performance requirements of the system.

1.09 SUBMITTALS

A. BROCHURES

Submit four (4) sets of brochures enclosing catalog information and where required, shop drawings on materials to be furnished. Each item shall be reviewed by Contractor and stamped approved before forwarding to Engineer. Submittals that do not follow this format will be returned without approval.

Brochures shall include, but not be limited to the following:

1. Panel Boards.

2. Wiring devices and plates.

3. Conduits and wiring.

4. Lighting fixtures and control equipment.

Each brochure must include all the above items. Submittals of individual items will not be accepted.

Do not order or manufacture equipment until full approval received from Engineer when indicated on review stamp.

Submit, where applicable, certificates denoting conformance to standards adopted by recognized organizations such NEMA, UL, OSHA, etc.

1.10 PRODUCT APPROVAL

The meaning and intent of this statement, when affixed to Shop Drawings and catalogs which were prepared and submitted to the Engineer ("the submittal"), means that the Engineer has reviewed the submittal and finds no objection (except for those noted thereon or in correspondence) to inclusion of any items or work indicated in the submittal.

A. REQUIREMENTS FOR APPROVAL

1. Work and product complies with Contract Drawings and Specification as to quantities, space requirements, and dimensions.
2. Work or product does not interfere with other trades.
3. Work or product is not the cause of union tradesmen disputes.
4. Work or product does not infringe on patent rights.
5. Work or product does not cause injury or damage to persons or property.
6. Work or product complies with OSHA regulations.

Approval of the submittal does not relieve Contractor of any Contractual responsibilities.

1.11 SUBSTITUTIONS

Substitutions will only be considered by written request, and only in accordance with Division 1 of this specification.

1.12 OPERATION AND MAINTENANCE MANUALS

A. SCOPE

Following the approval and installation of all electrical equipment and prior to acceptance of the Electrical Work, the contractor will prepare a manual describing the operations, servicing, and maintenance requirements for all electrical equipment and systems installed. Manuals should be prepared for equipment specifically but not limited to that which is described in Division 26 of this specification.

B. FORMAT

1. Equipment Described in the Manuals:

   a. All equipment listed in "Submittals" and called for on drawings and in specifications.

   b. All other auxiliary miscellaneous systems.

2. Information Contained in the Manuals:

   a. Catalog data on lights including catalog number and manufacturer.

   b. Diagrams complete for each system installed.

   c. Manufacturer's printed operating and maintenance instructions.

   d. Parts List, including current prices, and recommended spare parts to be maintained in storage.

3. Physical Form of the Manuals:

   a. Enclose each manual in a three-ring post-type binder.

4. Exterior Information on the Manuals:

   a. Name and Type of Electrical Equipment.

   b. Name of Owner.

   c. Year Completed.

   d. Names of Architect, Engineer, and Contractor.

1.13 RECORD DRAWINGS

Provide in accordance with Division 1 of these specifications. Show all deviations from contract drawings by accurate dimensions from building lines.

1.14 GUARANTEE

Guarantee all Work included in this Specification for period of one (1) year from date of final acceptance unless otherwise noted in accordance with the General Conditions.

During that period, remedy without delay or expense to Owner any defects that are not the result of misuse or abuse on part of the Owner.

PART 2 – PRODUCTS

2.01 MATERIALS

All materials shall be new of the quality herein specified, free from defects and approved by the Underwriter's Laboratories, Inc. Each type of material shall be of the same manufacture throughout the building.

2.02 UL APPROVAL

All materials and equipment, within scope of the UL reexamination service shall be approved by Underwriter's Laboratories for the purpose for which they are used and shall bear their label.

2.03 CORROSION PROTECTION

Provide corrosion protection for ferrous metalwork exposed to weather by hot dip galvanizing, or factory painted finish suitable for outdoor installations.

PART 3 – EXECUTION

3.01 GENERAL

A. INSPECTION:

Prior to Installation of the work of this Section, carefully inspect the installed work of others and verify that all such work is complete to the point where this installation may properly commence.

B. DISCREPANCIES:

Do not install work of this Section until all unsatisfactory conditions have been corrected. Commencing any work denotes acceptance of existing conditions.

3.02 SCHEDULING OF WORK

Schedule work to maintain progress and avoid conflicts with various trades. Coordinate with General Contractor to provide access for installing large equipment. Coordinate with other work contracted by the owner outside of this contract that may affect the installation of components provided under this contract.

3.03 MANUFACTURER'S INSTALLATION DETAILS

Where available, details shall be followed exactly. Special wiring of fittings required shall be provided.

3.04 ENCLOSING UNINSPECTED WORK

Do not cover up or enclose work until it has been properly and completely inspected and approved.

3.05 PROTECTION OF WORK

1. Protect other Work against damage and discoloration caused by Work of this Section.

2. Protect against displacement and intrusion by foreign matter.

3.06 EXCAVATION AND BACKFILLING

1. The Electrical Contractor shall coordinate with General Contractor for all necessary excavation and backfill for installation of underground facilities as shown on drawings, depth per Code requirements unless otherwise indicated.

2. Backfill in layers not exceeding 8 inches deep and compact to 95% of maximum density at optimum moisture to preclude settlement.

3. Backfill with a final 8 inches of clean soil on top of excavated material.

4. Following backfill, grade all trenches to the level of surrounding soil. All excess soil shall be disposed of at the site as directed.

5. It shall be the responsibility of this Contractor to determine location of new underground water, sewer, telephone, and electric lines. Locate accurately on ground surface and for depth of same before excavation. Uncover by hand digging. Power digging equipment may be used only in direction away from new facilities.

3.07 CUTTING STRUCTURAL FRAMING

Cutting exposed members is not permitted unless shown on the Drawings or otherwise approved.

3.08 CLEANING

Upon completion of work of this Section, promptly remove from the working area all scraps, debris, and surplus material of this Section.

3.09 COMPLETION

Final Acceptance occurs when the entire installation is turned over to Owner in a finished and satisfactory working condition. See Special Provisions / Division 1.

END OF SECTION

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 SUMMARY

A The intent of this Division's Specifications and Drawings is to provide a complete and workable facility, with complete systems as required by applicable codes, as indicated, and as specified.

B Provide a complete and workable facility with complete systems that comply with the requirements of the state codes, local codes, and other authorities having jurisdiction. Include design, labor and materials required to install, test and place into operation the systems as called for in the Contract Documents and according to applicable codes and regulations.

C Specifications and the accompanying Drawings are complementary and what is called for by one is as binding as if called for by both.

D The General and Supplemental Conditions apply to this Division, including but not limited to:
1. Drawings and Specifications.
2. Public ordinances and permits.
3. Payments and fees required by governing authorities for work of this Division.

E The Drawings that accompany this Division are diagrammatic. They do not show every offset, bend, tee, or elbow, which may be required to install work in the space provided and avoid conflicts with other construction.

F Provide connections, raceway, wiring, breakers and installation required for systems specified, as required by the manufacturers installation documents, and for complete system functionality.

G Offsets and transitions are to be assumed at a minimum at each crossing of services, structural penetrations through shear walls or beams, structural grids, where ceiling heights are restricted, and at piping and conduit mains.

H Follow the Drawings as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions, and without additional cost to the Owner. Significant deviations from the routing shown on the drawings is subject for approval prior to installation. The right is reserved by the design team to make reasonable changes in locations of system components prior to roughing-in, without cost impact.

I Verify dimensions, field conditions, quantities, and measurements prior to installing work.

J Work done under this Division of the specifications includes the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings or as specified herein.

K Work installed contrary to Drawings and Specifications is subject to change as directed by the Owner and no extra compensation will be allowed for making those changes.

1.02 PRICE AND PAYMENT PROCEDURES

A Allowances
1. Comply with Division 01, General Requirements.

1.03 RELATED REQUIREMENTS

A Division 00, Procurement and Contracting Requirements

B Division 01, General Requirements

C Division 07, Thermal and Moisture Protection

D Division 08, Openings

E Division 09, Finishes

F Division 11, Equipment

G Division 21, Fire Suppression

H Division 22, Plumbing

I Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

J Division 25, Integrated Automation

K Division 26, Electrical
L Division 31, Earthwork
M Division 33, Utilities

1.04 REFERENCES

A References, Codes and Standards per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, individual Division 27 Sections and those listed in this section.

B Codes and Standards:

1. Comply with applicable sections of the most recent editions and addenda of following for interior and exterior installations.
2. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
   a. IBC - International Building Code
   b. NEC/NFPA 70 - National Electrical Code
   c. ANSI/IEEE C2 - National Electrical Safety Code
   d. ANSI - American National Standards Institute
   e. NEMA - National Electrical Manufacturers Association
   f. NFPA - National Fire Protection Association
   g. NECA - National Electrical Contractors Association
   h. NETA - National Electrical Testing Association
   i. IEEE - Institute of Electrical and Electronic Engineers
   j. UL - Underwriters Laboratories
   k. [FED SPEC - Federal Specifications]
   l. [FAR - Federal Acquisition Regulation]

1.05 ADMINISTRATIVE REQUIREMENTS

A Coordination

1. Review Drawings of other trades and Owner provided equipment to avoid conflicts.
2. Report potential conflicts to Architect, provide resolution prior to rough-in.
3. Architectural Drawings take precedence regarding exact placement of system components and equipment.
4. Verify the physical dimensions of equipment to fit the space available.
5. Coordinate access routes through the construction, equipment move-in planning, and provide required equipment, transport and services necessary to facilitate installation of equipment.
6. Where connections are required for equipment provided as Work of other Divisions, coordinate rough in and connection requirements for that equipment with its supplier and installer prior to commencing work.
7. Notify Architect of any discrepancies between the actual rough in and connection requirements, and those identified on Drawings for resolution prior to installation.
8. Coordinate underground work with other trades working on the site.
   a. Common trenches may be used with other trades, providing clearances required by codes and ordinances are maintained.
9. Coordinate installation of required supporting devices and set sleeves in architectural and structural components as they are constructed.
10. Coordinate location of access panels and doors for items concealed behind finished surfaces with Architect.
11. Coordinate sleeve selection and application with firestopping specified elsewhere.
12. Finishes: Coordinate with Architect, finish to match surrounding surfaces.
13. Layout Drawings:

a. The documents represent the design intent for the systems on the project. They do not indicate means and methods.
b. For projects with existing conditions and renovations, the documents do not represent the installed systems or installations.
c. Equipment arrangement shown on Drawings is diagrammatic to indicate general equipment sizing and spatial relationship. Include, as part of distribution equipment submittal, a scaled floor plan, which includes equipment shown with their submitted sizes. Include feeder conduit routing, both aboveground and underground, including termination points at equipment. Submit for Engineer's review prior to commencing work.
d. Provide additional wiring details at switchboards, motor control centers, and other areas where work is of sufficient complexity to warrant additional detailing for coordination.
e. Equipment layouts will comply with all code required clearance and working areas and any additional required maintenance clearance and access areas.
f. Submit layout drawings for approval prior to commencing field installation.

14. Arrange raceways, wiring, and equipment to permit ready access to switches, motors, and control components.
    a. Keep doors and access panels clear.
15. Coordinate electrical, telephone, and other utility services with the appropriate serving utility.
    a. No additional compensation will be allowed to the Contractor for connection fees or additional work or equipment required by the serving utility, but not covered in the Drawings or Specifications.

B Sequencing
1. The electrical work of this project is complex in nature and has an inherent sequence, which may not be readily discernable.
2. Implement construction sequences to be the least impactive possible to current facilities and services. Where current services are required to be maintained, provide necessary equipment such temporary generators and all connections to minimize downtime and cutovers.
3. Submit construction sequences for review and coordinate sequencing with other trades.
4. Construction sequences may be provided as part of the design documents. Where provided, review, provide comments and input. The sequences indicate the general natural of the work are provided as a guide. Provide further development of the construction sequences as required to perform the work.

C Permits
1. Obtain permits and inspections for the installation of work and pay charges required. Deliver certificates of inspection issued by authorities to the Owner.

1.06 SUBMITTALS
A General Submittal Requirements:
1. Refer to Division 00 and Division 01 for general submittal requirements.
2. Requirements set forth in this Section pertain to all specifications included in this Division of work.

B Pre-Bid Submittal Requirements
1. Submit Questions and Substitution Requests before the Questions deadline, defined in Division 00 and Division 01.

C Bid Submittal Requirements
1. Refer to individual Division sections for specific requirements due with Bid.

D Contractor Responsibilities:
1. Provide submittals one time and organized in proper order.
2. Indicate deviations from Drawings and Specifications explicitly in the submittals. Failure to comply will void review automatically.

E Submittal Schedule:
1. General:
   a. Submit a schedule that is coordinated with the project construction schedule.
   b. Allow for time required for review of submittals, making corrections/revisions to submittals, ordering, manufacturing, fabrication, and delivery.
2. Submittal Schedule to include the following for each submittal as a minimum:
   a. Identify submittal by specification section number and title.
   b. Date the item will be submitted. Arrange items in chronological order by scheduled date for first submittal.
   c. Identify critical submittals and long lead items explicitly.
   d. Submittal Category:
      1) Product Data
      2) Coordination Drawings
      3) Shop Drawings
      4) Samples
      5) Construction Sequences
      6) Certificates
      7) Delegated Design Submittals
      8) Test and Evaluation Reports
      9) Manufacturers' Instructions
      10) Source Quality Control
      11) Site Quality Control
      12) Manufacturer Reports
      13) Sustainable Design
      14) Qualification Statements
   e. Closeout Submittal Category:
      1) Maintenance Contracts
      2) Operations and Maintenance Data
      3) Bonds
      4) Warranty Documentation
      5) Final Test and Evaluation Reports
      6) Record Documentation
      7) Demonstration and Training
      8) Sustainable Design Closeout
      9) Software

F Product Data:
1. General:
   a. Assemble complete submittal package for this Division into a single submittal.
      1) Partial submittals will not be accepted.
   b. Submit product data on following equipment for review:
      1) Equipment scheduled on Drawings.
      2) Equipment requiring electrical connections or connections by other trades.
      3) As required by each specification section or by notes on the Drawings.
2. Format:
   a. Electronic: Submit electronic copies for Work of this Division in PDF format.

1) Include a complete index in the original submittal.
   (a) Incorporate links enabling navigation to each item.
   (b) Identify with each item filed under a folder and labeled with its respective specification section number, Article, and paragraph.
2) Provide cover sheet for each applicable section number.

3. Include for each item as a minimum:
   a. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified.
   b. Manufacturer's detailed shop drawings including clearances required.
   c. Manufacturer's detailed specifications.
   d. Manufacturer's data sheets including capacities, operating speeds, power requirements, design and operating conditions, performance curves, characteristics scheduled or described on the Drawings, and similar data.
   e. List the name of the motor manufacturer and service factor for each piece of equipment.
   f. Indicate equipment operating weights including bases and weight distribution at support points.
   g. Wiring diagrams showing factory installed wiring.

G Coordination Drawings:
1. General:
   a. Assemble complete submittal package for the project into a minimum of two submittals.
      1) Coordination Drawings - Below Grade
      2) Coordination Drawings - Above Grade
   b. Prepare project-specific information, drawn accurately to scale.
   c. Submit coordination drawings for review prior to beginning fabrication.
   d. Sheet Size: Match sheet size of Construction Drawings.
   e. Prepare in three-dimensional format utilizing the same digital data software program, version, and operating system utilized to develop the Construction Drawings.
2. Format:
   a. Electronic: Submit electronic copies in PDF format.
3. Include as a minimum:
   a. Color code and overlay shop drawings for each trade:
      1) Structural
      2) Civil
      3) Lighting
      4) Electrical Power
   b. Complete floor plans to a minimum of 1/4-inch equals 1-foot scale.
   c. Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.

H Shop Drawings:
1. General:
   a. Assemble complete submittal package for this Division into a single submittal.
      1) Partial submittals will not be accepted.
   b. Prepare project-specific information, drawn accurately to scale.
   c. Prepare new Shop Drawings by Contractor and not reproductions or tracings of Engineer's Design Drawings.
   d. Submit shop drawings for review prior to beginning fabrication.
      1) Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to

whether contract documents are being complied with or the design intent is being met.

e. Sheet Size: Match sheet size of Construction Drawings.

2. Format:
   a. Electronic: Submit electronic copies for Work of this Division in PDF format.
      1) Include a complete index in the original submittal.
         (a) Incorporate links enabling navigation to each item.
         (b) Identify with each item filed under a folder and labeled with its respective specification section number, Article and paragraph.
3. Include as a minimum:
   a. Complete floor plans to a minimum of 1/4-inch equals 1-foot scale.
   b. Mechanical, Electrical, and Technology rooms to a minimum of 1/2-inch equals 1-foot scale.
   c. Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.
   d. Fabricated equipment to a minimum of 1/4-inch equals 1-foot scale.

I Samples
1. Refer to individual Division sections for Submittal requirements.

J Certificates
1. Refer to individual Division sections for Submittal requirements.

K Delegated Design Submittals
1. Refer to individual Division sections for Submittal requirements.

L Test and Evaluation Reports
1. Refer to individual Division sections for Submittal requirements.

M Manufacturers' Instructions
1. Refer to individual Division sections for Submittal requirements.

N Source Quality Control Submittals
1. Refer to individual Division sections for Submittal requirements.

O Site Quality Control Submittals
1. Refer to individual Division sections for Submittal requirements.

P Manufacturer Reports
1. Refer to individual Division sections for Submittal requirements.

Q Sustainable Design Submittals
1. Refer to individual Division sections for Submittal requirements.

R Qualification Statements
1. Refer to individual Division sections for Submittal requirements.

1.07 CLOSEOUT SUBMITTALS

A Maintenance Contracts
1. Refer to individual Division sections for Submittal requirements.

B Operations and Maintenance Data
1. General:
   a. Assemble complete submittal package for this Division into a single submittal.
      1) Partial submittals will not be accepted.
   b. Submit when the work is substantially complete.
   c. Submit manufacturer's operation and maintenance instruction manuals and parts lists for review on following equipment:
      1) Equipment scheduled on Drawings.
      2) Equipment requiring electrical connections or connections by other trades.
      3) As required by each specification section or by notes on the Drawings.
2. Format:

a. Electronic: Submit electronic copies for Work of this Division in PDF format.
   1) Include a complete index in the original submittal.
      (a) Incorporate links enabling navigation to each item.
      (b) Identify with each item filed under a folder and labeled with its respective specification section number, Article and paragraph.
b. Hard Copy: Submit copies for Work of this Division in a 3-ring loose leaf binder.
   1) Include a complete index in the original submittal.
      (a) Identify with each item filed under a tab and labeled with its respective specification section number, Article and paragraph.

3. Include for each item as a minimum:
   a. Include name and contact information for location of source parts and service for each piece of equipment.
   b. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified.
   c. Manufacturer's operation and maintenance instruction manuals.
   d. Manufacturer's detailed shop drawings including clearances required.
   e. Manufacturer's detailed specifications.
   f. Manufacturer's data sheets including capacities, operating speeds, power requirements, design and operating conditions, performance curves, characteristics scheduled or described on the Drawings, and similar data.
   g. List the name of the motor manufacturer and service factor for each piece of equipment.
   h. Indicate equipment operating weights including bases and weight distribution at support points.
   i. Wiring diagrams showing factory installed wiring.

C Bonds
1. Refer to individual Division 00 and Division 01 sections for Submittal requirements.

D Warranty Documentation
1. Refer to individual Division 00 and Division 01 sections for Submittal requirements.

E Final Test and Evaluation Reports
1. Refer to individual Division sections for Submittal requirements.

F Record Documentation
1. Shop Drawings
   a. Shop drawings updated with as-built information and submitted as the record drawing set.
2. Record Drawings
   a. General:
      1) Provide drawings with notations reflecting the as-built conditions.
      2) Notations to include any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.
      3) Prepare project-specific information, drawn accurately to scale.
      4) Provide project specific title block.
   b. Sheet Size: Match sheet size of Construction Drawings.
   c. Prepare in two-dimensional format utilizing the same digital data software program, version, and operating system utilized to develop the Construction Drawings.
   d. Format:
      1) Electronic: Submit electronic copies of record drawings for Work of this Division in PDF format.

(a) Include a complete index in the original submittal.
(b) Incorporate links enabling navigation to each item.
(c) Identify with each item filed under a folder and labeled with its respective specification section number, Article and paragraph.

2) Hard Copy: Submit copies of record drawings for Work of this Division in a 3-ring loose leaf binder.
(a) Include a complete index in the original submittal.
(b) Identify with each item filed under a tab and labeled with its respective specification section number, Article and paragraph.

G Demonstration and Training
1. Training Plan:
a. Submit outline of instructional program for demonstration and training.
b. Include the following:
1) List of training modules.
2) Schedule of proposed dates, times, length of instruction time.
3) Instructors' names for each training module.
4) Learning objective and outline for each training module.
2. Training Video Recordings:
a. Identification: On each copy, provide an applied label with the following information:
1) Name of Project.
2) Name and address of videographer.
3) Name of Architect.
4) Name of Contractor or Construction Manager.

H Sustainable Design Closeout Documentation
1. Refer to individual Division sections for Submittal requirements.

I Software
1. Refer to individual Division sections for Submittal requirements.

1.08 MAINTENANCE MATERIAL SUBMITTALS

A Spare Parts
1. Refer to individual Division sections for Submittal requirements.

B Extra Stock Materials
1. Refer to individual Division sections for Submittal requirements.

C Tools
1. Refer to individual Division sections for Submittal requirements.

1.09 QUALITY ASSURANCE

A Regulatory Requirements
1. Products and equipment are prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment within this specification contain these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
2. General:
a. Conform Work and materials to requirements of the local, State, and Federal authorities having jurisdiction and other applicable laws and regulations.
b. Where codes or standards are referenced, the applicable portions apply.
c. Drawings, specifications, codes and standards are minimum requirements. Where requirements differ, apply the more stringent.
d. Should any change in drawings or specifications be required to comply with governing regulations, notify the Architect prior to submitting bid.

e. Execute work in strict accordance with the best practices of the trades in a thorough, substantial, skillful and well-executed manner by competent workers. Provide a competent, experienced full-time Superintendent who is authorized to make decisions on behalf of the Contractor.

f. The Architect or Architect's Representative may conduct unannounced field reviews of any work completed or in progress during the Contractor's working hours. A report will be issued to the Contractor if the field review of the systems construction has revealed elements of the work which are inconsistent with the Contract Documents. All items in the report are to be addressed in writing by the Contractor within two (2) weeks and corrections in the field made as directed.

B Apparatus:

1. Build and install to deliver full rated capacity at the efficiency for which it was designed.
2. Provide entire system and apparatus that operate at full capacity without objectionable noise or vibration.

C Alignment

D Install panels, cabinets, and equipment level and true. Provide housekeeping pads and curbs accounting for floor or roof slope.

E Install distribution equipment and electrical enclosures fitted neatly, without gaps, openings, or distortion.

1. Properly and neatly, close unused openings with approved devices.
2. Fit surface panels, devices, and outlets with neat, appropriate, trims, plates, or covers without overhanging edges, protruding corners, or raw edges.

F Materials and Equipment:

1. Provide new work of good quality, free of faults and defects and in conformance with the Construction documents.
2. Each piece of equipment furnished will meet the detailed requirements of the Drawings and Specifications and will be suitable for the installation shown. Equipment not meeting the requirements will not be acceptable, even though specified by name along with other manufacturers.
3. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
4. Furnish materials and equipment of size, make, type, and quality herein specified.
5. Equipment scheduled by performance or model number is considered as the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the Contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements, or any other differences which impact the project.

G Workmanship:

1. General: Install materials in a neat and professional manner.
2. Manufacturer's Instructions:
   a. Follow manufacturer's directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division Specifications, obtain clarification before starting work.

H Noise Control

1. Do not install contactors, transformers, starters, and similar noise-producing devices on walls that are common to occupied spaces, unless otherwise indicated.

a. Where such devices are indicated to be mounted on walls common to occupied spaces, use shock mounts, or otherwise isolate them to prevent the transmission of noise to the occupied spaces.

2. Ballasts, contactors, starters, transformers, and like equipment which are found to be noticeably noisier than other similar equipment on the project will be deemed defective and be replaced.

I Cutting and Patching:

1. Provide cutting, patching, and repairing for the proper installation and completion of the work specified in this Division by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work. This work includes but is not limited to plastering, masonry work, concrete work, carpentry work, and painting.
2. Make additional openings required in building construction by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Do not pierce beams, columns or structure members without approval from the Architect and structure engineer, and then only as directed.
5. New or existing work cut or damaged will be restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces will be repaired, refinished, and left in condition existing prior to commencement of work.

J Visibly damaged goods are to be returned to the supplier and replaced at no additional cost to the Owner.

K Contractor Responsibility:

1. Examination of building and site responsibility:
   a. Examine site and building prior to installation to determine conditions affecting the scope of work.
   b. Contact Owner representative for arrangements.
2. Respect and protect the privacy and confidentiality of Owner, its employees, processes, products, and intellectual property to the extent necessary, consistent with the legal responsibilities of the State and Owner policies.
3. Total responsibility for the coordination and installation of the work shown and described in the Drawings and Specifications.
4. Specified systems installed under the direction of a qualified Contractor. Qualification requirements include submittal by the Contractor to the Architect of the following:
   a. Have experience with three or more installations of systems comparable in size, complexity, type, and design as specified herein.
   b. Perform each of these installations satisfactorily for at least one year after final acceptance by the user. Include the names, locations, and point of contact for these installations as a part of the initial submittal documentation.
   c. List of previous projects of this scope, size, and nature, including names and sizes of projects, description of work, time of completion, and names of contact persons for reference.

L Manufacturers

1. Equipment in these Sections are the standard products of a manufacturer regularly engaged in the manufacture of such products unless specified otherwise. Provide commercial grade components and products used in the system that comply with these Specifications.
2. Each component of equipment identifies the manufacturer's name, model, and applicable serial number. The Owner's authorized representative retains the right to reject

products that reflect, in their opinion, sub-standard design practices, manufacturing procedures, support services, or warranty policies.

M Certifications
1. Refer to individual Division sections for Submittal requirements.

N Sustainability Standards Certifications
1. Refer to individual Division sections for Submittal requirements.

O Preconstruction Testing
1. Refer to individual Division sections for Submittal requirements.

P Site Samples
1. Refer to individual Division sections for Submittal requirements.

Q Mock-ups
1. Refer to individual Division sections for Submittal requirements.

1.10 DELIVERY, STORAGE, AND HANDLING

A Assume custody and responsibility for the items upon delivery and determining that the contents are complete and in satisfactory condition for installation.

B The Contractor is responsible for handling and control of equipment and liable for material loss due to delivery and storage problems.

C Materials and equipment delivered and placed in storage will be stored with protection from the weather, humidity, and temperature variation, dirt, and dust or other contaminants.

D Coordinate deliveries and submittals with the General Contractor/Owner to ensure a timely scheduled installation.

E Equipment and materials are to be delivered to the site no more than three weeks prior to the commencement of its installation. Coordinate with General Contractor/Owner for the location of storage materials.

1.11 SITE CONDITIONS

A Existing Conditions:
1. Prior to bidding, verify and become familiar with existing conditions by visiting the site.
2. Include related costs associated with site factors in the initial bid proposal.

B Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

C Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

1.12 WARRANTY

A Provide a written guarantee covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.

B Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.

C Arrange to have the equipment factory representative present for those tests where the manufacturer's warranty could be impacted by the absence of a factory representative.

D Correct warranty items promptly upon notification.

E Apparatus:
1. Free of defects of material and workmanship and in accord with the Contract Documents.
2. Built and installed to deliver its full rated capacity at the efficiency for which it was designed.

1.13 UNINTERRUPTED SERVICE

A Maintain electrical, signal and communication services to all functioning portions of the building throughout construction.

B Pre-arrange with Owner outages necessary for new construction.

1. Comply with Division 01, General Requirements.
2. Apply for scheduled shutdowns a minimum of 4 weeks prior to time needed and reconfirm a minimum of 72 hours prior to time needed.
3. Contractor is liable for any damages resulting from unscheduled outages or for those not confined to the pre-arranged times. Damages include costs incurred by the Owner and by the Owner's tenants.

1.14 DEMOLITION AND SALVAGE

A General:
1. Where affected by work, r emove or relocate equipment, services, and systems encountered during the course of the remodel/construction work to a safe location that will be undisrupted by further construction.
2. Disconnect electrical service to hard-wired equipment scheduled for removal under other Divisions of Work.
3. Wiring which serves usable existing outlets restored and routed clear of the construction or demolition.
4. Safely cut off and terminate wiring abandoned and removed to leave site clean.

B Reuse of Existing:
1. Existing concealed conduits in good condition may be reused for installation of new wiring where available.
2. Existing undamaged, properly supported surface conduits may be reused where surface conduits are called for, if the installation meets workmanship requirements of the Specifications.
3. Where new wiring is added or existing wiring disturbed in existing branch circuit raceways, existing wires replaced with new.

C Salvage and Disposal:
1. Removed materials, not containing hazardous waste, not scheduled for reuse are the property of the Contractor for removal from the site, except for those items specifically indicated on the Drawings for salvage or reuse.
2. Identify materials containing, or possibly containing, hazardous waste for removal and disposal by the Hazardous Waste Contractor.
3. Neatly store salvaged items at one location at the site where directed by the Owner's Representative.
4. Salvage properly operating circuit breakers from panels scheduled for removal and use to replace faulty or inadequate breakers in existing panels scheduled to remain.

1.15 COMPLETION AND TESTING

A General:
1. Comply with Division 01, General Requirements.

B Upon completion, test systems to show that installed equipment operates as designed and specified, free of faults and unintentional grounds.
1. Schedule system tests so that several occur on the same day.
2. Coordinate testing schedule with construction phasing.
3. Conduct tests in the presence of the Architect or its representative.
4. Notify Architect of tests 48 hours in advance.

C Engage a journeyman electrician with required tools to conduct equipment tests. Arrange to have the equipment factory representative present for those tests where the manufacturer's warranty could be impacted by the absence of a factory representative.

D Perform tests per the requirements of each of the following systems:
1. Medium Voltage Distribution System
2. Low Voltage Distribution System

3. Emergency Power System
4. Standby Power System
5. Fire Alarm System
6. Security System
7. Public Address System
8. Nurse Call System
9. Lighting System
10. Lighting Control System
11. Power Metering and Monitoring System
12. Power Factor Correction Capacitors
13. UPS System

E Provide a written record of performance tests and submit with operation and maintenance data.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 INSTALLATION

A Equipment Support

1. Minimum Support Capacity:
   a. Provide fastening devices and supports for electrical equipment, luminaires, panels, outlets, and cabinets capable of supporting not less than four times the ultimate weight of the object or objects fastened to or suspended from the building structure.
2. Powder actuated or similar shot-in fastening devices will not be permitted for any electrical work except by special permission from the Architect.

B Equipment Connections

1. General:
   a. Provide complete electrical connections for all items of equipment requiring such connections, including incidental wiring, materials, devices, and labor necessary for a finished working installation.
   b. Verify the location and method for connecting to each item of equipment prior to roughing-in.
   c. Check the amperage, maximum overcurrent protection, voltage, phase, and similar attributes of each item of equipment before rough in and connection.
2. Motor Connections:
   a. Make motor connections for the proper direction of rotation.
   b. Minimum Size Flex for Mechanical Equipment: 1/2-inch; except at small control devices where 3/8-inch flex may be used.
   c. Exposed Motor Wiring: Jacketed metallic flex with minimum 6-inches slack loop.
   d. Do not test run pump motors until liquid is in the system.
3. Control devices and wiring relating to the HVAC systems are furnished and installed under Division 23, HVAC; except for provisions or items indicated in Division 26, Electrical Drawings and Specifications.

C Special Techniques

1. Installation in Rated Construction
   a. Install intumescent material around ducts, conduits, and other electrical elements penetrating rated construction.
   b. Comply with firestop materials manufacturer written instructions to prevent spread of smoke or fire through sleeves or block-outs penetrating rated fire barriers.
   c. Provide firestop materials specified in Division 07, and as follows:
      1) Capable of passing a 3-hour test per ASTM E-814 (UL 1479).

2) Consisting of material capable of expanding nominally eight times when exposed to temperatures of 250 degrees F-350 degrees F.
3) An alternate method utilizing intumescent materials in caulk or putty complying with Division 07, Thermal and Moisture Protection Section, "Through-Penetration Firestop Systems" may be used.

2. Wiring in Precast Construction
   a. Coordinate installation of electrical conduit, boxes, fittings, anchors, and miscellaneous items concealed in precast concrete assemblies with the General Contractor.
   b. Where electrical items are required to be installed in concrete assemblies precast off-site, it will be the Electrical Contractor's responsibility to place the electrical items necessary in the concrete at the off-site locations or pay for the General Contractor to make arrangements for the installation of these items in the precast assemblies. Electrical Contractor held responsible for the proper placement and locations of electrical items at the off-site location.

D Interface with Other Work
1. Existing concrete, block, or brick walls are considered not accessible and may require use of Surface Mounted Raceway (SMR) if existing concealed raceway and device boxes are not available for reuse or do not meet the intent of the design (i.e., proximity to egress path, point of use, etc.). Coordinate route and installation where SMR is required with the Architect/Engineer prior to rough-in. Responsible for reinstalling SMR routed without such prior approval to the Architect's satisfaction.
2. Existing stud walls (wood or metal) with or without blocking with plaster, plasterboard, or paneling finish are considered accessible with accessible ceiling, attic, tunnel, or crawl space above, below, or adjacent. Remove, patch, and repair finished surface as required to conceal rough in for new device locations. If it is determined that a specific instance will not permit concealment of rough-in due to obstructions such as beams, headers, and other structural elements, prior approval before rough-in from the Architect is required.

E Systems Integration
F Tolerances

3.02 SITE QUALITY CONTROL
A Site Tests and Inspections
B Non-Conforming Work
C Manufacturer Services

3.03 CLEANING
A Waste Management
B General
C Painted Surfaces:
1. Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

3.04 PROTECTION
A Protect electrical work and equipment installed under this Division against damage by other trades, weather conditions, or any other causes.
1. Equipment found damaged or in other than new condition will be rejected as defective.
B Keep switchgear, transformers, panels, luminaires, and electrical equipment covered or closed to exclude dust, dirt, and splashes of plaster, cement, paint, or other construction material spray.
1. Equipment not free of contamination is not acceptable.
C Provide enclosures and trims in new condition, free of rust, scratches, and other finish defects.

1. If damaged, properly refinish in a manner acceptable to the Architect.

END OF SECTION 26 05 00

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 Armored cable.
E Wiring connectors.
F Oxide inhibiting compound.
G Wire pulling lubricant.
H Cable ties.

1.02 RELATED REQUIREMENTS

A Section 07 84 00 - Firestopping.
B Section 26 05 26 - Grounding and Bonding for Electrical Systems.

1.03 REFERENCE STANDARDS

A ASTM B3 - Standard Specification for Soft or Annealed Copper Wire.
B ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
C ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes.
D ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation.
E ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers.
F ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation.
G ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape.
H NECA 1 - Standard for Good Workmanship in Electrical Construction.
I NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable.
J NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC).
K NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF).
L NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
M NFPA 70 - National Electrical Code.
N UL 4 - Armored Cable.
O UL 44 - Thermoset-Insulated Wires and Cables.
P UL 83 - Thermoplastic-Insulated Wires and Cables.
Q UL 486A-486B - Wire Connectors.
R UL 486C - Splicing Wire Connectors.
S UL 486D - Sealed Wire Connector Systems.
T UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables.
U UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape.
V UL 854 - Service-Entrance Cables.

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 with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

1.05 SUBMITTALS

A See Section 26 05 00 - Common Work Results for Electrical, 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.

1.06 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

B Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five yearsdocumented experience.

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.

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 Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D Comply with NEMA WC 70.

E Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G Conductor Material:

1. Provide copper conductors except where aluminum conductors are specifically indicated. Substitution of aluminum conductors for copper is not permitted. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
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.
4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

H 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. Equipment Ground, All Systems: Green.

2.03 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

A Manufacturers:
1. Cerro Wire LLC.
2. Encore Wire Corporation.
3. Southwire Company.
4. Okonite

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.

2.04 SERVICE ENTRANCE CABLE

A Manufacturers:
1. Copper Service Entrance Cable:
a. Cerro Wire LLC.
b. Encore Wire Corporation.
c. Southwire Company.
d. Okonite

B 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.

C Conductor Stranding: Stranded.

D Insulation Voltage Rating: 600 V.

2.05 ARMORED CABLE

A Manufacturers:
1. AFC Cable Systems Inc.
2. Encore Wire Corporation.
3. Southwire Company.

B Description: NFPA 70, Type AC cable listed and labeled as complying with UL 4, 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.

F Grounding: Combination of interlocking armor and integral bonding wire.

G Armor: Steel, interlocked tape.

2.06 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.
3. Connectors for Aluminum Conductors: Use 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. Aluminum Conductors: Use compression connectors for all connections.
7. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
8. 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 Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G 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.
   b. Ideal Industries, Inc.
   c. NSI Industries LLC.

H Mechanical Connectors: Provide bolted type or set-screw type.
1. Manufacturers:
   a. Burndy LLC.
   b. Ilsco.
   c. Thomas & Betts Corporation.

I Compression Connectors: Provide circumferential type or hex type crimp configuration.
1. Manufacturers:
   a. Burndy LLC.
   b. Ilsco.
   c. Thomas & Betts Corporation.

J Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
1. Manufacturers:
   a. Burndy LLC.
   b. Ilsco.
   c. Thomas & Betts Corporation.

2.07 ACCESSORIES

A Electrical Tape:
1. Manufacturers:
   a. 3M.
   b. Plymouth Rubber Europa.
2. 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.

B Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
1. Manufacturers:
   a. Burndy LLC.
   b. Ideal Industries, Inc.
   c. Ilsco.

C 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.
   b. American Polywater Corporation.
   c. Ideal Industries, Inc.

D Cable Ties: Material and tensile strength rating suitable for application.
1. Manufacturers:
   a. Burndy LLC.

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.

a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
b. Increase size of conductors as required to account for ampacity derating.
c. Size raceways, boxes, etc. to accommodate conductors.

8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B Install products in accordance with manufacturer's instructions.

C Perform work in accordance with NECA 1 (general workmanship).

D Install aluminum conductors in accordance with NECA 104.

E Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.

F Install armored cable (Type AC) in accordance with NECA 120.

G 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.

H Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

I 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.

J Terminate cables using suitable fittings.

1. Armored Cable (Type AC):
   a. Use listed fittings and anti-short, insulating bushings.
   b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

K Install conductors with a minimum of 12 inches of slack at each outlet.

L Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

M Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

N 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. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

O 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.

P Insulate ends of spare conductors using vinyl insulating electrical tape.

Q Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

R 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.

END OF SECTION 26 05 19

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 access wells.

1.02 RELATED REQUIREMENTS

A Section 09 65 00 - Resilient Flooring: Static control flooring.
B 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.
C Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.
B NECA 1 - Standard for Good Workmanship in Electrical Construction.
C NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings.
D NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems.
E NFPA 70 - National Electrical Code.
F NFPA 99 - Health Care Facilities Code.
G NFPA 780 - Standard for the Installation of Lightning Protection Systems.
H UL 467 - Grounding and Bonding Equipment.

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. For signal reference grids, coordinate the work with access flooring furnished in accordance with Section 09 69 00.
4. 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 26 05 00 - Common Work Results for Electrical, 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 Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
B Do not use products for applications other than as permitted by NFPA 70 and product listing.
C 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.
D Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
E 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.
F 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 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.
    3. 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.

4. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
5. 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.
6. 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.

G 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.

H Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
   a. Transformers (except autotransformers such as buck-boost transformers).
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.
   c. Metal process 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.
11. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.
12. Provide redundant grounding and bonding for patient care areas of health care facilities in accordance with NFPA 70 and NFPA 99.

J 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.

K Signal Reference Grids:

1. Provide signal reference grid on subfloor under access floors where indicated.
2. Construct grid using field-welded sections of pre-fabricated signal reference grids.
3. Unless otherwise indicated, locate grid between 6 and 18 inches (150 and 450 mm) from perimeter walls.

4. Unless otherwise indicated, make bonding connections to signal reference grid using exothermic welded connections.
5. Make bonding connections as short as possible, with no sharp folds or bends.
6. Unless otherwise indicated, provide separate bonding connections from signal reference grid to each item to be bonded. Do not daisy chain items together to facilitate single point connection to signal reference grid.
7. Provide 6 AWG bonding jumper to connect every sixth access floor pedestal in each direction to signal reference grid. Make connections to floor pedestals using exothermic welded connections.
8. Provide 6 AWG bonding jumper to connect each steel column within and at the perimeter of room to signal reference grid. Make connections to steel columns using exothermic welded connections.
9. Provide 6 AWG bonding jumper to connect each metal item such as conduits, pipes, ducts, etc. crossing the plane of, or within 6 feet (1.8 m) of, the signal reference grid. Make connections to conduits and pipes using listed ground clamps.
10. Provide 6 AWG bonding jumper to connect signal reference grid to grounding point of separately derived systems serving equipment located on the signal reference grid.
11. Provide low impedance risers to connect each equipment enclosure to signal reference grid. For each piece of equipment, provide two separate connections of different lengths connected to opposite sides of equipment and to different points on the signal reference grid. Make connections to equipment enclosures using mechanical connectors. Do not make connection to signal reference grid on the outermost grid conductor.
12. Provide transient suppression plates on floor beneath items indicated. Provide 6 AWG bonding jumper to connect transient suppression plate to signal reference grid.
    a. Transient Suppression Plates: Constructed from 26 gauge sheet copper, 4 by 4 feet unless otherwise indicated.

L Lightning Protection Systems:
1. Do not use grounding electrode dedicated for lightning protection system for component of building grounding electrode system provided under this section.
2. Provide bonding of building grounding electrode system provided under this section and lightning protection grounding electrode system in accordance with NFPA 70 and NFPA 780.

M Static Control Flooring: Provide bonding of static control flooring provided in accordance with Section 09 65 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 gauge 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.
    a. Exceptions:
        1) Use mechanical connectors for connections to electrodes at ground access wells.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
    a. Exceptions:
        1) Use exothermic welded connections for connections to metal building frame.
4. Manufacturers - Mechanical and Compression Connectors:
    a. Advanced Lightning Technology (ALT).
    b. Burndy LLC.
    c. Harger Lightning & Grounding.
    d. Thomas & Betts Corporation.
    e. Substitutions: See Section 01 60 00 - Product Requirements.
5. Manufacturers - Exothermic Welded Connections:
    a. Burndy LLC.
    b. Cadweld, a brand of Erico International Corporation.
    c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC.
    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).
    b. Erico International Corporation.
    c. Harger Lightning & Grounding.
    d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC.
    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).
    b. Erico International Corporation.
    c. Galvan Industries, Inc.
    d. Harger Lightning & Grounding.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

F 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.
b. Harger Lightning & Grounding.
c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC.
d. Substitutions: See Section 01 60 00 - Product Requirements.

G 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.
a. Areas Exposed to Vehicular Traffic: Rated for not less than _____ vertical design load.
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).
b. Erico International Corporation.
c. Harger Lightning & Grounding.
d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC.
e. Substitutions: See Section 01 60 00 - Product Requirements.

H Pre-Fabricated Signal Reference Grids:
1. Description: Factory pre-fabricated grid manufactured from 2 inch wide, 26 gauge, flat copper strips spaced on 24 inch centers, factory-welded at each crossover.
2. Low Impedance Risers: Factory fabricated 2 inch wide, 26 gauge, flat copper strips designed for connecting equipment enclosures to pre-fabricated signal reference grid.
3. Manufacturers:
a. Advanced Lightning Technology (ALT).
b. Erico International Corporation.
c. Harger Lightning & Grounding.
d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC.
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 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.

E Identify grounding and bonding system components in accordance with Section 26 05 53.

F Ufer Ground: Provide a concrete encased building grounding electrode where shown on the Drawings. Gounding electrode to consist of a minimum of 20 feet of #4 AWG copper conductor cast into the bottom 6 inches of an exterior concrete foundation or footing.

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 26 05 26

SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A Galvanized steel rigid metal conduit (RMC).
B PVC-coated galvanized steel rigid metal conduit (RMC).
C Flexible metal conduit (FMC).
D Electrical metallic tubing (EMT).
E Rigid polyvinyl chloride (PVC) conduit.
F Liquidtight flexible nonmetallic conduit (LFNC).
G Conduit fittings.
H 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 26 - Grounding and Bonding for Electrical Systems.
1. Includes additional requirements for fittings for grounding and bonding.
D Section 26 05 29 - Hangers and Supports for Electrical Systems.
E Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
F Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
G Section 26 21 00 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.
H Section 31 23 16 - Excavation.
I Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.
J Section 31 23 23 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

A ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC).
B ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S).
C NECA 1 - Standard for Good Workmanship in Electrical Construction.
D NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT).
E NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit.
F NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC).
G NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.
H NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
I NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit.
J NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
K NFPA 70 - National Electrical Code.
L UL 1 - Flexible Metal Conduit.
M UL 6 - Electrical Rigid Metal Conduit-Steel.
N UL 514B - Conduit, Tubing, and Cable Fittings.
O UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.
P UL 797 - Electrical Metallic Tubing-Steel.
Q UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit.

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 26 05 00 - Common Work Results for Electrical, 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 galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, or rigid PVC 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) conduitlarger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
6. Where steel conduit is installed in direct contact with earthwhere soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, 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 on Grade(within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.
4. 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 Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

F Exposed, Exterior: Use galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit.

G Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit.

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 Electrical Service Conduits: Also comply with Section 26 21 00.

C Communications Systems Conduits: Also comply with this Section.

D Fittings for Grounding and Bonding: Also comply with Section 26 05 26.

E Provide conduit, fittings, supports, and accessories required for a complete raceway system.

F Provide products listed, classified, and labeled as suitable for the purpose intended.

G Minimum Conduit Size, Unless Otherwise Indicated:
1. Branch Circuits: 3/4 inch (21 mm) trade size.
2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
3. Control Circuits: 3/4 inch (21 mm) trade size.
4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
5. Underground, Exterior: 3/4 inch (21 mm) trade size.

H 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.
2. Republic Conduit.
3. Wheatland Tube Company.

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.
   b. O-Z/Gedney, a brand of Emerson Electric Co.
   c. Thomas & Betts Corporation.
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.
4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

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

A Manufacturers:

1. Thomas & Betts Corporation.
2. Robroy Industries.

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 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.

E PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A Manufacturers:

1. AFC Cable Systems, Inc.
2. Electri-Flex Company.
3. International Metal Hose.

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.
   b. O-Z/Gedney, a brand of Emerson Electric Co.
   c. Thomas & Betts Corporation.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.

2.06 ELECTRICAL METALLIC TUBING (EMT)

A Manufacturers:

1. Allied Tube & Conduit.
2. Republic Conduit.
3. Wheatland Tube Company.

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.
   b. O-Z/Gedney, a brand of Emerson Electric Co.
   c. Thomas & Betts Corporation.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
4. Connectors and Couplings: Use compression (gland) or set-screw type.
   a. Do not use indenter type connectors and couplings.
5. Use in dry protected locations for circuites rated 600V and less. Exceptions:
   a. EMT is acceptable for outdoor use in photovoltaic roof applications.
   b. EMT is acceptable for other outdoor applications in covered locations.
   c. For outdoor applications, raintight fittings must be used.

2.07 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A Manufacturers:
1. Cantex Inc.
2. Carlon, a brand of Thomas & Betts Corporation.
3. JM Eagle.

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.

2.08 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

A Manufacturers:
1. AFC Cable Systems, Inc.
2. Electri-Flex Company.
3. International Metal Hose.

B Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.

C Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for the type of conduit to be connected.

2.09 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.

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 PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.

E Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F Install liquidtight flexible nonmetallic conduit (LFNC) 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 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.
    c. Flues.
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 permitted only as follows:
    a. Support of electrical metallic tubing (EMT)up to 1 inch (27 mm) trade size concealed above accessible ceilings and within hollow stud walls.
11. Use of wire for support of conduits is permitted only as follows:
    a. For securing conduits to studs in hollow stud walls.
    b. For suspending conduits supported by spring steel conduit clips (only where specifically indicated or 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. 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. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

7. 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.
8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

K Underground Installation:
1. Provide trenching and backfilling in accordance with Section 31 23 16.13.
2. Provide trenching and backfilling in accordance with Section 31 23 16 and Section 31 23 23.
3. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 24 inches.
   b. Under Slab on Grade: 12 inches to bottom of slab.
4. 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: 3/4 inch (21 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 26 05 33.13

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 Boxes and enclosures for integrated power, data, and audio/video.
D Boxes for hazardous (classified) locations.
E Floor boxes.
F Underground boxes/enclosures.
G Accessories.

1.02 RELATED REQUIREMENTS

A Section 03 30 00 - Cast-in-Place Concrete.
B Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
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 53 - Identification for Electrical Systems: Identification products and requirements.
F Section 26 27 26 - Wiring Devices:
    1. Wall plates.
    2. Additional requirements for locating boxes for wiring devices.
G Section 27 10 00 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.03 REFERENCE STANDARDS

A NECA 1 - Standard for Good Workmanship in Electrical Construction.
B NECA 130 - Standard for Installing and Maintaining Wiring Devices.
C NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
D NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.
E NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
F NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
G NFPA 70 - National Electrical Code.
H SCTE 77 - Specification for Underground Enclosure Integrity.
I UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.
J UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.
K UL 508A - Industrial Control Panels.
L UL 514A - Metallic Outlet Boxes.
M UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.

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 26 05 00 - Common Work Results for Electrical, for submittal procedures.

B Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, 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:

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, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

F Maintenance Materials: Furnish the following for Owner'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 cast aluminum boxes where aluminum rigid metal conduit is used.
5. Use nonmetallic boxes where exposed rigid PVC conduit is used.
6. Use suitable concrete type boxes where flush-mounted in concrete.
7. Use suitable masonry type boxes where flush-mounted in masonry walls.
8. Use raised covers suitable for the type of wall construction and device configuration where required.
9. Use shallow boxes where required by the type of wall construction.
10. Do not use "through-wall" boxes designed for access from both sides of wall.
11. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
12. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
13. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
14. 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.
15. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
16. 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: Comply with Section 27 10 00.
    c. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
    d. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
17. Wall Plates: Comply with Section 26 27 26.
18. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation.
    b. Hubbell Incorporated; Bell Products.
    c. Hubbell Incorporated; RACO Products.
    d. O-Z/Gedney, a brand of Emerson Electric Co.
    e. Thomas & Betts Corporation.
    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 EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA EN 10250 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.
   b. Hoffman, a brand of Pentair Technical Products.
   c. Hubbell Incorporated; Wiegmann Products.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

D 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.
      2) MacLean Highline.
      3) Oldcastle Precast, Inc.
      4) Substitutions: See Section 01 60 00 - Product Requirements.
   b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.
   c. Product(s):
      1) MacLean Highline PHA Series: Straight wall, all-polymer concrete splice box/pull box; available Tier 8, Tier 15, and Tier 22 load ratings.
         (a) 11 by 18 by 12 inches nominal; Model PHA111812 (stackable).
      2) MacLean Highline CHA Series: Fiberglass/polymer concrete splice box/pull box; available Tier 8 and Tier 15 load ratings.
         (a) 11 by 18 by 12 inches nominal; Model CHA111812.
      3) MacLean Highline CVA Series: Fiberglass/polymer concrete splice vault; available Tier 8, Tier 15, and Tier 22 load ratings.

(a) 30 by 48 by 18 inches nominal; Model CVA304818.

2.02 ACCESSORIES

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 where approved by the Architect.
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.
   b. Communications Systems Outlets: Comply with Section 27 10 00.
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 Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.

O 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.

P Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

Q Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

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 26 05 33.16

SECTION 26 05 43 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A The Sections includes:
1. Precast Concrete Handholes and Boxes.
2. Precast Concrete Manholes.
3. Duct Lines.
4. Spacers.
5. Ground Rods.
6. Ground Wire.
7. Conduit Expansion/Deflection Fittings.

1.02 RELATED SECTIONS

A Division 01, General Requirements
B Division 03, Concrete
C Division 26, Electrical
D Division 31, Earthwork

1.03 REFERENCED STANDARDS

A References listed below:
1. American Association of State Highway and Transportation Officials
2. American Concrete Institute
3. American National Standards Institute
4. American Society for Testing and Materials
5. National Electrical Code
6. National Electrical Manufacturers Association
7. Underwriters Laboratories

1.04 SUBMITTALS

A Shop Drawings:
1. Submit descriptive details of the manufacturers' proposed standard product listings, including:
a. Precast manholes and handholes.
b. Precast manhole and handhole accessories, including covers and frames.
c. Precast concrete 28-day compressive strength data.
d. Manhole and handhole cement certification.
e. Duct bank cement certification.
f. Duct spacers.
g. Ducts and raceways.
h. Conduit expansion/deflection fittings.

B Show drawings for manholes and handholes, including:
1. Design criteria signed by professional structural engineer licensed by the State of California.
2. Reinforcing steel locations and concrete covers.
3. Layout of inserts, attachments, and openings.
4. Locations and types of joints.
5. Accessories, including covers, frames, and diamond plate doors where applicable.

C Duct-Bank Coordination Drawings: show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
2. Sign and seal drawings by a qualified professional engineer licensed by the State of California.

PART 2 PRODUCTS

2.01 PRECAST CONCRETE HANDHOLES AND BOXES

A Handholes and Boxes:
1. Precast concrete, 4,000 psi strength at 28 days, with reinforcing and galvanized checker plate traffic covers designed for AASHTO loading of H-20.
2. Wall thickness 3-inches minimum.

B Precast Units:
1. Conform to ASTM C 478.
2. Size, plan area and clear height not less than shown on the drawings and have concrete slab bottoms with sumps.

C Pulling Irons: 7/8-inch diameter hot-dip galvanized steel bar with exposed triangular opening.

D Design:
1. Precast structures shall be designed in accordance with AASHTO Specification for Highway Bridges. Concrete and reinforcing shall be designed in accordance with ACI 318.
2. Tops and walls of structures designed for AASHTO H-20 highway loading, with 30 percent loading added for impact.
3. Design walls to withstand soil pressures, taking into consideration the soil to be encountered and ground water level present at the site.
4. Assume ground water level is at ground surface unless a lower water table is indicated in the boring logs. Design and construct precast handhole pull boxes not to float.

E Identify structures with manufacturer's name embedded in, or otherwise permanently attached to, an interior wall face.

F Covers for handholes and boxes spring-assisted galvanized diamond plate door with locking latch, 3-inch high markings in weld bead, inscribed before galvanizing with the word, ELECTRICAL, COMMUNICATION, or DATA. Identify the covers.

G Acceptable Manufacturers:
1. Utility Vault Company
2. Hanson
3. Renton Concrete Products
4. Or equal.

2.02 PRECAST CONCRETE MANHOLES

A Manholes:
1. Precast concrete, minimum 4,000 psi strength at 28 days, with reinforcing and cover designed for AASHTO loading of H-20.
2. Wall thickness 3-inches minimum. Necking and shaft shall have 36-inch minimum clear opening.

B Precast Units:
1. Conform to ASTM C 478.
2. Size, plan area and clear height not less than shown on the drawings with concrete slab bottoms with sumps.

C Pulling Irons: 7/8-inch diameter, hot-dip galvanized steel bar with exposed triangular opening.

D Design:

1. Precast structures designed in accordance with AASHTO Specification for Highway Bridges. Concrete and reinforcing shall be designed in accordance with ACI 318.
2. Tops and walls of structures shall be designed for AASHTO H-20 highway loading, with 30 percent loading added for impact.
3. Design walls to withstand soil pressures, taking into consideration the soil to be encountered and groundwater level present at the site.
4. Assume ground water level is at ground surface unless a lower water table is indicated in the boring logs. Precast manholes shall be designed and constructed not to float.

E Identify structures with manufacturer's name embedded in, or otherwise permanently attached to, an interior wall face.

F Manhole Cover and Frame: Class 30B grey cast iron per ASTM A 48 with machine-finished, flat, bearing surfaces.

G Frame: Solid cast ductile iron with a 36-inch round opening. The cover shall have holes for lifting and shall have minimum 2-inch high factory label TELEPHONE, ELECTRIC, or ELECTRIC HV, as appropriate or as noted on the drawings.

H Manufacturers:
1. Utility Vault Company
2. Hanson
3. Renton Concrete Products
4. Or equal.

2.03 SPACERS

A Factory-fabricated rigid PVC vertical and horizontal interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum of 3-inches separation between ducts while supporting ducts during concreting or backfilling.

B Manufacturers:
1. Carlon
2. Orangeburg
3. Or equal.

2.04 GROUND RODS

A Copper-clad steel, 3/4-inch diameter and 10-feet long.

2.05 GROUND WIRE

A Ground wire shall be stranded bare copper 6 AWG minimum.

PART 3 EXECUTION

3.01 CONDUIT ENCASEMENT OR EMBEDMENT (STRUCTURES AND DUCT BANKS)

A Concrete class 3500-3/4 with red dye.

B Concrete-embedded conduit shall be separated from the earth by at least 3-inches of concrete. Clearances shall be equal to the conduit diameter, but not less than 1-1/2-inches. Clearances shall also be maintained between conduits encased in slabs. Clearances of less than 1-1/2-inches at conduit crossing and terminating locations are acceptable.

C Provide conduit expansion/deflection fittings where embedded conduit crosses building expansion joints, passes between two adjacent structures, or passes between a duct bank and structure. Locate conduit expansion/deflection fittings between duct bank and manholes or pull boxes where noted on the drawings.

D Place duct banks on an undisturbed soil base wherever possible. Where duct banks pass through backfilled areas, the soil base shall be as specified elsewhere in the project manual. Duct banks that run under traffic areas shall be steel reinforced.

E Locate plastic spacers 5-feet to 8-feet on center as recommended by the manufacturer. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may

form conductive or magnetic loops around ducts or duct groups. Secure spacers to earth and to ducts to prevent conduit flotation during concreting. Conduit runs shall be watertight.

F Protect conduit ends from damage during construction. When using plugs for protection, a 1/4-inch hole shall be drilled in the lower portion of the plug to provide drainage.

G Where a conduit is specified spare or for future use, install a nylon cord in conduit and fasten at each end.

H Pull leather-washer-type duct cleaner, with graduated washer sizes through full lengths of ducts immediately after concrete is poured. After the concrete has set but before backfilling, pull a 4-inch-long mandrel having a diameter equal to the conduits inside diameter minus 1/2-inch through each conduit. The mandrel shall be lead-covered or painted white so that it will indicate any protrusion on the inside of the conduit.

3.02 PRECAST MANHOLES AND HANDHOLE PULL BOXES

A Construction

1. Units may be precast monolithically or may consist of assembled sections.
2. Assembled sections shall have mating edges with tongue-and-groove joints. Joints shall be designed to firmly interlock adjoining components, and provide waterproof junctions. Joints shall be sealed watertight using preformed plastic strips installed in accordance with the manufacturer's instructions.
3. Furnish lifting devices for proper handling of units.
4. Provide ground rod and sleeve in manhole floors.
5. Install sump with grate.

B Duct entries shall be a minimum of 14-inches above floor and below ceiling.

C Provide cable supports, clamps, or racks.

D Floor slope 2 percent in all directions to a sump.

E Sump a minimum of 8-inches in diameter.

F Install pulling irons or inserts for pulling eyes, inserts for cable racks, and openings for conduit entry as required. Steel components other than reinforced steel shall be hot-dip galvanized after fabrication. Manholes and handhole pull boxes shall have concrete bottoms.

G Install drains in electrical manholes and handhole pull boxes with a minimum 4-inch pipe set in the bottom and terminated in a minimum of 1 cubic yard of drain rock.

H Manholes and handhole pull boxes specifically noted on the drawings shall be drained into the storm water system. Seal vault watertight and drain coordinated with raceway entries.

3.03 INSTALLATION

A Install on a level bed of well-tamped gravel or crushed stone, well-graded from the 1-inch to 2-inch sieve.

1. The top of frame and covers shall be flush with the finished surface of pavements, and flush with finished grade in unpaved areas.
2. Set manholes and handholes plumb to limit the depth of standing water to a maximum of 2-inches. Unless otherwise specified, manhole covers shall be set at grade.
3. Construct a sufficient number of precast concrete and mortar courses between top of manhole and manhole frame to reach the required level. Grout the manhole frame to the chimney.

B Locate underground duct lines and manholes and handholes at the approximate locations shown on the drawings with due consideration given to the location of other utilities, grades, and paving.

C Provide windows for duct bank terminations and fill with concrete or non-shrink grout after duct placement.

D Provide pulling irons opposite each duct and conduit entrance. Pulling irons shall be cast in the walls opposite all duct windows approximately 6-inches above the top of the window.

E Ground Rods and Grounding:
1. Rods protrude approximately 4-inches above the manhole floor.
2. In precast manholes, drive a ground rod into the earth through the floor sleeve. After the manhole is set in place, fill the sleeve with sealant to make a watertight seal.

F Ground Wires:
1. Install ground wires around the inside perimeter of the manhole and anchor them to the walls.
2. Connect the wires to the ground rods by exothermic welding or approved compression process to form solid metal joints.
3. Bond the ground wires to the exposed non-current-carrying metal parts of racks, etc., in the manholes. Also bond the wires to duct bank bare equipment grounding conductors.

3.04 TRENCHING

A Excavate trenches in accordance with Division 31, Earthwork.

B Work with extreme care near existing utilities to avoid damaging them. Cut the trenches neatly and uniformly.

C For Concrete-Encased Ducts:
1. After excavation of the trench, drive stakes in the bottom of the trench at 4-foot intervals to establish the grade and route of the duct bank.
2. Pitch the trenches uniformly toward manholes or both ways from high points between manholes for the required duct line drainage. Avoid pitching the ducts towards buildings.
3. The walls of the trench may be used to form the side walls of the duct bank provided that the soil is self-supporting and that the concrete envelope can be poured without soil inclusions. Use forms where the soil is not self-supporting.
4. After the concrete-encased duct has sufficiently cured, backfill the trench in accordance with Division 31, Earthwork.

END OF SECTION 26 05 43

SECTION 26 09 93 - SEQUENCE OF OPERATIONS FOR LIGHTING CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A This Section includes:

1. Abbreviations and Definitions
2. General Controls Approach
3. Space-by-Space Sequence of Operations

1.02 ABBREVIATIONS AND DEFINITIONS:

A GUI: Graphic User Interface

B LCP: Lighting Control Panel

C TC: Timeclock, or astronomical timeclock

1.03 REFERENCE STANDARDS

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SPACE-BY-SPACE SEQUENCE OF OPERATION

A Exterior Lighting:

1. All luminaires to function via 24hr/12hr digital astrinomical timeclock for automatic on, automatic off, for dusk-till-dawn operation. The digital astronomical time clock is to possess conditional logic which allows multiple lighting zones to have independent schedules depending upon seasonal conditions.
2. During summer months (June-September) all exterior lighting is to turn on two hours prior to dusk. For all other times of the year, all exterior lighting is to turn on at dusk.
3. All exterior lighting is to automatically turn off at predetermined curfew (10pm) - verify final curfew time with owner.
4. Coordinate final timeclock settings with owner for dusk-to-dawn.

END OF SECTION 26 09 93

SECTION 26 21 00 - LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A Electrical service requirements.

1.02 RELATED REQUIREMENTS

A Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for cast-in-place 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 53 - Identification for Electrical Systems: Identification products and requirements.

E Section 31 23 16 - Excavation.

F Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

G Section 31 23 23 - Fill: Bedding and backfilling.

1.03 DEFINITIONS

A Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

1.04 REFERENCE STANDARDS

A IEEE C2 - National Electrical Safety Code.

B NECA 1 - Standard for Good Workmanship in Electrical Construction.

C NFPA 70 - National Electrical Code.

1.05 ADMINISTRATIVE REQUIREMENTS

A No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.

B Coordination:

1. Verify the following with Utility Company representative:
   a. Utility Company requirements, including division of responsibility.
   b. Exact location and details of utility point of connection.
   c. Utility easement requirements.
   d. Utility Company charges associated with providing service.
2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

C Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

D Utility Company charges associated with providing permanent service to be paid by Owner.

E Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

F Scheduling:

1. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.
2. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.06 SUBMITTALS

A See Section 26 05 00 - Common Work Results for Electrical, for submittal procedures.

B Utility Company letter of availability for providing electrical service to project.

C Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.

D Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required clearances, and proposed service routing.

1. Obtain Utility company approval of shop drawings prior to submittal.

E Drawings prepared by Utility Company.

F Project Record Documents: Record actual locations of equipment and installed service routing.

1.07 QUALITY ASSURANCE

A Comply with the following:

1. IEEE C2 (National Electrical Safety Code).
2. NFPA 70 (National Electrical Code).
3. The requirements of the Utility Company.
4. The requirements of the local authorities having jurisdiction.

B Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C Products: Listed, classified, and labeled as suitable for the purpose intended.

D Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

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

B Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). 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 products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE REQUIREMENTS

A Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B Electrical Service Characteristics: As indicated on drawings.

C Electrical Service Characteristics:

1. Service Type: Underground.
2. Service Voltage: 240/120 V, 1 phase, 60 Hz.
3. Service Size: 600A.

D Utility Company: As indicated on drawings.

E Utility Company: Pacific Power.

1. Point of Contact: Wesley Janes.
2. Address: 4025 S Old Hwy 99Grants Pass/Crescent City.
3. Phone: 541-955-7908.
4. Email: Wesley.Janes@pacificorp.com.
5. Utility Company Project Reference Number: WO#7210539.

F Division of Responsibility: As indicated on drawings.

G Division of Responsibility:
1. Pad-Mounted Utility Transformers:
a. Transformer Vaults and Pads: Furnished and installed by Contractor per Utility Company requirements.
b. Transformers: Furnished and installed by Utility Company.
c. Transformer Grounding Provisions: Furnished and installed by Contractor per Utility Company requirements.
d. Transformer Protective Bollards: Furnished and installed by Contractor per Utility Company requirements.
e. Primary:
1) Trenching and Backfilling: Provided by Contractor.
2) Conduits: Furnished and installed by Contractor.
3) Conductors: Furnished and installed by Utility Company.
f. Secondary:
1) Trenching and Backfilling: Provided by Contractor.
2) Conduits: Furnished and installed by Contractor.
3) Conductors: Furnished and installed by Contractor (Service Point at transformer).
2. Terminations at Service Point: Provided by Utility Company.
3. Metering Provisions:
a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.
b. Metering Transformer Cabinets: Furnished and installed by Contractor per Utility Company requirements.
c. Metering Compartments in Service Entrance Equipment: Furnished and installed by Contractor per Utility Company requirements.
d. Metering Transformers: Furnished and installed by Utility Company.
e. Conduits Between Metering Transformers and Meters: Furnished and installed by Contractor per Utility Company requirements.
f. Wiring Between Metering Transformers and Meters: Furnished and installed by Utility Company.
g. Communications Conduits for Meters: Furnished and installed by Contractor per Utility Company requirements.

H Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A Verify that field measurements are as indicated.
B Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
C Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A Verify and mark locations of existing underground utilities.

3.03 INSTALLATION

A Install products in accordance with manufacturer's instructions and Utility Company requirements.
B Perform work in accordance with NECA 1 (general workmanship).
C Arrange equipment to provide minimum clearances and required maintenance access.
D Provide required trenching and backfilling in accordance with Section 31 23 16.13.

E Provide required trenching and backfilling in accordance with Section 31 23 16 and Section 31 23 23.
F Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 03 30 00.
G Provide required protective bollards in accordance with Utility Company requirements.
H Provide required support and attachment components in accordance with Section 26 05 29.
I Provide grounding and bonding for service entrance equipment in accordance with Section 26 05 26.
J Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 05 53.

3.04 PROTECTION

A Protect installed equipment from subsequent construction operations.

END OF SECTION 26 21 00

SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A Power distribution panelboards.

B 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 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 27 13 - Electricity Metering: For interface with equipment specified in this section.

G Section 26 28 13 - Fuses: Fuses for fusible switches and spare fuse cabinets.

H Section 26 43 00 - Surge Protective Devices.

1.03 REFERENCE STANDARDS

A FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service.

B NECA 1 - Standard for Good Workmanship in Electrical Construction.

C NECA 407 - Standard for Installing and Maintaining Panelboards.

D NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.

F NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum).

G NEMA PB 1 - Panelboards.

H NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

I NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems.

J NFPA 70 - National Electrical Code.

K UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

L UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.

M UL 67 - Panelboards.

N UL 98 - Enclosed and Dead-Front Switches.

O UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.

P UL 869A - Reference Standard for Service Equipment.

Q UL 943 - Ground-Fault Circuit-Interrupters.

R UL 1053 - Ground-Fault Sensing and Relaying Equipment.

S UL 1699 - Arc-Fault Circuit-Interrupters.

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. 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 26 05 00 - Common Work Results for Electrical, 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.

D Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.

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 Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

H Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

I Maintenance Materials: Furnish the following for Owner'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.
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 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.
2. Panelboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A Eaton Corporation
B General Electric Company
C Schneider Electric; Square D Products
D Siemens Industry, Inc
E Milbank
F Substitutions: See Section 01 60 00 - Product Requirements.
G 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 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.
b. Panelboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.
C 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. Provide panelboards 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.
3. Listed series ratings are acceptable only where specifically indicated.
4. Label equipment utilizing series ratings as required by NFPA 70.
D Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
E Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
F Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
G 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.

H Conductor Terminations: Suitable for use with the conductors to be installed.

I Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
      a. 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. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K 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.

L 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.

M 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.

N Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

O 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.

P Load centers are not acceptable.

Q Provide the following features and accessories where indicated or where required to complete installation:
   1. Feed-through lugs.
   2. Sub-feed lugs.

R Metering:
1. Where indicated on Design Drawings, provide microprocessor-based digital electrical metering system including instrument transformers, wiring, and connections necessary for measurements specified.
2. Metering type to be as indicated on Design Drawings
   a. See Section 26 27 13 for metering equipment requirements.

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

C Conductor Terminations:
1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

D Bussing:
1. Phase and Neutral Bus Material: Aluminum.
2. Ground Bus Material: Aluminum.

E 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.

F Circuit Breaker Selection for Transformer Primary Protection: Provide circuit breakers with time-current characteristics to clear transformer inrush currents while still providing protection for the ANSI through-fault protection curve. Provide circuit breakers with adjustable magnetic trip or electronic trip units as necessary to provide time-current curve shaping to achieve long time trip indicated on drawings, inrush coordination and damage protection.

G Circuit-breaker frame sizes 250 A and larger shall be 100 percent rated to continuously carry their full ampere capacity.

H Enclosures:
1. Provide pad-mountedsurface-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.
3. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
4. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
5. Provide clear plastic circuit directory holder mounted on inside of door.

I Metering:
1. Where indicated on Design Drawings, provide microprocessor-based digital electrical metering system including instrument transformers, wiring, and connections necessary for measurements specified.
2. Metering type to be as indicated on Design Drawings
   a. See Section 26 27 13 for metering equipment requirements.

2.04 OVERCURRENT PROTECTIVE DEVICES

A Fusible Switches:

1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA BS 31047, 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, but not less than:
      1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      2) 14,000 rms symmetrical amperes at 480 VAC.
   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. Acceptable only where specifically 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. Provide 100 percent Rated Circuit Breakers for circuit breaker frame sizes 250 amperes and larger.
7. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
8. 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.
   f. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
   g. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
   h. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
9. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
10. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.
11. Do not use tandem circuit breakers.
12. Do not use handle ties in lieu of multi-pole circuit breakers.
13. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
14. 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.

2.05 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 field measurements are as indicated.

B Verify 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 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 .
F Install panelboards plumb.
G 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.
H Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
I 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.
J Install field-installed branch devices, components, and accessories.
K Provide fuses complying with Section 26 28 13 for fusible switches as indicated.
L Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
M Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
N Set field-adjustable circuit breaker tripping function settings as indicated.
O Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.
P Set field-adjustable ground fault protection pickup and time delay settings as indicated.
Q Provide filler plates to cover unused spaces in panelboards.
R 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.
S 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. Tests listed as optional are not required.
    1. Perform insulation-resistance tests on all control wiring with respect to ground.
    2. Test functions of the trip unit by means of secondary injection.

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 26 24 16

SECTION 26 27 13 - ELECTRICITY METERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A Equipment for Owner Electricity Metering.

B Basic Electricity Metering:

1. Single circuit electricity meters.
2. Multi-circuit electricity meters.
3. Branch circuit electricity meter (BCEM).

C Advanced Electricity Metering:

1. Single circuit meter.
2. Multi-circuit meter.

D Power Quality Electricity Metering:

1. Single circuit meter.

E Ethernet Gateway for Electricity Meters.

F Data Acquisition Servers.

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 13 13 - Metal-Clad Switchgear.

F Section 26 24 13 - Switchboards: For interface with meters specified in this section.

G Section 26 24 16 - Panelboards: For interface with meters specified in this section.

H Section 26 28 13 - Fuses.

1. Includes requirements for spare fuses and spare fuse cabinets.

1.03 REFERENCE STANDARDS

A IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers.

B NECA 1 - Standard for Good Workmanship in Electrical Construction.

C NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems.

E NFPA 70 - National Electrical Code.

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 26 05 00 - Common Work Results for Electrical, for submittal procedures.

B Product Data:

1. Provide manufacturer's standard catalog pages and data sheets for electricity metering systems and associated components and accessories.
2. Include ratings, configurations, standard wiring diagrams, dimensions, service condition requirements, and installed features.
3. Include manufacturer's published data tables with complete listing of metering device Modbus registers and/or BacNet Object IDs with associated data descriptions, formats, units, scale factors.

C Shop Drawings:
1. Include system interconnection schematic diagrams showing all factory and field connections. Diagrams to Include potential transformer (PT) and current transformer (CT) connections that clearly indicate the point(s) of metering device sensing within the electrical distribution system to be metered and indicate the CT orientation (polarity) with respect to the metered circuit.
2. 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:
1. Final as built system interconnection schematic diagrams.
2. Final equipment settings:
   a. Device usernames and passwords updated from factory defaults.
   b. TCP/IPv4 network settings for all Ethernet enabled meters configured for Modbus/TCP or BacNet/TCP
   c. TCP/IPv4 network settings for all Ethernet enabled electrical metering equipment gateways and/or protocol converters.
   d. Modbus slave IDs for all RS485 enabled meters.
   e. Meter device configuration reports.
   f. Meter device setting file exports.

G Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

H Maintenance Materials: Furnish the following for Owner'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 - Basis of Design: Electro Industries.

B Other Acceptable Manufacturers:

1. Leviton
2. Veris Industries
3. Same as manufacturer of electrical distribution equipment used for this project.
   a. Eaton Corporation.
   b. Schneider Electric.
   c. Siemens Industry, Inc.
   d. Atom Power, Inc.

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

D 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.

E 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 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 Meters

1. Designed for multifunction electrical measurement on 3 phase power systems. Meter to perform to spec in harsh electrical applications in high and low voltage power systems.
2. Support 3 element Wye, 2.5 element Wye, 2 element Delta, 4 wire Delta systems.
3. Surge Withstand: conform to IEEE C37.90.1
4. Fault Current Withstand: 100 Amps for 10 seconds, 300 Amps for 3 seconds, and 500 Amps for 1 second.
5. Inputs and outputs: galvanically isolated to 2500 VAC.

F Enclosures:

1. Where not furnished by manufacturer, provide required cabinets and enclosures in accordance with Section 26 05 33.16 - Boxes for Electrical Systems.
2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. Outdoor Locations: Type 3R or Type 4.
3. Provide lockable door(s) for outdoor locations.
4. Finish: Manufacturer's standard unless otherwise indicated.

G Instrument Transformers:

1. Comply with IEEE C57.13, where applicable.
2. Select suitable ratio, burden, and accuracy as required for connected devices, including protective relay equipment that may be present in the design.
3. Select suitable insulation/voltage class for the circuit to be metered.

4. Current Transformers:
    a. Solid Core CTs for less than or equal to 400A primary metering applications unless otherwise noted in Design.
    b. Split Core CTs for 600A and greater primary metering applications unless otherwise noted in Design.
    c. Rogowski CTs permitted only with pre-bid approval or as indicated in the Design.
    d. Compatible with connected meters; replace meters damaged by connection of incompatible current transformers.
    e. Provide shorting terminal blocks for connection of secondaries where applicable.
    f. CT line voltage terminals to be finger safe.
5. Potential Transformers:
    a. Include primary and secondary fuses with disconnecting means.
    b. CT line voltage terminals to be finger safe.

H Interface with Other Work:

2.03 BASIC ELECTRICITY METERS

A Electricity meters with "M|B" annotations as indicated on Design Documents are subject to the requirements of this Part. Basic electricity meters can be Single Circuit, Multi-Circuit or Branch Circuit type electricity meters as indicated on Design Documents.

B Basic Electricity Meter equipment to be connected to Facility Building Management System (BMS)
1. Basic meters to communicate with Facility BMS via BACnet-IP communication protocol.
2. See Section 23 09 13 - Instrumentation and Control Devices for HVAC.
3. See Design Documentation for additional requirements.

C Basic Electricity Meter equipment to be provided with Data Acquisition Servers (DAS)
1. Basic meters to communicate with DAS via BACnet-IP communication protocol.
2. DAS equipment, if provided, to be dedicated to Division 26 electricity meter data acquisition, storage, display and retrieval.
3. DAS to be capable of logging hourly interval data from meters and retaining logged data in non-volatile memory for a minimum of 36 months.
4. See Design Documentation for additional requirements

D Single Circuit Electricity Meter
1. Basis of Design:
    a. Electro Industries Shark 50B
2. Display:
    a. Integral LED to present user scrollable display of measured readings.
3. Enclosure:
    a. Integrated into switchgear or switchboard assembly or into dedicated cabinet. If switchgear/switchboard integrated, the metering section or cubicle will include dielectric barriers to separate the meter equipment space from live electrical components, shock hazards and Arc Flash hazards.
    b. Include terminal blocks, fuses, power supplies and other accessories as required to satisfy the Design.

E Multi-Circuit Electricity Meter
1. Basis of Design:
    a. Electro Industries Shark MP200
2. Number of metering points:
    a. Capable of metering 8 or more three phase circuits via a single multi-point meter assembly and associated enclosure.

b. Capable of metering 24 or more single phase circuits via a single multi-point meter assembly and associated enclosure.

3. Display:
   a. Optional integral or remote color LED touch screen display to display real time data for each metered point.
   b. See Design Documents for inclusion and desired location.
4. Enclosure:
   a. Integrate into switchgear or switchboard assembly or into dedicated cabinet. If switchgear/switchboard integrated, the metering section or cubicle will include dielectric barriers to separate the meter equipment space from live electrical components, shock hazards and Arc Flash hazards.
   b. Include terminal blocks, fuses, power supplies and other accessories as required to satisfy the Design.

F Branch Circuit Electricity Meter (BCEM)
1. Basis of Design:
   a. Schneider Electric PowerLogic Branch Circuit Power Meter (BCPM)
   b. Eaton Power Xpert Branch Circuit Monitor (PXBCM)
2. As indicated in Design Documents or as required for panelboard branch circuits to be monitored. Product to have configurations available for monitoring up to 84 branch circuits, two 3-phase main devices, and two neutrals with a single meter.
3. Each branch circuit and main device metering point to be subject to the product and functional requirements of this Part (Basic Electricity Meters).
4. Display:
   a. Optional integral or remote color LED touch screen display to display real time data for each metered point.
   b. See Design Documents for inclusion and desired location.

G Basic Electricity Metering Product Requirements:
1. Accuracy:
   a. Real Power/Energy: Plus/minus 0.5 percent, complying with ANSI C12.20 accuracy and IEC 62053-21, Class 0.5, or IEC 60253-22, Class 0.5S.
   b. Reactive Power/Energy: Plus/minus 1.0 percent, complying with IEC 62053-24, Class 1, or better.
   c. Line to Neutral Voltage: Plus/minus 0.2 percent.
   d. Line to Line Voltage: Plus/minus 0.4 percent.
   e. Current: Plus/minus 0.2 percent.
   f. Power Factor: Plus/minus 1.0 percent.
   g. Frequency: Plus/minus 0.01 Hz.
2. Sampling Frequency, Update Rate and Harmonics:
   a. Sampling frequency: 400 per cycle (24,000Hz)
   b. Update rate: 2 seconds (maximum)
   c. Harmonics Resolution: N/A.
3. Measured Parameters:
   a. Real energy (kWh); per phase and total of phases.
   b. Reactive energy (kVARh); per phase and total of phases.
   c. Apparent energy (kVAh); per phase and total of phases.
   d. Real power (kW); Average and maximum over a user-specified interval of one hour or less.
   e. Reactive power (kVAR); Average and maximum over a user-specified interval of one hour or less.

f. Apparent power (kVA); Average and maximum over a user-specified interval of one hour or less.
g. Bi-directional Energy Measurements:
   1) Real/active energy (kWh) and apparent energy (kVAh); imported (from the grid), exported (to the grid), and signed net total.
   2) Reactive energy (kVARh); imported (from the grid) and exported (to the grid), per quadrant as defined by IEEE 1459.
   3) Maximum demand; real/active power (kW), reactive power (kVAR), and apparent power (kVA); imported (from the grid) and exported (to the grid).
h. Current; per phase and average of phases.
i. Voltage; line-to-line and line-to-neutral; per phase and average of phases.
j. Power factor; per phase and average of phases.
k. Frequency.

4. Non-Volatile Memory:
   a. N/A
5. Data Logging
   a. N/A
6. Waveform Recording
   a. N/A
7. Alarm
   a. N/A
8. Meter Inputs/Outputs (I/O):
   a. NA
9. Communications:
   a. Compatible with connected systems. Provide accessories necessary for proper interface.
   b. Protocol converters not permitted unless otherwise noted in Design Documentation or this Section.
   c. Serial Communications (at least one of the following):
      1) RS-485, 2-wire: support for Modbus RTU
      2) RS-485, 2-wire; support for BACnet MS/TP
   d. Ethernet Communications (at least one of the following):
      1) Modbus TCP/IP
      2) BacNet IP

2.04 ADVANCED ELECTRICITY METERS

A Electricity meters with "M|A" annotation as indicated on Design documents are subject to the requirements of this Part.

B Advanced Electricity Meter equipment to be connected to Facility Building Management System (BMS)
   1. Basic meters to communicate with Facility BMS via BACnet-IP communication protocol.
   2. See Section 23 09 13 - Instrumentation and Control Devices for HVAC.
   3. See Design Documentation for additional requirements.

C Advanced Electricity Meter equipment to be provided with Data Acquisition Servers (DAS)
   1. Basic meters to communicate with DAS via BACnet-IP communication protocol.
   2. DAS equipment, if provided, to be dedicated to Division 26 electricity meter data acquisition, storage, display and retrieval.
   3. DAS to be capable of logging hourly interval data from all meters and retaining logged data in non-volatile memory for a minimum of 36 months.
   4. See Design Documentation for additional requirements

D Single Circuit Electricity Meter
1. Basis of Design:
   a. Electro Industries Shark 200v5
2. Display
   a. Integral LED to present user scrollable display of measured readings.
3. Enclosure
   a. Integrate into switchgear or switchboard assembly or into dedicated cabinet. If switchgear/switchboard integrated, the metering section or cubicle will include dielectric barriers to separate the meter equipment space from live electrical components, shock hazards and Arc Flash hazards.
   b. Inclusive of terminal blocks, fuses, power supplies and other accessories as required to satisfy the Design.

E Advanced Electricity Metering Product Requirements:
1. Accuracy:
   a. Real Power/Energy: Plus/minus 0.2 percent, complying with ANSI C12.20 accuracy and IEC 62053-22, Class 0.2S.
   b. Reactive Power/Energy: Plus/minus 1.0 percent, complying with IEC 62053-24, Class 1 or better.
   c. Line to Neutral Voltage: Plus/minus 0.1 percent.
   d. Line to Line Voltage: Plus/minus 0.2 percent.
   e. Current: Plus/minus 0.2 percent.
   f. Power Factor: Plus/minus 0.2 percent.
   g. Frequency: Plus/minus 0.01 Hz.
2. Sampling Frequency, Update Rate and Harmonics
   a. Sampling frequency: 400 per cycle (24,000 Hz)
   b. Update rate: Watts, VARs and VA at 0.1 seconds (6 cycles) and other recorded parameters at 1.0 seconds (60 cycles).
   c. Harmonics Resolution: 40x of fundamental frequency (40^{th} Order).
3. Measured Parameters:
   a. Real energy (kWh); per phase and total of phases.
   b. Reactive energy (kVARh); per phase and total of phases.
   c. Apparent energy (kVAh); per phase and total of phases.
   d. Real power (kW); Average and maximum over a user-specified interval of one hour or less
   e. Reactive power (kVAR); Average and maximum over a user-specified interval of one hour or less
   f. Apparent power (kVA); Average and maximum over a user-specified interval of one hour or less
   g. Bi-directional Energy Measurements:
      1) Real/active energy (kWh) and apparent energy (kVAh); imported (from the grid), exported (to the grid), and signed net total.
      2) Reactive energy (kVARh); imported (from the grid) and exported (to the grid), per quadrant as defined by IEEE 1459.
      3) Maximum demand; real/active power (kW), reactive power (kVAR), and apparent power (kVA); imported (from the grid) and exported (to the grid).
   h. Current; per phase and average of phases.
   i. Voltage; line-to-line and line-to-neutral; per phase and average of phases.
   j. Power factor; per phase and average of phases.
   k. Frequency.

4. Non-Volatile Memory
   a. Minimum 3 megabytes.
5. Data Logging
   a. Real-time clock that allows for time stamping of logged data.
      1) Equipped with seven (7) dedicated log files as follows:
         (a) Three (3) historical logs for trending profiles. Each log programmable with up to sixty-four (64) parameters. User sallocatable memory between each of the historical logs in order to increase or decrease the memory allotted to each of the logs.
         (b) One (1) log for Limits Alarms. Limits log provides magnitude and duration of an event, time-stamp, and log value. Log capable of recording to 2048 events.
         (c) One (1) log for System Events. System Events log records the following occurrences with a time-stamp: Demand Resets, Password Requests, System Startup, Energy Resets, Log Resets, Log Reads, Programmable Settings Changes, and Critical Data Repairs.
         (d) One (1) log for I/O changes. I/O Change log provides a time-stamped record of any Relay Outputs and any Input Status changes. The log must be capable of recording up to 2048 events.
         (e) One (1) log for Waveform Recording
6. Waveform Recording:
   a. Triggering:
      1) Up to 16 user settable waveform capture triggers based on percent of full-scale for measured parameters.
      2) Voltage and current trigger setpoints compared against RMS measured values updated on a 1-cycle basis.
   b. Event Capture:
      1) User programmable sampling rates of 16, 32 or 64 samples per cycle for waveform capture.
      2) Pre-event and post-event recording.
      3) Meter stores waveform capture events on a first-in, first-out basis to ensure most recent waveform capture data is continuously recorded.
      4) Intergral non-volatile memory available for waveform capture storage.
7. Limit Alarms
   a. User configurable limit alarm setpoints for measured parameters.
   b. Setpoints to be based on percentage of full scale for measured parameters.
   c. Up to 16 limit alarm setpoints.
   d. User configurable limit alarms to map to meter I/O (if equipped).
   e. User configurable limit alarms to map to remote annunciation (if equipped).
8. Meter Inputs/Outputs (I/O):
   a. I/O expandability through two (2) option card slots on the back.
   b. I/O cards capable of being installed in the field, without removing the meter from installation.
   c. Meter auto-detects the presence of any I/O option cards.
   d. Meter capable of accepting any combination of I/O option cards.
   e. Option card slots accept I/O cards in all of the following formats:
      1) 100BaseT Ethernet Communication Card
      2) Four Channel Bi-directional 0-1mA Output Card
      3) Four Channel 4-20mA Output Card

4) Two Relay Outputs/2 Status Inputs Card
5) Four Pulse Output/4 Status Inputs Card
6) Fiber Optic Card
7) IEC 61850 Protocol Ethernet Network Card.

9. Communications:
   a. Compatible with connected systems. Provide accessories necessary for proper interface.
   b. Protocol converters not permitted unless otherwise noted in Design Documentation or this Section.
   c. Serial Communications:
      1) RS-485, 2-wire via fixed backplate terminals.
      2) Baud rate to be user configurable from 1,200 to 57,600.
      3) Support for serial protocols:
         (a) Modbus ASCII.
         (b) Modbus RTU.
         (c) DNP3.
         (d) BACNet MS/TP via Electro Industries ProtoCom-KT Gateway.
   d. Programming Port:
      1) Dedicated optical Infrared Data Association (IrDA) type programming port located on meter faceplate.
      2) Allow the unit to be set up and programmed using a remote laptop without need for a communication cable.
      3) Provide (2) USB to IrDA adapter cables for facility owner O&M operations.
   e. Ethernet Communications:
      1) Provided pre-installed at factory unless otherwise noted on Design Drawings.
      2) 100BaseT Ethernet.
      3) NTP time server for high accuracy network time synchronization.
      4) Allow the meter to speak with 12 simultaneous sockets of Modbus TCP, so that multiple requests for data can be received simultaneously.
      5) Allow the meter to speak with 5 simultaneous sockets of DNP over TCP/IP so that multiple requests can be handled simultaneously, using standard and optional ports.
      6) Allow the meter to speak with both Modbus TCP and DNP over Ethernet simultaneously.
      7) Allow auto transmit/receive detection for straight or null RJ45 cables.
      8) Provide an embedded Web server that allows access to metered readings through the Internet, using any standard Web browser from a PC, smart phone, or tablet PC.
      9) Provide email on configured alarms.
      10) Provide email notification of meter status and readings data on a programmed schedule.

F DAS equipment, if provided, to be dedicated to Division 26 electricity meter data acquisition, storage, display and retrieval.
   1) Provide data push of up to 15 meter readings to a cloud server with the JSON structure.
   2) Provide heightened security by allowing setup of an exclusive TCP/IP client. When the client is communicating though the meter's network card, no other communication to that network card will be allowed, to protect against unauthorized programming.

3) The meter shall be programmable to shut down unused network services to protect against meter tampering.
4) BacNet IP via Electro Industries ProtoCom-KT Gateway
5) When two Ethernet cards are installed in the meter, an independent IP address and MAC address shall be assignable to each card.

b. Relay Output & Status Input:
1) Optional I/O Card – Provide only when indicated on Design Documents or required in other specification Sections.

c. IEC 61850:
1) Optional I/O card – Provide only when indicated on Design Documents or required in other specification Sections.
2) Integrates into any IEC 61850 network.
3) Provides support for Modbus and IEC 61850 protocols simultaneously.
4) Configurable for multiple logical nodes.
5) Provides buffered and unbuffered reporting.
6) Certified by a 3rd party Authorized IEC61850 Test Laboratory.
7) Capable of supporting two Ethernet /IP connections with separate /IP addresses, each running IEC 61850 protocol.
8) Provide heightened security using setup of an exclusive TCP/IP client. When the client is communicating though the meter's network card, no other communication to that network card permitted, to protect against unauthorized programming.

2.05 POWER QUALITY (PQ) ELECTRICTY METERS

A Electricity meters with "M|Q" annotation as indicated on Design documents are subject to the requirements of this Part.

B PQ Meter equipment to be connected to Facility Building Management System (BMS):
1. Basic meters to communicate with Facility BMS via BACnet-IP communication protocol.
2. See Section 23 09 13 - Instrumentation and Control Devices for HVAC.
3. See Design Documentation for additional requirements.

C PQ Meter equipment to be provided with Data Acquisition Servers (DAS):
1. Basic meters to communicate with DAS via BACnet-IP communication protocol.
2. DAS to be capable of logging hourly interval data from all meters and retaining logged data in non-volatile memory for a minimum of 36 months.
3. See Design Documentation for additional requirements.

D Single Circuit Electricity Meter.
1. Basis of Design:
a. New Construction:
1) Electro Industries Nexus 1500v3.
b. Retrofit:
1) Electro Industries Nexus 1450v2.
2. Display:
a. New construction:
1) Integral LED to present user scrollable display of measured readings.
2) Supports screen rotation to enable vertical meter mounting.
b. Retrofit:
1) Remote color LED touch screen display to display real time data for each metered point.
3. Enclosure:

a. Integrate into switchgear or switchboard assembly or into dedicated cabinet. If switchgear/switchboard integrated, the metering section or cubicle will include dielectric barriers to separate the meter equipment space from live electrical components, shock hazards and Arc Flash hazards.
b. Inclusive of terminal blocks, fuses, power supplies and other accessories as required to satisfy the Design.

E Power Quality Electricity Metering Product Requirements:

1. Accuracy:
   a. Real Power/Energy: Plus/minus 0.2 percent, complying with ANSI C12.20 accuracy and IEC 62053-22, Class 0.2S.
   b. Reactive Power/Energy: Plus/minus 1.0 percent, complying with IEC 62053-24, Class 1 or better.
   c. Line to Neutral Voltage: Plus/minus 0.05 percent.
      1) 0.05 percent for the one second reading (High Accuracy).
      2) 0.1 percent for the 100-millisecond reading (High Speed).
   d. Line to Line Voltage: Plus/minus 0.1 percent.
      1) 0.1 percent for the one second reading (High Accuracy).
      2) 0.2 percent for the 100-millisecond reading (High Speed).
   e. Current: Plus/minus 0.025 percent.
      1) 0.025 percent for the one second reading (High Accuracy).
      2) 0.1 percent for the 100-millisecond reading (High Speed).
   f. Power Factor: Plus/minus 0.2 percent.
   g. Frequency: Plus/minus 0.01 Hz.
      1) Less than 0.01 Hz for the one second reading (High Accuracy).
      2) Less than 0.03 Hz for the user programmable 2 to 20 cycle reading (High Speed).
   h. Auto-calibration capability to correct for temperature dependent affects.
      1) Meter self-calibrates once every ten (10) seconds continuously.
2. Sampling Frequency, Update Rate and Harmonics:
   a. Sampling frequency: 1024 per cycle (61,440 Hz).
   b. Update rate for measured parameters:
      1) High Accuracy:
         (a) One second (60 cycles).
      2) High Speed:
         (a) Voltage and Current at 0.1 seconds (10 cycles).
         (b) Frequency and other parameters at a user settable rate of 0.03 to 0.33 seconds (2 to 20 cycles).
   c. Harmonics Resolution: 127x of fundamental frequency (127^{th} Order).
   d. Internal precision real time clock providing max accuracy at full temperature range to plus/minus 3.5ppm. Less than 10 seconds per month clock drift.
3. Measured Parameters:
   a. Real energy (kWh); per phase and total of phases.
   b. Reactive energy (kVARh); per phase and total of phases.
   c. Apparent energy (kVAh); per phase and total of phases.
   d. Real power (kW); Average and maximum over a user-specified interval of one hour or less.
   e. Reactive power (kVAR); Average and maximum over a user-specified interval of one hour or less.

f. Apparent power (kVA); Average and maximum over a user-specified interval of one hour or less.
g. Bi-directional Energy Measurements:
    1) Real/active energy (kWh) and apparent energy (kVAh); imported (from the grid), exported (to the grid), and signed net total.
    2) Reactive energy (kVARh); imported (from the grid) and exported (to the grid), per quadrant as defined by IEEE 1459.
    3) Maximum demand; real/active power (kW), reactive power (kVAR), and apparent power (kVA); imported (from the grid) and exported (to the grid).
h. Current; per phase and average of phases.
i. Voltage; line-to-line and line-to-neutral; per phase and average of phases.
j. Power factor; per phase and average of phases.
k. Frequency.

4. Non-Volatile Memory:
    a. Minimum 4 gigabytes.
    b. Data stored in non-volatile memory retained for no less than ten (10) years in the event of loss of control power,.
5. Data Logging:
    a. Real-time clock that allows for time stamping of all logged data:
        1) Equipped with thirteen (13) dedicated log files as follows:
            (a) Eight (8) historical logs for trending profiles. Each log shall be capable of being programmed with up to one hundred twenty-eight (128) parameters. The user shall have the ability to allocate memory between each of the historical logs in order to increase or decrease the memory allotted to each of the logs.
            (b) One (1) log for Limits Alarms. The Limits log shall provide magnitude and duration of an event, time-stamp, and log value. The log must be capable of recording to 2048 events.
            (c) One (1) log for System Events. The System Events log shall record the following occurrences with a time-stamp: Demand Resets, Password Requests, System Startup, Energy Resets, Log Resets, Log Reads, Programmable Settings Changes, and Critical Data Repairs.
            (d) One (1) log for I/O changes. The I/O Change log shall provide a time-stamped record of any Relay Outputs and any Input Status changes. The log must be capable of recording up to 2048 events.
            (e) One (1) log for Waveform Recording.
            (f) One (1) log for ITIC/CBEMA events which records magnitude and duration of voltage and current surges and sags for every power quality event.
6. Waveform Recording:
    a. Accuracy:
        1) The accuracy of IRIG-B time stamping of waveform capture shall be 100 microseconds.
    b. Triggering:
        1) Up to 16 user settable waveform capture triggers based on percent of full-scale for all measured parameters.
        2) Voltage and current trigger setpoints compared against RMS measured values updated on a 1-cycle basis.
    c. Event Capture:

1) User programmable sampling rates of up to 1024 samples per cycle for waveform capture
2) Pre-event and post-event recording duration configurable up to 179 cycles.
3) Meter stores waveform capture events on a first-in, first-out basis to ensure most recent waveform capture data is always recorded.
4) Integral non-volatile memory available for waveform capture storage.

d. Sub-Cycle Transient Recorder:
1) Process 50 MHz high-speed voltage transients.
2) Transients will be analyzed utilizing a field programmable gate array (FPGA) to designate the high peak transient magnitude and its duration in nanoseconds.

7. Limit Alarms:
a. User configurable limit alarm setpoints for any measured parameter.
b. Setpoints to be based on percentage of full scale for any measured parameter.
c. Up to 32 limit alarm setpoints.
d. User configurable limit alarms to map to meter I/O (if equipped).
e. User configurable limit alarms to map to remote annunciation (if equipped).

8. Meter Inputs/Outputs (I/O):
a. Meter to have eight (8) built-in digital high-speed status inputs
1) Inputs automatically sense when the circuit is externally wetted.
2) If externally wetted, inputs accept up to 150 V DC; if internally wetted the meter supplies the necessary voltage for the control application.
3) Status inputs configurable for pulse accumulation, pulse synchronization, or event monitoring. When used for pulse accumulation, each input has an accumulating register to count incoming pulses.
4) Time stamp all changes to the nearest millisecond and placed in an event log with time and event label information.
5) Enable users to recreate sequence of events involving external status points.
6) High-speed status inputs shall be able to trigger waveform recording to the waveform log.
7) Record inputs at 1 cycle RMS and be programmable for (2-20) cycles RMS recording.

b. Meters have I/O expandability through four (4) option card slots on the back of the meter and through optional external input/output modules.
c. I/O cards capable of being installed in the field, without removing the meter from installation.
d. Meters able to auto-detect the presence of any I/O option cards.
e. Meter capable of accepting any combination of cards.
f. Option card slots accept I/O cards in all of the following formats:
1) Dual RS485/Pulse Output card.
2) Ethernet card with RJ45 or Fiber Optic port with 100BaseT support.
3) Up to two Relay Output cards with 6 output relays on each card.
4) Up to two Digital Input Status cards with 16 inputs on each card.

g. Meter to have optional external input/output modules with the following configurations:
1) Supports up to 4 Analog Output Modules in 0-1 mA or 4-20 mA, in either 4 or 8 analog output models.
2) Supports up to one Digital Dry Contact Relay Output Module, with 4 relay outputs.
3) Supports up to 4 Digital Solid State Pulse Output modules for KYZ pulsing.

4) Supports up to 4 Analog Input Modules for external sensing of temperature or process conditions.
5) Able to support 13 external I/O modules.
6) External input/output modules powered by external power source and attached to the meter with mounting brackets. Mounting brackets equipped with DIN Rail mounting clips.

9. Communications:
   a. Compatible with connected systems. Provide all meter expansion cards and accessories necessary for proper interface.
   b. Protocol converters not permitted unless otherwise noted in Design Documentation or this Section.
   c. Serial Communications:
      1) Baud rate to be user configurable from 1,200 to 115,200.
      2) Support for serial protocols:
         (a) Modbus ASCII.
         (b) Modbus RTU.
         (c) DNP3.
         (d) BACNet MS/TP via Electro Industries ProtoCom-KT Gateway.
   d. Programming Port::
      1) Dedicated programming port to be Universal Serial Bus (USB) type and located on meter faceplate.
   e. Ethernet Communications
      1) Standard 10/100BaseT Ethernet port.
      2) Optional 2nd Ethernet port to be either 10/100BaseT or 10/100Base-FX fiber optic. See Design Documents for requirements.
      3) SNTP time protocol support for high accuracy network time synchronization.
      4) Modbus TCP/IP server and Modbus TCP/IP client:
         (a) Allow the meter to speak with 12 simultaneous sockets of Modbus TCP, so that multiple requests for data can be received simultaneously.
      5) DNP:
         (a) Allow the meter to speak with 5 simultaneous sockets of DNP over TCP/IP so that multiple requests can be handled simultaneously, using standard and optional ports.
         (b) Allow the meter to speak with both Modbus TCP and DNP over Ethernet simultaneously.
      6) Allow auto transmit/receive detection for straight or null RJ45 cables.
      7) Provide an embedded Web server that allows access to metered readings through the Internet, using any standard Web browser from a PC, smart phone, or tablet PC.

PART 3 EXECUTION

3.01 EXAMINATION

A Verify field measurements are as indicated.
B Verify the ratings and configurations of metering systems and associated components are consistent with the indicated requirements.
C Verify mounting surfaces are ready to receive meters.
D Verify 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.
F Identify meters and associated wiring 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 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.
1. Testing results report to include meter CT polarity and CT/PT phase relationship verification with respect to the metered circuit and associated directionality of current and power flows.

3.04 ADJUSTING

A Program system parameters according to requirements of Owner.

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 Owner'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 26 27 13

SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A Receptacles.

B Wall plates.

1.02 RELATED REQUIREMENTS

A Section 26 05 33.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A FS W-C-596 - Connector, Electrical, Power, General Specification for.

B NECA 1 - Standard for Good Workmanship in Electrical Construction.

C NECA 130 - Standard for Installing and Maintaining Wiring Devices.

D NEMA WD 1 - General Color Requirements for Wiring Devices.

E NEMA WD 6 - Wiring Devices - Dimensional Specifications.

F NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A See Section 26 05 00 - Common Work Results for Electrical for submittal procedures.

B Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C Operation and Maintenance Data:

1.05 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

B Products: Listed, classified, and labeled as suitable for the purpose intended.

1.06 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 GFCI protection for receptacles serving electric drinking fountains.

2.02 WIRING DEVICE FINISHES

A Provide wiring device finishes as described below unless otherwise indicated.

B Wiring Devices, Unless Otherwise Indicated: Gray with stainless steel wall plate.

2.03 RECEPTACLES

A Manufacturers:

1. Hubbell Incorporated.
2. Leviton Manufacturing Company, Inc.
3. Lutron Electronics Company, Inc.
4. Pass & Seymour, a brand of Legrand North America, Inc

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. 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.
3. 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.
4. 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.

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 Exposed Device Color, unless otherwise noted, is as follows:
1. Normal power: Gray or as selected by Architect.

2.04 WALL PLATES

A Manufacturers:
1. Hubbell Incorporated.
2. Leviton Manufacturing Company, Inc.
3. Lutron Electronics Company, Inc.
4. Pass & Seymour, a brand of Legrand North America, Inc.

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.

C Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

D 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.

E 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.

PART 3 EXECUTION

3.01 EXAMINATION

A Verify field measurements are as indicated.

B Verify 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 wall openings are neatly cut and will be completely covered by wall plates.

D Verify final surface finishes are complete, including painting.

E Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F Verify 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 Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.

1. ocate 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 Owner to obtain direction prior to proceeding with work.

C Install wiring devices in accordance with manufacturer's instructions.

D Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F 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.

G Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.

J Install wiring devices plumb and level with mounting yoke held rigidly in place.

K Install wall switches with OFF position down.

L Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

M 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.

N Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

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. Receptacle testing report form example is as follows:

Receptacle Testing and Acceptance Report Form						Date	
Room/Area	Receptacle Test			Ground System Voltage/Impedance		Grounding	Exceptions/Remarks
	Physical Integrity	Polarity	Tension >4oz	New <20m V	Impedance <0.1 Ohms		

E Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A Adjust devices and wall plates to be flush and level.

3.06 CLEANING

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

3.07 CORD CAPS

END OF SECTION 26 27 26

SECTION 26 28 16.13 - ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A Enclosed circuit breakers.

B Molded case 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 53 - Identification for Electrical Systems: Identification products and requirements.

D Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.03 REFERENCE STANDARDS

A FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service.

B NECA 1 - Standard for Good Workmanship in Electrical Construction.

C NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems.

E NFPA 70 - National Electrical Code.

F UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

G UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.

H UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.

I UL 869A - Reference Standard for Service Equipment.

J UL 943 - Ground-Fault Circuit-Interrupters.

K UL 1053 - Ground-Fault Sensing and Relaying Equipment.

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 26 05 00 - Common Work Results for Electrical, 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.

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 installed locations of enclosed circuit breakers.

G 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.

B Source Limitations: Furnish enclosed circuit breakers and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project.

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 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.

D 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 indicated on the drawings.
2. 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.

3. Listed series ratings are only acceptable where specifically indicated.
4. Label equipment utilizing series ratings as required by NFPA 70.

E Enclosed Circuit Breakers Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

F Conductor Terminations: Suitable for use with the conductors to be installed.

G Circuit-breaker frame sizes 250 A and larger shall be 100% rated to continuously carry their full ampere capacity.

H Circuit breakers that are 1200 amp and larger rated, or can be adjusted to be 1200 amp or larger rated: Provide with an energy reducing maintenance switch adjustment to meet the requirements of NEC 240.87.

I Circuit Breaker Selection for Transformer Primary Protection: Provide circuit breakers with time-current characteristics to clear transformer inrush currents while still providing protection for the ANSI through-fault protection curve. Provide circuit breakers with adjustable magnetic trip or electronic trip units as necessary to provide time-current curve shaping to achieve long time trip indicated on drawings, inrush coordination and damage protection.

J Provide thermal magnetic circuit breakersfor circuit breaker frame sizes less than 250 amperes.

K Provide electronic trip circuit breakersfor circuit breaker frame sizes 250 amperes and above.

L Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

M Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

N Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. 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.

O Provide externally operable handle with means for locking in the OFF position.

P 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.

Q 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: Aluminum, suitable for terminating aluminum or copper conductors.

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 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. Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.
4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
5. Communication Capability: Communication module with functions and features compatible with power monitoring and control system specified in Division 26 Section "Electrical Power Monitoring and Control."
6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
8. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handles in on or off position.
9. Handle Clamp: Loose attachment, for holding circuit-breaker handles in on position.

PART 3 EXECUTION

3.01 EXAMINATION

A Verify field measurements are as indicated.
B Verify the ratings of the enclosed circuit breakers are consistent with the indicated requirements.
C Verify mounting surfaces are ready to receive enclosed circuit breakers.
D Verify 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 .
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 circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.
L Set field-adjustable ground fault protection pickup and time delay settings as indicated.
M 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. Tests listed as optional are not required.

1. Perform insulation-resistance tests on all control wiring with respect to ground.
2. Test functions of the trip unit by means of secondary injection.

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 26 28 16.13

SECTION 26 50 00 - LIGHTING

PART 1 GENERAL

1.01 SUMMARY

A This Section includes:

1. Lenses.
2. Reflector Cones.
3. Housings.
4. Finish.
5. Lamps and Sockets.
6. Power Supplies.
7. Transformers.
8. Exterior Luminaires.
9. Extra Material.
10. Disposal and Replacement.

1.02 DEFINITIONS

A BACNET - Protocol for integration with BAS/BMS/EMS.

B CCT- Correlated Color Temperature.

C CRI - Color Rendering Index.

D FC - Footcandles.

1. The metric for measuring illuminance light levels.
2. GUI - Graphic User Interface.
3. LCP - Lighting Control Panel.
4. LED - Light Emitting Diode.
5. LonWorks - Protocol for integration with BAS/BMS/EMS.
6. MTBF - Minimum Time Between Failures.
   a. Total hours of testing / Number of failures.
7. OS/VS - Occupancy Sensor / Vacancy Sensor.
   a. Occupancy sensors provide automatic on and automatic shut-off.
   b. Vacancy sensors provide automatic shut-off only, and require manual-on.
8. Power Supply Ballasts and LED drivers.
9. RS - RS-232 Connection for AV Integration.
10. SC - Scene Control.
11. TC - Timeclock, or astronomical timeclock.

1.03 REFERENCE STANDARDS

A ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts.

B ANSI E1.11 - Entertainment Technology - USITT DMX512-A - Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories.

C ANSI E1.20 - Entertainment Technology - RDM - Remote Device Management over DMX512 Networks.

D ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

E IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code).

F IEC 60929 - AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements.

G IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products.

H IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources.

I NFPA 70 - National Electrical Code.
J TIA-485 - Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems.

1.04 QUALITY ASSURANCE

A The lighting design for this project was based on luminaire types and manufacturers as specified.
B Basis of Design manufacturers are pre-qualified to bid on products where specified. Inclusion of manufacturer and product series does not relieve specified manufacturer from providing product as described in luminaire schedule; modifications to standard product, if required, include with initial bid.
C Alternate manufacturers listed in the Luminaire Schedule do not require prior approval but included with the shop drawing submittal. Inclusion of manufacturer and product series as an alternate does not relieve the manufacturer from providing product equivalent to the basis of design as described in luminaire schedule; modifications to standard product, if required, include with initial bid.
D Or Approved or Pre-Bid Approved Equal:
    1. Submit Substitution Request prior to bid, complying with requirements of Division 01, General Requirements.
    2. Approval determined by review of the following luminaire characteristics where applicable. Lack of pertinent data on characteristic constitutes justification for rejection of the submittal.
        a. Performance:
            1) Distribution.
            2) Utilization.
            3) Average brightness/maximum brightness.
            4) Spacing to mounting height ratio.
            5) Visual comfort probability.
        b. Construction:
            1) Engineering.
            2) Workmanship.
            3) Rigidity.
            4) Permanence of materials and finishes.
        c. Installation Ease:
            1) Captive parts and captive hardware.
            2) Provision for leveling.
            3) Through-wiring ease.
        d. Maintenance:
            1) Relamping ease.
            2) Ease of replacement of ballast and lamp sockets.
        e. Appearance:
            1) Architectural integration.
            2) Light tightness.
            3) Neat, trim styling.
            4) Conformance with design intent.

1.05 GENERAL REQUIREMENTS

A Provide lighting outlets indicated on the Drawings with a luminaire of the type designated and appropriate for the location.

B Where a luminaire type designation has been omitted and cannot be determined by the Contractor, request a clarification from the Architect in writing and provide a suitable luminaire type as directed.

C Coordinate installation of luminaires with the ceiling installation and other trades to provide a total system that is neat and orderly in appearance.

D Luminaires located in fire rated assemblies rated for use in such assemblies or have assembly maintained by the installer through the use of appropriate construction techniques to maintain the assembly rating. It is the responsibility of the Contractor to maintain the assembly rating and provide required components during construction. Coordinate luminaires impacted with Division 01, General Requirements, and life safety documents.

E Install remote power supplies and transformers in enclosures as required by luminaire specified. Locate remote power supplies and transformers as shown on drawings; where no location is shown, provide recommendation for approval prior to commencing field installation. Locate remote mounted power supplies and transformers within the distance limitations specified by the manufacturer.

F Exterior pole lights have an appropriated pole base as part of the assembly. For pole lights in pedestrian areas, use a flush pole base. Pole lights in parking areas a raised base used. Pole bases, footings, and structural components reviewed and approved by a state licensed structural engineer prior to ordering and installation.

G Linear lighting elements installed on building exterior, in coves, soffits, panels and other architectural materials are the longest sections available to meet the intent of the design and centered in the available space. Other items required to make the lights function installed out of site and coordinated with Architect, Landscape Architect, Lighting Designer, and Electrical Engineer of Record. Transformers, drivers, and ballasts in suitable enclosures. Required connection points are the minimum box or connector available from the manufacturer. Standard electrical boxes are not allowed to produce linear runs in architectural coves. Ancillary material required is concealed from view. Coordinate final ceiling material, dimensions, and limitations with the ceiling manufacturer prior to ordering and installation.

H Coordinate voltage requirements to each luminaire as indicated on drawings.

I Verify luminaires carry a valid UL or ETL listing. Luminaires located in outdoor locations to carry and appropriate wet or damp listing as required for the mounting application.

J Procure luminaires through a distributor located within 200 miles of the project site with a valid business license in the state the project is located.

K Upon request of the Architect, Engineer, or Owner, provide back-up pricing in a unit cost breakdown per luminaire. Back-up pricing includes distributor net pricing, Contractor net pricing, final Owner pricing and mark-ups and discounts (lot price or all-or-none) associated with the luminaires.

L Lighting related change orders to include back-up pricing noted above for review by the Engineer and Lighting Designer.

M Provide manufacturer's warranty covering 5 years on drivers from date of purchase. Luminaire manufacture to operate driver at or below the required driver warranty temperature. Luminaire manufacturers failing to operate the driver, at the project required ambient temperature and within the driver manufacturer warranty parameters will be responsible for driver warranty related costs over the warranty period.

N 80 percent of the luminaire material by weight at a minimum should be recyclable at end of life. Design luminaire for ease of component replacement and end-of-life disassembly.

1.06 SUBMITTALS

A Submit the following in accordance with Section 26 05 00 - Common Work Results for Electrical :

1. Shop Drawings, to include:
   a. Product Data.
      1) Provide manufacturer's published product data information.
      2) This information is to be relevant to the specified product only.
      3) Submittals limited to not more than three sheets for each type specified.
      4) They are specifically not to have configurations available included for review.
      5) Submittals that contain information that is not relevant to the product specified will be rejected in total and resubmission will be required.
   b. Luminaire dimensions on a fully dimensioned line drawing.
   c. Lamp information, including array configuration:
      1) For LED lamps: proof of conformance with the following: ANSI C78.377-2015, IES LM-79-2008, IES LM-80-2008, IES LM 82-2012, IES LM 84-14, IES LM 85-14, IES TM 21-2011, IES TM 28-14 and special certifications required by the contract documents.
   d. Lamp socket information.
   e. Power supply and transformer information using ballast manufacturers published product data information. Multiple power supplies or transformers may be submitted for single luminaire if compatible with specification included in contract documents. Include certification of lamp and power supply and transformer compatibility for submitted.
   f. Mounting details including clips, canopies, supports, and methods for attachment to structure. Provide equipment required for row configurations.
   g. UL/ETL Labeling Information
   h. Manufacturer's Warranty
   i. Photometric Reports consisting of the following:
      1) Candlepower distribution curves: Provide five plane candlepower distribution data at no more than 5 degree vertical angle increments.
      2) Coefficient of utilization table.
      3) Zonal lumen summary including overall luminaire efficiency.
      4) Luminaire luminance: Provide measured maximum brightness data for luminaires with reflectors and average brightness data for luminaires with refractors.
      5) Spacing to mounting height ratio. If parallel and perpendicular ratios differ, provide data on each plane.
      6) Pole information to include maximum supported effective projected area (EPA) and weight for the design wind speed, as well as structural calculations for each pole proposed.
      7) VCP calculations (where applicable): For general office lighting luminaires, provide typical VCP calculations for ceiling heights between 9-feet and 12-feet at 1-foot increments, for room sizes 20-feet by 20-feet and 30-feet by 30-feet.
   j. Special requirements of the specification.
2. Operation and Maintenance Data:
   a. Prepare two copies of a Lighting Systems Maintenance Manual consisting of the following in a hard-cover binder for review. After review, Architect will deliver one copy to Owner. Manual to include:
      1) One complete set of final submittals of actual product installed, including product data and shop drawings. Include product data for actual power supply and transformer installed where applicable.

2) List of lamps used in Project, cross-referenced to fixture types, with specific manufacturer's names and ordering codes.
3) Re-lamping instructions for lamps that require special precautions (LED, tungsten halogen, metal halide, etc.).
4) Lighting fixture cleaning instruction, including chemicals to be used or avoided.
5) Parts list of major luminaire components and ordering information for replacement
6) Copies of manufacturer warranties on product.

3. 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.
4. Manufacturer's Installation Instructions:
   a. Indicate application conditions and limitations of use stipulated by product testing agency.
   b. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
5. Closeout Submittals:
   a. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.
   b. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
   c. Maintenance Materials: Furnish for Owner's use in maintenance of project.

PART 2 PRODUCTS

2.01 GENERAL

A Luminaires new and complete with mounting accessories, junction boxes, trims, and lamps.
B Luminaire assemblies UL listed.
C Luminaires UL listed appropriate to mounting conditions and application.
D Each luminaire family type (downlights, troffers, etc.) supplied by only one manufacturer.
E Install recessed luminaires in fire rated ceilings and use a fire rated protective cover thermally protected for this application and carry a fire rated listing.
F Luminaires installed under canopies, roofs, or open areas and similar damp or wet locations to be UL listed and labeled as suitable for damp or wet locations.

2.02 LENSES

A Mechanically secured from within the housing.
B Interior linear prisms with smooth exterior.
C Prismatic Acrylic:
   1. 12-inch by 24-inches and Larger: Extruded of clear virgin acrylic plastic, 0.125-inch minimum overall thickness, 0.1-inch nominal unpenetrated thickness, Pattern 12 with flat sided female prisms running at 45 degrees off panel axis unless otherwise specified in the luminaire schedule. Concave prisms are not acceptable.
   2. 12-inch by 24-inches and Larger: Low brightness type, extruded of clear virgin acrylic plastic, 0.156-inch minimum overall thickness, 0.1-inch nominal unpenetrated thickness, Pattern 19 with flat sided male prisms running parallel with panel axis unless otherwise specified in the luminaire schedule. Concave prisms are not acceptable.
   3. 12-inch by 24-inch and Larger: Injection molded of clear virgin acrylic plastic, 0.16-inch minimum overall thickness with 0.125-inch nominal unpenetrated thickness square cone base, similar to Pattern 12 configuration.
   4. As specified in the Luminaire Schedule.
D Opal Acrylic:

1. Extruded or injection molded of virgin acrylic plastic, 0.08-inch minimum overall thickness.
2. As specified in the Luminaire Schedule.

E Opal Acrylic Overlay: High transmittance type, extruded of virgin acrylic plastic, 0.04-inch overall thickness, with minimum 80 percent light transmittance.

2.03 REFLECTOR CONES

A Spun of uniform gauge aluminum, free of spinning marks or other defects.

B Integral trim flange.

C Color and finish as specified in Luminaire Schedule.

D White Reflectors:

1. Steel or aluminum, minimum 22 gauge, with hard baked white enamel finish with minimum 85 percent reflectance.

E Alzak Reflectors:

1. Low iridescent specular or as indicated in the luminaire schedule, Alzak or Coilzak with minimum reflectance of 90 percent.
2. Supply luminaires using Alzak reflector cones by the same manufacturer unless directed otherwise in Luminaire Schedule.

2.04 HOUSINGS

A Dimensions:

1. Proper for the various wattage noted on the plans and as recommended by the luminaire manufacturer or as specified in the luminaire schedule.

B Extruded Aluminum Housing:

1. One piece housing of AA 6063 T5 extruded aluminum with 0.14 minimum thickness smooth and free of tooling lines in one uninterrupted section of 1-foot to 24-foot with the cross sectional dimensions as indicated in the Luminaire Schedule.
2. Section lengths as shown on the drawings and able to be transported into and out of the installation location after final construction without building demolition being required.

C Steel Housing:

1. 20 gauge minimum, free of dents, scratches, or other defects.
2. Fill and sand exposed weld marks, joints, and seams smooth before finishing. Clean and dress edges to remove sharp edges or burrs.
3. Section lengths as shown on the drawings comprised of 1-foot to 12-foot lengths.

D Sheet Metal Housings:

1. Minimum 22 gauge cold-rolled steel, with welded joints. Exposed weld marks and seams filled and ground smooth.

E Door Frames for lensed luminaires:

1. White painted, flat aluminum with mitered corners, rotary cam latches to hinge from either side.

F End Plates:

1. Mechanical attach die cast end plates without exposed fasteners. End caps, minimum 0.125-inch thick.

G Provide an internal alignment spline where housing sections are joined together to form a continuous row.

H For wet and damp use, LED-based luminaire to be sealed, rated, and tested for appropriate environmental conditions and may not be accomplished by using an additional housing or enclosure.

2.05 FINISH

A Visible surfaces to be of color and texture as directed in Luminaire Schedule.

1. Baked white dry polyester powder, if not specified, with a minimum average reflectance of 85 percent on exposed and light reflecting surfaces.

B Concealed interior and exterior luminaire surfaces to be Matte black or as recommended by the luminaire manufacturer.
C Prepare steel components for finishing with a 5-step zinc phosphating process prior to painting.
D Paint luminaire (including painted component parts) after fabrication unless specifically noted in the Luminaire Schedule.
E Exposed aluminum surfaces:
1. Satin etched and clear anodized.
2. Treat with an acid wash and clear water rinse prior to painting.
3. Electrostatically paint or powder coat and oven bake in the color indicated in the Luminaire Schedule.
F Exposed steel surfaces:
1. Treat with acid wash and clear water rinse, then prime coat.
2. Electrostatically paint or powder coat and oven bake in the color indicated in the Luminaire Schedule.

2.06 LAMPS AND SOCKETS

A Lamp each luminaire with the suitable lamp cataloged for the specific luminaire type and as indicated by the manufacturer, or as specifically indicated in the Luminaire Schedule, or as specified herein.
B Lamps to be field replaceable.
C Lamp sockets to be of configuration and design to accept standard LED lamps and circuit boards.
D LED lamps to meet or exceed 50,000 hours as defined by LM-80-08 based on both the ambient temperature listed and the LEDs B10L70 performance curve as published by the LED lamp manufacturer.
E LED lamps to be high brightness and proven quality from established and reputable LED manufacturers, including:
1. Nichia.
2. Osram-SemiOpto.
3. Cree.
4. Philips Lumileds.
5. Seoul Semiconductor.
6. Bridgelux.
7. General Electric Gelcore.
8. Xicato.
9. Osram.
F Replacement Lamps:
1. Sorra.
2. Toshiba.
G LED lamps that are integral into the housing; light bars, diodes, boards and other, to be rated and tested for use in the fixture specified and compatible with the driver tested and compatible with that fixture.
H Screw-In Base Replacement LED Lamps:
1. Manufacturer to provide wattage restriction label on socket, equivalent to specified wattage on LED replacement lamp.
2. LED replacement lamps not to be placed in air-tight enclosures or in insulated air tight (ICAT) rated luminaire enclosures without dedicated heat dissipation and thermal management of the luminaire system.
I Color Rendering Index (CRI):
1. 80 or higher for ambient lighting in common spaces.

2. 90 or higher for accent lighting in common spaces.
3. 95 or higher for art lighting.
4. As indicated in the luminaire schedule.

J Color Rendering Index (CRI): 90+ per ANSI C78.377-2008/CIE 13.3-1995 unless noted otherwise on the luminaire schedule.

K Correlated Color Temperature (CCT) per luminaire schedule:
1. Color consistency not to exceed a +/- tolerance of greater than two MacAdam Ellipses over the life of the luminaire.

L Adjustable Lamp Mechanisms: To have aiming stops which can be permanently set to position lamp vertically and rotationally.

M High power LED luminaire thermally protected using one or more of the following thermal management techniques: metal core board, gap pad, and/or internal monitoring firmware

N Operating Temperature: -22 degrees F to 115 degrees F.:
1. Operate below manufacturer's published die junction temperatures when operated at 1W at 350 mA in an elevated ambient of 46 degrees C.

O Utilize quick-connect connections to replaceable boards to meet ANSI and UL/ETL and NEMA requirements.

2.07 POWER SUPPLIES

A UL recognized under the component program and modular for simple field replacement.

B Rate for use with the LED array specified:
1. Warranty array and driver as an assembly.
2. 5 year full replacement, non-pro-rated warranty is required on electronic components.

C Luminaires requiring more than one driver are not permitted, unless specified in the luminaire schedule.

D Power supplies used in enclosed and gasketed luminaires listed for use in wet locations, Type 1 construction.

E Rate for the expected ambient temperature in which they are installed:
1. Exterior installed power supplies rated to start the lamps at 0 degrees F.

F Operate for a (+/- 10 percent) supply voltage of 120V through 277VAC at 60Hz.

G Power Factor: 0.9 minimum.

H Lifetime minimum:
1. 50,000 hours at full load and 77 degrees F ambient.
2. Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.

I Minimum time between failures (MTBF) greater than 300,000 hours at full load and 77 degrees F ambient, in accordance with MIL-HDBK-217.

J Driver and luminaire electronics deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10):
1. Flicker index to be less than 5 percent at frequencies below 1000 Hz.

K Label systems using tandem wired luminaires be labeled accordingly. Locate label in the lamp compartment of each luminaire and identify the function of that luminaire. Do not make the label visible from room.

L Total Harmonic Distortion less than 20 percent and meet ANSI C82.11 maximum allowable THD requirements at full output. At no point in the dimming curve allow imbalance current to exceed full output THD.

M Meet or exceed 30mA2s at 277VAC for up to 50Ws of load and 75A at 240us at 277VAC for 100 watts of load.

N Withstand up to a 1,000V surge without impairment of performance as defined by ANSI C62.41 Category A.

O Housing have circuit diagrams and lamp connections applied thereto.

P Must be Reduction of Hazardous Substances (RoHS) compliant

Q Provide no light output when the analog control signal drops below 0.5 V, or the DALI/DMX digital signal calls for light to be extinguished and consume 0.5 watts or less in this standby. Control deadband between 0.5V and 0.65V included to allow for voltage variation of incoming signal without causing noticeable variation in fixture to fixture output.

R Support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:

1. Adjustment of forward LED voltage, supporting 3V through 55V.
2. Adjustment of LED current from 200mA to 1.05A at the 100 percent control input point in increments of 1mA.
3. Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.

S Remote: Driver may be remote mounted up to 300-feet depending on power level and wire gauge.

T Dimming Drivers:

1. Dimming power supplies controlled by a common controller provided by the same manufacturer.
2. Manufacturer to have minimum 5 years' experience in manufacturing of dimmable electronic lighting drivers.
3. LED dimming to be equal in range and quality to a commercial grade incandescent dimmer. Quality of dimming to be defined by dimming range, freedom from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experience in a commercial environment.
   a. Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.
4. Provide step-free, continuous dimming to black from 100 percent to 0.1 percent and 0 percent relative light output, or 100 - 1 percent light output and step to 0 percent where indicated. Driver responds similarly when raising from 0 percent to 100 percent.
   a. Driver to be capable of 20 bit dimming resolution for white light LED drivers or 15 bit resolution for RGBW LED drivers.
5. Track evenly across multiple fixtures at light levels, and provide input signal to output light level that allow smooth adjustment over the entire dimming range.
6. Limit inrush current.
7. No visible change in light output with a variation of plus/minus 10 percent line voltage input.
8. Ability to configure a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels
9. Basis of Design Product: eldoLED or subject to compliance and prior approval with specified requirements of this section, one of the following:
   a. eldoLED.
   b. Philips.
   c. Osram Sylvania.
   d. Tridonic.
   e. General Electric.
10. Dimming Protocols:

a. If not otherwise noted on the luminaire schedule, dimming LED drivers to be 0-10V.
b. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers
    1) Must meet IEC 60929 Annex E for General White Lighting LED drivers.
    2) Connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at a low end of 0.3V. Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.
    3) Must meet ESTA E1.3 for RGBW LED drivers.
    4) 0-10V input protected from line voltage miswire, and immune and output unresponsive to induced AC voltage on the control leads.
c. Digital (DALI Low Voltage Controlled) Dimming Drivers
    1) Must meet IEC 62386.
d. Digital Multiplex (DMX Low Voltage Controlled) Dimming Drivers
    1) Must meet DMX / RDM: ANSI/TIA-485, ANSI E1.11 - USITT DMX512A and ANSI E1.20 (Explore and Address)
    2) Capable of signal interpolation and smoothing of color and intensity transitions.
    3) Luminaires requiring more than one driver are not permitted.
    4) Drivers may be connected to the DMX bus by a T-tap spur not to exceed 12-inch in absolute length. In other cases, a DMX input and output connection must be provided.
e. As indicated in the luminaire schedule.

2.08 EXTERIOR LUMINAIRES

A Label fixtures from the factory for use in the designed installation. It is the responsibility of the Contractor to verify labeling and installation requirements with the NEC and applicable codes and standards.
    1. External Label: ANSI C136.15
    2. Luminaires must have locality-appropriate governing mark and certification.

B The luminaire must be subjected to 100,000 cycles of 2 Gs at the resonant frequency of the luminaire (between 5 and 30 Hz) applied at the center of gravity of the luminaire on three primary axes per ANSI C136.31 without damage to the luminaire. Fully functional luminaire upon completing the test.

C Luminaire must be IP and/or UL-listed for damp or wet locations, as appropriate for exterior application, and wiring cavity must be field accessible for service or repair needs.

D Provide luminaires fully assembled and electrically tested before shipment from factory.

E Optical cavity must be a minimum IEC 60529/IP65.

F Rate luminaires for -4 degrees F to 104 degrees F operation.

G The coating must be capable of surviving ASTM B117 Salt Fog environment for 500 hour minimum without blistering or peeling. The coating must demonstrate gloss retention of greater than or equal to 90 percent for 500 hour exposure QUV test per ASTM G53 UVB313, 4 hour UV-B 140 degrees F/4 hour condensation 122 degrees F.

H Provide luminaires with a NEMA distribution pattern as indicated in the luminaire schedule.

I Project Conditions Coordination:
    1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under Work of Other Sections, or by others.
    2. Coordinate elevation to obtain specified foundation height.
    3. Notify Owner of conflicts or deviations; obtain direction prior to proceeding with Work.

J Exterior Lenses
    1. In-grade lenses drive-over and cool touch rated.

2. For lenses not integral to the LED lamp, construct the luminaire optical enclosure (lens/window) of clear and UV-resistant polycarbonate, acrylic, or glass.

K Unless otherwise indicated, provide cast-in-place embedded style concrete foundations with constructed forms for square foundations or round foundations with spirally wrapped treated paper forms. Provide concrete, anchor bolts, and reinforcing steel as indicated in the Drawings.

2.09 EXTRA MATERIAL

A Furnish extra materials described below that match product installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Glass and plastic lenses, covers, louvers, globes, guards, and other removable fixture parts: 5 percent or one dozen (whichever is less) of each type and rating installed. Furnish at least one of each type.
2. Control gear: 5 percent or one dozen (whichever is less) of each field-replaceable control module, driver, ballast, or individual fixture transformer. For fixtures with non-easily replaceable control gear provide 5 percent or one dozen (whichever is less) extra fixtures. Confirm non-replaceable products during submittal process.
3. Adjustable accent lights (track, recessed, or surface mounted): 10 percent of each beam angle lens (or removable lens accessory), 10 percent or one dozen (whichever is less) additional accessory lenses, color filters, louvers, and other accessories specified for use during final focusing.
4. For non-decorative LED lights, provide 2 percent additional fixtures, or minimum two fixtures.
5. Touch-Up Paint: 2 gallons, to match color of pole finish.

2.10 DISPOSAL AND REPLACEMENT

A LED manufacturer is responsible for the disposal of expired LED arrays and heat sinks. Clearly label fixture with return information, disposal procedures and manufacturer disposal contact information.

B Owner will pay for shipping.

C Manufacturer is required to inform the Owner of new power requirements and /or lumen output values if new replacement components prior to shipping replacement parts.

D Label disposal and replacement information inside the luminaire and in the project operation and maintenance manuals along with O&M requirements listed in Division 01, General Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A Meet general requirements of NFPA 70, National Electric Code.

B Support:

1. Support by separate means from the building structure and not from the ceiling system, ductwork, piping, or other systems.
2. Final decision as to adequacy of support and alignment will be given by the Architect.

C Power Supplies:

1. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
   a. Ambient temperature: -4 degrees to 122 degrees F.
   b. Relative humidity: Maximum 90 percent, non-condensing.
   c. Protected from dust and excess moisture during installation.
2. Install per manufacturers prescribed methods.
3. Located remote mounted power supplies and transformers within the distance limitations specified by the power supply manufacturer.

D Level luminaires, align in straight lines, and locate as shown on the architectural elevations and reflected ceiling plan.

E Manufacturer's labels or monograms not visible after luminaire is installed, but must be included for future reference.

F Tungsten Halogen Lamps:

1. When lamping tungsten halogen luminaires use silk gloves to insert lamps.
2. Do not energize tungsten halogen luminaires during construction to prevent dust build up on lamp, socket and lamp chamber. Lamping occurs as last stage of construction.

3.02 COORDINATION OF WORK

A Architectural Reflected Ceiling Plans take preference as to the exact placement of the luminaires in the ceiling.

B Determine ceiling types in each area and provide suitable accessories and mounting frames where required for recessed luminaires. Luminaire catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a luminaire may be installed.

3.03 AIMING

A Aim luminaires with proper lamps installed.

B Aim directional luminaires, including but not limited to luminaires described in the Contract Documents or by the luminaire manufacturer as aimable, adjustable, or asymmetric as follows:

1. Provide the lighting pattern for which the luminaire is designed.
2. Provide the lighting pattern as shown on the drawings.
3. Predetermined aiming points as shown on the drawings.
4. Where aiming cannot be determined, request, in writing, clarification from the Architect, indicating luminaires needing clarification.

C Re-aim luminaires as determined by Architect during final project walkthrough.

D Install adjustable luminaires with dead zone of rotation away from intended aiming point.

3.04 PROJECT CLOSEOUT

A Leave luminaires clean at the time of acceptance of the work. If luminaires are deemed dirty by the Architect at completion of the work, clean them at no additional cost. Protective plastic wrap is to be removed from parabolic luminaires just prior to Owner acceptance.

B Provide fixtures with new lamps operating at time of final acceptance. Exception: For fluorescent dimming fixtures, provide minimum 100 hour/maximum 200 hour, continuously lit lamps or per ballast manufacturer's recommendations.

C Where incandescent lamps are used for construction lighting, replace the lamps with new lamps just prior to occupancy by the Owner.

END OF SECTION 26 50 00

ECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Section includes provisions for clearing and grubbing as herein defined.

B. Division 00 Contracting Requirements and Division 01 General Requirements apply to the Work of this Section.

1.02 DEFINITIONS

A. "Clearing" means the picking up, removal, and disposal of above ground rubbish, debris, vegetation, trees, pavement markings, and structures not otherwise designated for demolition or preservation.

B. "Grubbing" means the dislodging, removal, and disposal of below ground rubbish, debris, vegetation, tree root balls, rocks or similar elements, pre-existing facilities, and structures not otherwise designated for preservation.

C. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

D. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

E. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

F. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

G. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated according to requirements in Section 015639 "Temporary Tree and Plant Protection."

H. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.03 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.04 SUBMITTALS

A. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.05 INFORMATIONAL SUBMITTALS

A. Submit under the provisions of Section 01 33 00 Submittal Procedures.

B. Existing Conditions: Documentation of existing trees, plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.

2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

C. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.06 REFERENCES

A. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work of this section where cited by abbreviations noted below:

1. California Building Code (CBC), latest edition.

1.07 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Owner's Representative.

2. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

E. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."

1.08 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.09 PRESERVATION OF PROPERTY

Where construction is to be performed in the vicinity of trees and shrubbery, the work shall be carried on in a manner which will cause minimum damage. Trees which are to be removed will be designated by the Engineer. Under no circumstances are additional trees to be removed without written permission from the Engineer. Trees removed are the property of the property owner. Contractor shall follow the direction of the Engineer for stockpiling of cut trees or removal from the site. Trees and shrubbery that are not to be removed shall be protected from injury or damage resulting from the Contractor's operations. It shall be the responsibility of the Contractor to alert his men, his suppliers, and all sub- contractors of the intent of these Specifications pertaining to the protection of vegetation. During the execution of his work, the Contractor shall use the same care and protection of all vegetation within his work area.

A. In areas where trees or shrubs may be damaged by construction equipment, the Contractor shall provide protective fencing, padding on tree trunks, tie-back branches or take other necessary actions to prevent damage to the trees, shrubs, or other vegetation. Damage to trees and shrubs shall include, but will not be limited to:

1. Bark damage to trees
2. Breakage of branches on trees or shrubs
3. Breaking or tearing of roots
4. Spilling toxic materials near the root zones
5. Spraying toxic materials on foliage
6. Fire damage to foliage and branches
7. Compaction of root areas under the drip line or damage by fill or storage of materials over the root zone
8. Foot or vehicular damage on low shrubs and groundcover

B. All damage shall be immediately reported to the Engineer who will file a report so that penalties may be determined.

A sum of $50.00 per inch of diameter will be deducted from the monies due the Contractor for all trees that are removed which are not designated to be removed, or which do not have the written authorization of the Engineer for removal. The penalty is also applicable to trees damaged to the extent that such damage will, in the Engineer's opinion, cause the tree to die.

Contractor shall exercise caution when working near trees not designated to be removed, so that the trees will not be damaged. No root greater than 1 inch in diameter shall be cut unless it is necessary to do so during construction to reach the specified subgrade elevation.

PART 2 - PRODUCTS

2.01 GENERAL

A. Areas within limits of work shall be cleared of all materials listed in the definition of “clearing” hereinafter.

B. Retain existing topsoil for backfilling and landscaping upon completion, when determined to be acceptable.

2.02 CLEARING

A. Perform clearing operations in advance of excavating, filling, and grading, unless otherwise directed.

1. Remove above ground organic matter such as trees, brush, logs, stumps, rubbish, and debris and dispose of as specified hereinafter.

2.03 GRUBBING

A. Remove piping, foundations, and other underground objects.

B. Protect underground facilities encountered during grubbing operations, until it has been determined whether they are active or inactive. Repair damage occurring to active facilities which are to remain.

1. Remove inactive or abandoned underground utility pipes or ducts with tops located within 2 feet of the natural grade elevation.

2. Inactive or abandoned underground utility pipes or ducts with tops located more than 2 feet from the natural grade elevation may be abandoned in place, when agreed by the CM following verification and location in coordination with the new structures and facilities. Plug open pipe ends in manholes, valve pits, drainage structures, and similar items with 6 inches of concrete. Fill pits with excess local fill or as otherwise directed. Those that may be abandoned in place shall be shown as abandoned on "Record Drawings".

C. Grub to 2 feet below natural or finish grade elevation, whichever is lower, or as otherwise specified.

1. Remove roots, wood, buried logs, and other unwanted organic material 1½ inches in diameter, or greater.

2. Remove natural rock material 6 inches in diameter, or greater.

3. Remove root masses (balls) of trees and stumps to a depth of 4 feet below the natural or finish grade elevation, whichever is lower.

D. Remove bituminous pavement, concrete pavement, concrete slabs, curbs, columns, foundations, and walls within the designated limits and as specified hereinafter, neatly trim remaining portions. Saw cut pavement to provide a uniform, straight edge when retained.

E. Prior to grading operation, the site should be cleared of any debris and disposed of offsite. Stripping should extend laterally a minimum of 5 feet beyond the limits of structures and a minimum of 2 feet beyond paving.

2.04 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

2.05 DISPOSAL

A. Items cleared, grubbed, or removed that are not to be salvaged or reused in the work shall be legally disposed of off the site.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to CM.

D. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

E. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

F. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.02 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion and sedimentation control Drawings and requirements of authorities having jurisdiction. Refer to Division 1 specifications for permit requirements.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion and sedimentation control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.03 TREE AND PLANT PROTECTION

A. Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations according to requirements in Section 015639 "Temporary Tree and Plant Protection."

C. Trees and plants outside of the work area, but not indicated to be protected, shall have their driplines remain clear of all construction activities including excavated soil materials and construction equipment staging.

3.04 EXISTING UTILITIES

A. Arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. GC/CM will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

C. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

2. GC/CM will arrange to shut off indicated utilities when requested by Contractor.

D. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify GC/CM not less than two days in advance of proposed utility interruptions.

E. Excavate for and remove underground utilities indicated to be removed.

F. Removal of underground utilities is included in Division 2 Sections covering site utilities.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.

G. Locate, identify, and disconnect utilities indicated to be abandoned in place.

H. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Owner's Representative's written permission.

I. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

3.05 HANDLING EXISTING STOCKPILED MATERIALS

A. There are currently 400 cubic yards of trench earth spoils stockpiled materials located within the improvement area. These materials shall be relocated to City owned lot located between Front Street and 2nd Street east of C Street. Select volumes of this material may be proposed to be used as fill material if shown to be clean and compactable as fill. Approval from the Owner is required before placement. THIS MATERIAL MAY NOT BE USED AS PLANTING BERM MATERIAL.

3.06 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation not designated for protection to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.

4. Use only hand methods for grubbing within tree protection zone.

5. Chip removed tree branches and stockpile in areas approved by Owner's Representative.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.07 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and non-soil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches.

2. Do not stockpile topsoil within tree protection zones.

3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity required for reuse.

4. Stockpile remaining topsoil to allow for respreading.

3.08 SITE IMPROVEMENTS

A. Remove existing above and below grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw cut along the line of existing pavement to remain before removing adjacent existing pavement. Saw cut faces vertically.

2. Paint cut ends of steel reinforcement in concrete to remain with two coats of anti-rust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.09 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off property.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

3.10 RESEEDING

A. All disturbed areas as shall be fertilized, seeded, and mulched back to that area where undisturbed material exists. Fertilizing and seeding shall be as follows:

1. Fertilizer, seed mix, and mulch shall be subject to the approval of the Engineer and as noted on the plan set.

END OF SECTION

SECTION 31 20 00

EARTH MOVING

PART 1 - GENERAL

1.01 SUMMARY

A. Volume 1 - Contracting Requirements, and Division - 01 General Requirements apply to the Work of this Section.

1.02 SECTION REQUIREMENTS

A. Geotechnical Report: There is no Geotechnical Report for this project. When necessary, consult with the Engineer for approval of materials and methods related to earth moving.

B. The Contractor shall consult with the Engineer to confirm existing soil conditions on the project site, make final recommendations for earthwork related to the project design and to make recommendations regarding imported materials, unforeseen conditions, backfilling and compaction. The Contractor shall also employ a qualified, independent testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.

C. Before commencing off-site earthwork, meet with representatives of the City, the State, appropriate Contractor team members, the Engineer, independent testing agency, and other concerned entities. Before commencing on-site earthwork, meet with appropriate Contractor team members, the Engineer, independent testing agency, and other concerned entities. In both cases, review earthwork procedures and responsibilities including testing and inspection procedures and requirements.

D. The Contractor shall locate all underground features, which are required to remain, sufficiently in advance of the demolition or earthwork operations to preclude damage to same. The Contractor shall contact Underground Service Alert 48 hours before work is to begin.

E. Section 015639 "Temporary Tree and Plant Protection" for tree protection and root pruning.

F. Section 311000 "Site Clearing" for site stripping, grubbing, stripping, and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

G. Section 329113 "Soil Preparation" for subgrade preparation and placing planting soil for plants for planting areas.

H. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

I. Section 329300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.03 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Aggregate Base: Aggregate layer placed between the subgrade and paving.

C. Backfill Aggregate: Aggregate material used in pipe and trench backfilling.

D. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

E. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

F. CLSM: Controlled low strength material. Also referred to as "controlled density fill."

G. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

H. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Owner's Representative. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Owner's Representative. Unauthorized excavation, as well as remedial work directed by Owner's Representative, shall be without additional compensation.

I. Fill: Soil materials used to raise existing grades.

J. Haunches: Portion of material placed in an excavation on either side of and under a pipe from the top of the bedding up to the springline.

K. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-maximum-width, short-tip-radius rock

bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.

2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.

L. Springline: The horizontal centerline of a pipe.

M. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

N. Subbase Course: Aggregate layer placed between subgrade and aggregate base for a hot-mix asphalt pavement or walk, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete walk.

O. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

P. Topsoil: Soil that is present at the top layer of the existing soil profile (A horizon) where plant root growth is concentrated.

Q. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.04 REFERENCES

A. California Department of Transportation

1. CTM 111, Method of Tests for Developing Density and Moisture Calibration Tables for Nuclear Gages

2. CTM 202, Method of Test for Sieve Analysis of Fine and Coarse Aggregates

3. CTM 216, Method of Test for Relative Compaction of Untreated and Treated Soils and Aggregates

4. CTM 231, Method of Test for Relative Compaction of Untreated and Treated Soils and Aggregates Using Nuclear Gages

5. Section 19 of the Caltrans 2018 Standard Specifications (or latest edition)

1.05 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile: One 12 by 12-inch square; two 6 by 6-inch pieces with field seams.

1.06 INFORMATIONAL SUBMITTALS

A. Submit under provisions for Section 01 33 00 Submittal Procedures.

B. Product Data for Geotextiles.

C. Qualification Data: For qualified testing agency.

D. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D2487.

2. Laboratory compaction curve according to ASTM D698

E. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.07 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner's Representative or authorities having jurisdiction.

B. Utility Locator Service: Notify “Call Before You Dig" for area where Project is located before beginning earth-moving operations.

C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015000 "Temporary Facilities and Controls" and Section 311000 "Site Clearing" are in place.

D. Do not commence earth-moving operations until relevant Occupational Safety and Health Administration (OSHA) requirements or related state regulations for trenching and excavation depths are understood and able to be implemented for shoring, egress, and prevention of cave-ins.

E. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.

2. Parking vehicles or equipment.

3. Foot traffic.

4. Erection of sheds or structures.

5. Impoundment of water.

6. Excavation or other digging unless otherwise indicated.

7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Backfill and Fill: Satisfactory soil materials as determined by the Engineer.

B. Sub-base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; CTM 202; with at least 90% passing a 1-1/2 inch sieve and not more than 12% passing a No. 200 sieve.

C. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; CTM 202; with 100% passing a 1-1/2 inch sieve and 0 to 5% passing a No. 8 sieve, or as specified by manufacturer.

D. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

E. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487; free of rock or gravel larger than **3 inches** in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

F. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

G. Landscape Berm Material: Landscape berm and amphitheater fill material to be made available at no cost to the contractor from the Crescent City Harbor dredge ponds located south of Highway 101 off the Elk Valley Road extension beyond Sunset Circle. Material to be removed from piles identified by the City. The City will provide a monitor to comply with permitting for the removal of dredge pile material. Material is to be loaded and hauled by the contractor to the project site.

H. Backfill Aggregate: Commercially available 1-inch or 3/4-inch minus aggregate **with not more than 12 percent passing a No. 200 sieve**.

I. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90

percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

J. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

K. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

L. Drain Rock: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a **1-inch** sieve and zero to 5 percent passing a **No. 4** sieve.

M. Sand: ASTM C33/C33M; fine aggregate.

N. Controlled Low Strength Material: Standard Specifications for Construction; highly flowable lean concrete mix; mixture of fly ash cement, fine aggregates, water and admixtures if necessary.

2.02 GEOTEXTILES

A. Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than or equal to 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.

2. Apparent Opening Size: **No. 40** sieve, maximum; ASTM D4751.

3. Permittivity: **0.5** per second, minimum; ASTM D4491.

4. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.

2. Apparent Opening Size: **No. 30** sieve, maximum; ASTM D4751.

3. Permittivity: **0.05** per second, minimum; ASTM D4491.

4. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

C. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic

core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored according to APWA "Uniform Color Code."

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 DEWATERING

A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

3.03 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

a. [**24 inches**] outside of concrete forms other than at footings.

b. [**12 inches**] outside of concrete forms at footings.

c. [**6 inches**] outside of minimum required dimensions of concrete cast against grade.

d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.

e. [**6 inches**] beneath bottom of concrete slabs-on-grade.

f. [**6 inches**] beneath pipe in trenches and the greater of [**24 inches**] wider than pipe or [**42 inches**] wide.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Owner's Representative. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.

a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:

a. [**24 inches**] outside of concrete forms other than at footings.

b. [**12 inches**] outside of concrete forms at footings.

c. [**6 inches**] outside of minimum required dimensions of concrete cast against grade.

d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.

e. [**6 inches**] beneath bottom of concrete slabs-on-grade.

f. [**6 inches**] beneath pipe in trenches and the greater of **24 inches** wider than pipe or [**42 inches**] wide.

3.04 EXCAVATION FOR PAVEMENTS

A. Cutting Pavement, Curbs, and Gutters: Saw cut with neat, parallel, straight lines one foot wider than trench width on each side of trenches and one foot beyond each edge of pits. If an existing pavement joint or cracked area is within two feet outside of a designated

saw cut line shown on the drawings, removal and resurfacing shall be to that joint, and/or shall include the crack or cracked area, unless otherwise approved by the State.

3.05 SUBGRADE INSPECTIONS

A. Notify Owner's Representative when excavations have reached required subgrade.

B. If Owner's Representative determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than **15 tons** to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.

2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Owner's Representative, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for **unit prices**.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner's Representative without additional compensation.

3.06 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Owner's Representative.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Owner's Representative.

3.07 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe. Subgrade excavated and shaped to provide continuous pipe support without a bedding course shall only be utilized with prior approval from **Owner's Representative** in writing.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.08 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.09 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.

2. Surveying locations of underground utilities for Record Documents.

3. Testing and inspecting underground utilities.

4. Removing concrete formwork.

5. Removing trash and debris.

6. Removing temporary shoring, bracing, and sheeting.

7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within **18 inches** of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide **4-inch** thick, concrete-base slab support for piping or conduit less than **30 inches** below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of **4 inches** of concrete before backfilling or placing roadway **subbase** course. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Initial Backfill:

1. Backfill: Place and compact initial backfill of **satisfactory soil**, free of particles larger than **1 inch** in any dimension, to a height of 12 inches over the pipe or conduit.

    a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

G. Final Backfill:

1. Tracer Wire: Install tracer wire in trenches **as indicated on Drawings** directly above the initial backfill. Splice wires as necessary using a solderless connection kit that moisture-seals two or more conductors for direct burial and securely join the wires both mechanically and electrically; insulate splices to be moisture-proof and water proof.

2. Backfill: Place and compact final backfill of **backfill aggregate** in paved areas and **satisfactory soil** as defined in Geotech report in planting areas to final subgrade elevation.

H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.11 SOIL FILL AND LANDSCAPE BERM CONSTRUCTION

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Landscape berm material hauled from Harbor borrow site may be placed directly at landscape berm locations north of the existing dog park. Landscape berm material to be placed adjacent to bike pump track shall be stockpiled in advance of rainy season. These berms shall not be completely constructed until after construction of bike pump track. Coordination with the bike pump track construction contractor will be required.

C. Place and compact fill material in layers to required elevations as follows:

1. Under turf, grasses and planted areas, use **satisfactory soil material**.

2. Under walks and pavements, use satisfactory soil material.

3. Under steps and ramps, use engineered fill.

D. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than **8 inches** in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to **ASTM D698.**

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at **95** percent.

2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at **92** percent.

3. Under turf, grass or plantings areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at **75 to 82** percent.

4. For utility trenches, compact each layer of initial and final backfill soil material at **85** percent.

3.14 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf, Grass or Planting Areas: Plus or minus **1 inch.**

2. Walks: Plus or minus **1 inch**.

3. Pavements: Plus or minus **1/2 inch.**

3.15 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Place drainage geotextile around perimeter of subdrainage trench. Place a 4-inch course of drain rock, unless otherwise indicated, onto drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of

drain rock, placed in compacted layers 6 inches thick, and wrap in drainage geotextile, overlapping sides and ends at least 6 inches.

3.16 BASE MATERIAL UNDER PAVEMENTS AND WALKS

A. Place **aggregate base** on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place **aggregate base** under pavements and walks as follows:

1. Shape **aggregate base** to required crown elevations and cross-slope grades.

3.17 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

2. Place drainage course 6 inches or less in compacted thickness in a single layer.

3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

4. Compact each layer of drainage course to required cross sections and thicknesses to not less than **95** percent of maximum dry unit weight according to ASTM D698.

3.18 COMPACTION

A. Relative compaction specifications apply to material whether in an excavation or an embankment. The moisture content of material to be compacted to at least 95 percent must be such that the specified relative compaction is attained and the embankment is in a firm and stable condition. Do not compact material that contains excessive moisture until the material is dry enough.

B. Compact earthwork to a relative compaction of at least 95 percent for at least a depth of:

1. 0.5 foot below the grading plane for the width between the outer edges of shoulders

2. 2.5 feet below the finished grade for the width of the traveled way plus 3 feet on each side

Except for the outer 5 feet measured horizontally from the embankment side slope, compact the full width and depth of the embankment within 150 feet of each bridge abutment to at least 95 percent relative compaction. The 150-foot limit is measured horizontally from the bridge abutment and either parallel or concentric with the roadway centerline.

C. Compact earthwork to a relative compaction of at least 95 percent for embankments under retaining wall footings without pile foundations:

1. For the full depth of the embankment

2. Within the limits established by inclined planes sloping 1.5:1 (horizontal: vertical) out and down from lines 1 foot outside the bottom edges of the footing

D. Compact earthwork to a relative compaction of at least 90 percent in embankment areas not required to be compacted to 95 percent.

E. Compacted layers shall be no greater than 6 inches per lift nor less than 3 inches per lift.

3.19 FIELD QUALITY CONTROL

A. Testing Agency Services: Contractor's testing agency shall inspect and test each sub-grade and each fill or backfill layer. Earthwork shall not proceed until test results for previously completed work verify compliance with requirements.

B. Perform field in-place density tests according to CTM 216.

a. Field in-place density tests may also be performed by the nuclear method according to CTM 231, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using CTM 216. Calibration tests using CTM 216 should be performed at a ratio of one for every 6 nuclear method tests. With each density calibration check, check the calibration curves furnished with the moisture gages according to CTM 111.

b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Engineer.

2. Footing Sub-grade: At footing sub-grades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing sub-grades may be based on a visual comparison of each sub-grade with related tested strata when acceptable to the Engineer.

3. Paved and Building Slab Areas: At sub-grade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests. Contractor will proof roll sub-grade with 50-ton pneumatic tired roller to detect soft spots at the direction of the State.

4. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but no fewer than two tests.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Unpaved Areas: All proposed turf and planting area topsoil or subgrade that has been over compacted during construction operations are to be scarified according to "Compaction of Soil Backfills and Fills" Article.

C. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Owner's Representative; reshape and recompact.

D. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 31 22 00

GRADING

PART 1 – GENERAL 1.01 WORK INCLUDED

A. Rough and finish grading of site.

B. Dust alleviation and control.

C. Cleanup and disposal of excess material.

D. Provision of all material, equipment, and apparatus not specifically mentioned herein or noted on the plans, but which are obviously necessary to complete the work specified.

E. The Contractor shall be familiar with the soil conditions on the site, whether covered in the Soils Report or not, and shall thoroughly understand all recommendations associated with the grading.

F. The Contractor shall obtain a permit from the State Department of Industrial Relations, Division of Safety and Health (DOSH) for trenches or excavations five feet (5') deep or deeper. The Contractor shall submit a copy of the permit to the Engineer prior to initiating any work requiring such permit.

G. The Contractor shall comply with erosion control measures to prevent run-off of sediment and other unsuitable materials to the storm drain system.

1.02 RELATED REQUIREMENTS

Section 31 23 33 Trench and Backfill

1.03 REFERENCE STANDARDS

A. State Specifications.

B. American Society for Testing and Materials (ASTM).

1.04 QUALITY ASSURANCE

A. All work under this section will be subject to the inspection and approval of both the Engineer and an approved geotechnical engineer registered in California. Compaction testing either shall be performed by the geotechnical engineer or by a City approved independent testing laboratory under the supervision of a California registered geotechnical engineer.

B. The geotechnical engineer shall make enough visits to the site to insure ongoing familiarity with the progress and quality of the work. The geotechnical engineer shall make a sufficient number of field observations and tests to allow the forming of an opinion regarding the adequacy of the site preparation, the acceptability of the native or import fill material, and the extent to which the degree of compaction meets the specification requirements and the project needs.

C. Any fill where the site preparation, type of material, or compaction is not approved by the geotechnical engineer shall be removed and/or recompacted until the requirements are satisfied and approved by said geotechnical engineer. As required, fill material shall be tested for pollutants and certified for suitability by the geotechnical engineer.

D. On City-funded Projects, services of the geotechnical engineer and/or testing laboratory shall be retained by and paid for by the City. On all other projects, the geotechnical engineer and/or testing laboratory shall be retained by and paid for by the developer. For City-funded Projects, testing will be paid for by the City; however, testing or retesting caused by unsatisfactory contract operations shall be paid for by the Contractor.

E. The geotechnical engineer shall provide quality assurance reports as required and accepted by the Engineer.

F. Finish surface of the site shall not vary more than one tenth of a foot (0.10') from that called for on the plans or detail drawings.

G. Percentage of compaction specified shall be the minimum acceptable. Unless otherwise specified, 90% will be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material, as determined by the procedure set forth in ASTM Designation D 1557.

1.05 MEASUREMENT AND PAYMENT

A. Except as otherwise provided, site grading shall be paid for in accordance with Sections 19, "Earthwork," of the State Specifications. Earthwork/site grading shall be paid for as bid, either in a lump sum or based on cubic yardage measured in place by the approved surveying methods.

B. Contractors intending to use City water shall make arrangements with the City's Finance Department for metered connections and shall pay for all water at City rates, plus the required meter deposit.

1.06 SOILS REPORT

A soil investigation report may have been prepared for the project. Unless otherwise specified, it is intended that all earthworks be performed in accordance with the provisions of the report.

1.07 SOILS BORINGS

Subsurface soil investigations may have been made at the site and if so, logs of the test holes are available with the Soils Report. Such investigations have been made for the purposes of design only and neither the Engineer nor the geotechnical engineer guarantee adequacy or accuracy of the data, or that data are representative of all conditions to be encountered. Such information is made available for general information only and shall not relieve the Contractor of the responsibility for making his own investigations.

1.08 PROJECT CONDITIONS

A. Protect excavations by shoring, bracing, sheeting, underpinning, or other methods as required, to prevent cave-ins or loose dirt from entering excavations. Barricade open excavations and post warning lights at work adjacent to public streets and walks.

B. Underpin adjacent structure(s), including utility service lines, which may be damaged by excavation operations.

C. Promptly repair damage to adjacent facilities caused by earthwork operations. Cost of repair shall be at the Contractor's expense.

D. Promptly notify the Engineer of unexpected subsurface conditions.

1.09 EXISTING CONDITIONS

If a topographic survey of the property has been included in the drawings, it is for reference only. Upon beginning the earthwork, the Contractor represents that he has inspected the site and has satisfied himself as to actual grades and levels and the true conditions under which the work is to be performed.

PART 2 – PRODUCTS

2.01 REQUIREMENTS FOR GENERAL ENGINEERED FILL

All fill material shall be approved by the Engineer. All work shall conform with the applicable requirements of Section 19, "Earthwork," of the State Specifications.

PART 3 – EXECUTION 3.01 PREPARATION

A. Verify existing subgrades as shown on the drawings. Designate and identify datum elevation and project engineering reference points. Set required lines, levels, and elevations.

B. Do not cover or enclose work before obtaining required inspections, tests, approvals, and location recording.

3.02 EXISTING UTILITIES

A. Before starting grading and excavation, establish the location and extent of underground utilities in the work area. Exercise care to protect existing utilities during earthwork operations. Perform excavation work near utilities by hand and provide necessary shoring, sheeting, and supports as the work progresses.

B. The existing utility lines to remain passing through the work area shall be maintained, protected, relocated, or extended as required.

C. Protect active utility services uncovered by excavation.

D. Remove abandoned utility service lines from areas of excavation. Cap, plug, or seal abandoned lines and identify termination points at grade level with markers.

E. Accurately locate and record, abandoned and active, utility lines rerouted or extended on project record documents.

3.03 SITE GRADING

A. Perform grading within contract limits, including adjacent transition areas, to new elevations, levels, profiles, and contours indicated. Provide uniform levels and slopes between new elevations and existing grades.

B. Grade surfaces to assure areas drain away from structures and to prevent ponding and pockets of surface drainage. Provide subgrade surfaces free from irregular surface changes and as follows:

1. Rough Grading: Plus or minus one tenth of a foot (0.10') subgrade tolerance. Finish required will be that ordinarily obtained from either blade grader or scraper operations.

2. Subgrade: Provide subgrade surface free of exposed boulders or stones exceeding four inches (4") in greatest dimension in paved areas; two inches (2") in planting areas; one inch (1") in lawn areas.

3. Paved Areas: Shape surface of subgrade areas to line, grade, and cross section indicated. Provide compacted subgrade suitable to receive paving base materials. Subgrade tolerance plus zero inches (+0"), minus one-half inch (-1/2").

4. Granular Base: Grade subgrade surface smooth and even, free of voids to the required subgrade elevation. Provide compacted subgrade suitable to receive granular base materials. Tolerance one-half inch (1/2") in ten feet (10').

5. Drainage Swales: Grade to profiles indicated.

3.04 EXCAVATING

A. Excavate to elevations and dimensions shown. Remove loose, soft materials, and all organic matter. Existing concrete walks shall bear on approved undisturbed bearing soil.

B. Earth excavation shall include the satisfactory removal and disposal of all materials encountered, regardless of the nature of the materials, the condition of the materials at the time they are excavated, or the manner in which they were excavated, except materials classified as rock excavation.

C. Excavate unsatisfactory soil materials extending below required elevations to depth as directed. Such extra excavation will be paid for as a change in work. Obtain Engineer's written authorization before performing extra excavation work.

D. Shore, sheet, or brace excavations as required to maintain securely. Remove shoring and bracing as backfilling progresses when banks are safe against caving.

E. Do not excavate footings or slabs to the full depth when freezing temperature may be expected unless footings or slabs are placed immediately after the excavation has been completed. Protect excavation bottoms from freezing when the placing of concrete is delayed.

3.05 DRAINAGE

A. Provide necessary pumps and drainage lines and maintain excavations, including footings and pits, free from water during excavating and subsequent work operations.

B. Provide drainage of the working area at all times.

3.06 FILLING, BACKFILLING, AND COMPACTING

A. All work shall conform to applicable requirements of Section 19, "Earthwork," of the State Specifications.

B. Obtain Engineer's inspection and approval of subgrade surfaces prior to filling operations. Scarify, dry, and compact soft and wet areas; remove and replace unsuitable subgrade materials with an approved compacted fill material. Take correct measures before placing fill materials.

3.07 TESTING

A. Testing and inspection shall be performed by a qualified independent testing laboratory, under the supervision of a registered professional engineer specializing in geotechnical engineering.

B. The City or the Developer shall provide and pay for testing and inspection during earthwork operations, except as noted in the Special Provisions of these specifications.

3.08 FIELD QUALITY CONTROL

A. Provide field quality control soils testing and inspection during earthwork operations.

B. Contractor shall provide adequate notice, cooperate with, provide access to the work, obtain samples, and assist testing agency and their representatives in execution of their function.

C. Test proposed fill materials to verify suitability for use, gradation of material, moisture-density relation, design bearing value, and percent of organic materials.

D. When, during progress of work, field tests indicate that installed compacted materials do not meet specified requirements, provide additional compaction until specified density is achieved, or remove and replace defective materials with new materials as directed by the Engineer. Cost of additional labor, materials, and testing to attain specified density shall be at the Contractor's expense.

3.09 PROTECTION

A. Furnish, place, and maintain all supports, shoring, and sheet piling which may be required for the sides of the excavation or for protection of adjacent existing improvements.

B. Maintain all benchmarks, monuments, and other reference points. If disturbed or destroyed, replace as directed.

3.10 DISPOSAL OF WASTE MATERIAL Stockpile, haul from site, and legally dispose of waste materials, including excess excavated materials, rock, trash, and debris.

3.11 MAINTENANCE

A. Protect graded areas from traffic and erosion. Keep free of trash and debris. Repair and reestablish grades in settled, eroded, and damaged areas.

B. Where completed areas are disturbed by construction operations or adverse weather, scarify, reshape, and compact to required density.

END OF SECTION

SECTION 31 23 17
SHEETING, SHORING & BRACING

PART 1 – GENERAL

1.1 DESCRIPTION

This section specifies requirements for sheeting, shoring, and bracing of trenches and excavations greater than 5 feet in depth. The Contractor shall select the means and methods for providing support of the excavations in accordance with safety requirements, plans, and these specifications.

1.2 RELATED SECTIONS

Section 31 22 13: EARTHWORK

1.3 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
Cal/OSHA	State of California Construction Safety Orders California Labor Code

1.4 DESIGN REQUIREMENTS

A. The Contractor shall design sheeting, shoring, and bracing in accordance with Article 6 of Cal/OSHA and the California State Labor Code. The standards of design referred to in the Labor Code shall be those of Cal/OSHA. The shoring procedure designed by the Contractor shall be suitable for the site subsurface conditions and project operation constraints.
B. The design, planning, installation, and removal of all sheeting, shoring, lagging, and bracing shall be accomplished in such a manner as to maintain the required excavation or trench section and to maintain the undisturbed state of the soils below and adjacent to the excavation.

1.5 SUBMITTALS

A. Submittals shall conform to 00 72 13 General Conditions, Article 6 Contractor's Responsibilities Section 6.7 Submittals and 6.8 Shop Drawing and Sample Submittal Procedures. Three hard copies or a pdf electronic file of detailed shop drawings of field work and detailed design calculations shall be submitted to the Engineer for review for all sheeting, shoring, and bracing. Drawings or sketches shall contain sufficient details to clearly define work to be accomplished. Submitted drawings and calculations shall be stamped and signed by a California licensed Structural or Civil Engineer. Fabrication or

erection shall not be commenced prior to review and approval of shop drawings or sketches.

B. An electronic submittal will be accepted in only the following format.
   1. The file shall be in pdf format.
   2. Each project submittal shall be a separate file.
   3. Each file shall be labeled in the following sequence:
      a. Owner Name/Project Name
      b. Submittal No.
      c. Description

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL

A. The design, planning, installation, and removal, if required, of sheeting, shoring, sheet piling, lagging, and bracing shall be accomplished in such a manner as to maintain the required excavation and to maintain the undisturbed state of soil adjacent to, above, or below the trench or excavation.

B. Contractor shall provide support of existing structures where shown, specified, and at all other locations where excavation side slopes are greater than 1½ :1 or where excavation infringes upon a 1½ :1 slope extending from the bottom of the footing or adjacent structure being protected.

C. Stockpiling of excavated materials is not allowed within 40 feet of any installed shoring. The area around installed shoring shall be graded to prevent surface runoff from entering shored excavations.

D. Horizontal deflection of the shoring system into the excavation shall be limited to one inch. If the deflection exceeds one inch, the Contractor shall stop the excavation and take immediate corrective actions to prevent further inward movements.

E. Excavations shall be so braced and supported in accordance with the recommendations of a competent geotechnical engineer to prevent the ground adjacent to the excavation from sliding or settling.

F. Where sheet piling, shoring, sheeting, bracing, lagging, or other supports are necessary, they shall be furnished, placed, maintained and except as otherwise shown or specified, shall be removed.

G. During placement of backfill around structure walls without support at the top; such walls shall be continuously braced and shored from the bottom to the top at intervals as required but not to exceed 9 feet between lines of support.

H. Where sheeting, shoring, and bracing cannot be removed without resulting in damage to the adjacent structure or where such sheeting, shoring, or bracing is specified to remain, it shall be cut off five feet (5') below the finish grade and the cut off portions shall be removed from the site. Any wood shoring and cribbing that is left in place shall have been pressure treated to minimize decay. All voids which exist behind the sheeting or shoring left in place, together with all other sheeting or shoring, shall be backfilled in a manner acceptable to the Engineer.

3.2 SITE RESPONSIBILITIES

A. Regardless of what has been specified herein, the ultimate responsibility and liability of the reservoir excavation and backfill shall be that of the Contractor. Under no circumstances shall slopes of embankments be steeper that those approved by Cal/OSHA. Contractor shall obtain and keep active all necessary permits required by Cal/OSHA and local authorities to perform the excavation and backfill.
B. The design of the shoring system, method of construction, and stability monitoring of the shored excavations by surveying methods shall be the responsibility of the Contractor. The Contractor shall ensure that all the integrity of the existing structures is maintained and that the appropriate construction techniques are employed at all times to protect existing structures. In the event the shoring becomes unstable or large surface settlements occur, the Contractor shall be responsible for implementing corrective measures. The Contractor shall be solely responsible for any and all liability that arise from the failure to provide adequate shoring or sheeting as necessary to support the excavation under any and all of the loading conditions that may exist or arise during construction.
C. The Contractor shall be responsible for maintaining a safe work site and shall protect workers and the public health and safety from the consequences of its operations. The Contractor shall provide fencing and barricades around shored excavation to prevent unauthorized persons to access the shored excavation during non-working hours. Trenches shall be covered and barricaded after completion of the day's work, weekends, and other times as necessary.
D. The Contractor shall appoint a project safety supervisor, other than the Project Superintendent who shall be experienced in the installation, maintenance, and removal of the selected support system. The project safety supervisor shall have full authority over the work in all job safety matters and shall be on the job at all times when work is in progress in excavations and trenches.

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1 GENERAL

1.01 SUMMARY

A. This section includes construction dewatering.

1.02 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control ground-water flow into excavations and permit construction to proceed on dry, stable sub-grades.

1.03 SUBMITTALS

A. Shop Drawings for Information: Show arrangement, locations, and details of wells and well points; locations of headers and discharge lines; and means of discharge and disposal of water.

1. Include shop drawings signed and sealed by the qualified professional engineer responsible for their preparation.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with water disposal requirements of authorities having jurisdiction. Be aware of the requirements of the Coastal Development Permit and the City's Storm Drain system.

B. No dewatering discharge will be placed directly into Elk Creek or the storm drain system. Water must be pre-treated and stored for solid and contaminate testing prior to metered discharge into the sanitary system. A plan must be submitted and written approval received before disposing of stored water.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Include shop drawings signed and sealed by the qualified professional engineer responsible for their preparation.

2. Protect sub-grades and foundation soils from softening and damage by rain or water accumulation.

3.02 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface water controls.

B. Before excavating below groundwater level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed, or until dewatering is no longer required.

PART 4

Provide an adequate system to lower and control groundwater to permit excavation, construction of structures, and placement of fill materials on dry sub-grades. Install sufficient dewatering equipment to drain water bearing strata above and below bottom of the foundations, drains, sewers, and other excavations.

A. Do not permit open sump pumping that leads to loss of fines, soil piping, sub-grade softening, or slope instability.

PART 5

Reduce hydrostatic head in water bearing strata below sub-grade elevations of foundations, drains, sewers, and other excavations.

A. Maintain piezometric water level a minimum of twenty-four (24) inches below surface of excavation.

B. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

PART 6

Provide standby equipment on-site, installed, and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to owner.

A. Remove dewatering system from project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of thirty-six (36) inches below overlying construction.

B. Damages: Promptly repair any damage to adjacent facilities.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SUMMARY

A. The work encompassed by this Section shall consist of performing all operations and furnishing all labor, materials, tools, equipment, and incidentals as necessary to:

1. Trench for underground utilities including all stripping, excavation and trench shoring.

B. This specification provides the requirements and standards for bedding of pipes and conduits, and for trench backfill materials and construction procedures, including testing and inspection.

C. Volume 1 - Contracting Requirements, and Division - 01 General Requirements apply to the Work of this Section.

1.02 QUALITY ASSURANCE

A. Standard Test Methods:

1. The following standard test methods of the American Society for Testing and Materials (ASTM) form a part of this specification and are referred to herein by alphanumeric designation:

a. C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

b. D423 Method of Test for Liquid Limit of Soils.

c. D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

d. D1556 Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.

e. D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

f. D2419 Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

g. D2844 Standard Test Method for Resistance R-Value and Expansion Pressure of Compacted Soils.

h. D6938, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

B. Substitute Test Method:

1. Where local practice prescribes revised test methods for the ASTM tests listed above, those test may be substituted for the ASTM designated test method listed upon prior approval from CM.

C. Material Sources:

1. New Sources – The Contractor shall provide all bedding and backfill materials from sources previously undeveloped, tested, and certified by an approved, independent materials testing laboratory, per these specifications.

2. Existing Sources – Bedding and backfill materials from sources previously developed may be accepted without testing and certification upon written request by the Contractor. The existing sources shall be validated by the geotechnical engineer and deemed appropriate. CM and Engineer reserves the right to determine the acceptability of all materials proposed for use.

1.03 SUBMITTALS

A. Submit under provisions of Section 11 33 00 Submittal Procedures

1. Backfill material specifications.

PART 2 - PART 2 - PRODUCTS

2.01 MATERIALS

A. Sand:

1. Material shall be free of clay, organic matter or other objectionable material, and shall conform to the following standards:

a. Gradation per ASTM C136

Sieve Size	Percent by Weight Passing Sieve
3/8"	100
#4	90-100
#50	10-40
#100	3-15
#200	0-7

B. Type II Class B Aggregate Base, Roadbase

1. Type II shall be a crusher run, mineral aggregate free clay, organic matter, or other objectionable material, and shall conform to the following standards:

a. Gradation per ASTM C136

Sieve Size	Percent by Weight Passing Sieve
1"	100
3/4"	90-100
#4	35-65
#16	15-40
#200	2-10

b. Liquid Limit per ASTM D423

1) 35 maximum.

c. Plasticity Index per ASTM D4318

1) Maximum Allowable Plasticity Index (P) shall be determined by the formula PI = 15 – (S x 100) where "S" is the percent by weight passing the #200 sieve.

d. Resistance R-Value per ASTM D2844

1) 70 minimum.

C. Class C Backfill, 3/4" minus crushed drain rock:

1. Class C backfill need not be washed but shall be free of any organic impurities, clay lumps, or unstable substances. The material shall be graded from 3/4" to 3/8" conforming to the following gradation:

a. Gradation per ASTM C136

Sieve Size	Percent by Weight Passing Sieve
1"	100
3/4"	90-100
3/8"	10-55
#4**	0-10

b. **5% of pan material will be allowed.

c. Liquid Limit per ASTM D423

1) 35 maximum.

d. Plasticity Index per ASTM D4318

1) Maximum Allowable Plasticity Index (PI) shall be determined by the formula: PI = 15 – (S x 100) where "S" is the percent by weight passing the #200 sieve.

e. Resistance R-Value per ASTM D2844

1) 70 minimum.

D. Native Backfill:

1. Native backfill shall be excavated native granular material free drainage of clay, debris, organic matter, and rocks larger than 4" across their greatest dimension.

E. Substitute Material:

1. Substitute bedding and backfill materials may only be used if prior written approval is provided from the Geotechnical Engineer and the State. In requesting the use of a substitute material, the Contractor must submit adequate evidence that the materials have been successfully used in similar applications for other utilities or local governmental agencies.

F. Buried Warning Tape:

G. Polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Color shall be:

a. Yellow: Electric

b. Yellow: Gas

c. Orange: Telephone and Other Communications

d. Blue: Water Systems

e. Green: Sewer Systems

H. Detection Wire:

1. Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

PART 3 - EXECUTION

3.01 EXCAVATIONS FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of the pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape sub-grade to provide continuous support for bells, joints and barrels of pipes and for joints, fittings and bodies of conduits. Remove projecting stones and sharp objects along trench sub-grade.

D. Where unidentified existing utilities are encountered, determine whether these are active or abandoned. Remove interfering portions of abandoned utilities and cap or plug open ends of pipe to remain. Damage to utilities or other improvements due to Contractor's negligence in regard to this paragraph shall be repaired at the Contractor's expense.

E. Contractor shall pothole at all identifiable crossings of existing utilities prior to any trenching operations and provide the CM with a survey of the top elevations (and bottom elevations, if applicable), of possible interferences so that an evaluation of necessary adjustments to the current profile or alignment may be made. Additionally, the CM shall be given the opportunity to view possible conflicts in the field prior to the Contractor providing revised designs.

3.02 TRENCH CONFIGURATION

A. Material Installation/Repair

B. Conduits, pipes, and all apparatus shall be handled, installed, and joined in accordance with the manufacturer's specifications or recommendations. The Contractor, at his/her own expense, shall repair or replace any conduits, pipes or appurtenances damaged during bedding and backfill operations.

C. Sand Bedding

1. Sand bedding material, conforming to Article 2.1, A shall be placed in 12" maximum loose lifts and compacted to 90% maximum density per ASTM D1557.

D. Backfill

1. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below sub-grade under pavements and slabs.

2. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

3. Place and compact initial backfill of satisfactory soil (per Specification 31 20 00), free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.

4. Place and compact final backfill of satisfactory soil to final sub-grade elevation.

5. Place backfill on sub-grades free of mud, frost, snow or ice.

6. Public Rights-of-Way

a. Trenches in established streets, highways, or private paved areas subject to vehicular traffic, shall be backfilled per the requirements of the local utility agency.

E. Compaction

1. Trench subgrade and aggregate base material shall be compacted to at least 95% relative density. The contractor shall be fully responsible for the method of compaction and shall remove and replace any material not meeting the compaction requirements. The contractor shall also remove and replace as directed by the engineer any pipe, fittings, valves, or other items damage by compaction efforts.

F. Trench Dewatering

1. Where groundwater is encountered, the Contractor shall dewater the trench sufficiently to meet the bedding and backfill requirements of Article 3.1, B and C.

2. Dewatering shall continue until backfill has progressed to a minimum of two feet above the groundwater level. CM may require drain rock (3/4" minus) in addition to the sand bedding depending on condition of trench bed.

G. Finish Operations

1. Fine Grading:

   a. After backfilling, all trenches except those in existing paved areas shall be graded flush with adjacent finish or subgrade elevations. In landscaped areas, coordinate with topsoil requirements.

2. Temporary Patching

   a. Unless otherwise specified, all pavement cuts shall be temporarily patched with asphaltic concrete to a minimum depth of 2", with the finish grade 1/2" above the grade of the existing asphalt.

3. Disposition of Excess Materials

   a. Surplus excavated soils, asphalt pavement, concrete and other debris shall be promptly removed from the jobsite and properly disposed of.

3.03 FIELD SAMPLING AND TESTING

A. Testing shall be per Specification 31 20 00.

END OF SECTION

SECTION 32 00 00
EXTERIOR IMPROVEMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

This section specifies new and replacement paving consisting of aggregate base course, hot mixed asphalt, and associated materials, gravel roadways consisting of aggregate base course and aggregate top course, and concrete walkways. Other sections in Division 32 may further refine the specifications in this section.

1.03 The following Submittals are required in accordance with Specification 01 33 00:

1. Mix
2. Gradation of road used
3. Method of placement

PART 2 – PRODUCTS

2.01 MATERIALS

A. AGGREGATE BASE:

Aggregate base course for pavement shall be Class 2, ¾-inch maximum grading conforming to Section 26 of the Caltrans 2018 Standard Specification.

B. LIQUID ASPHALT:

Liquid asphalt for tack coats and treatment of aggregate base shall be Grade MC 250 and shall comply with Section 92 of the Caltrans 2018 Standard Specifications.

C. HOT MIX ASPHALT:

Hot Mix Asphalt shall be Type A and shall conform to Section 39, "Hot Mix Asphalt," of the Caltrans 2018 Standard Specifications.

The aggregate for Type "A" Hot Mix Asphalt shall conform to gradation table for 3/4-in HMA Type A and B, as specified in Section 39-2.02A(4)(b)(ii), "Aggregates," of the Caltrans 2018 Standard Specifications.

PART 3 – EXECUTION

3.01 GENERAL

Construction shall conform to the details, dimensions, and grades specified. Maximum variations in finished grade of paving shall be plus or minus 0.05 feet.

3.02 AGGREGATE BASE PLACEMENT

A. SUBGRADE:

The subgrades of areas to be paved or graveled shall be graded and compacted in accordance with paragraph 31 20 00 Paragraph 3.05.

B. AGGREGATE BASE:

Placing of aggregate base shall comply with Section 26 of the Caltrans 2018 Standard Specifications. Relative compaction shall be a minimum of 95 percent as determined using methods set forth in CTM 216 and CTM 231.

3.03 HOT MIX ASPHALT PAVEMENT

Placement of hot mix asphalt pavement shall comply with Section 39 of the Caltrans 2018 Standard Specifications.

3.04 ADJUST

Adjust frames, covers, gratings, and manholes conforming to Section 71-5 ADJUST DRAINAGE STRUCTURES of the Caltrans Standard Specifications and the details shown on the plans.

END OF SECTION

SECTION 32 11 00

BASE COURSES

PART 1 - GENERAL

1.01 SUMMARY

A. The work encompassed by this section shall consist of performing all operations and furnishing all labor, material, tools, equipment, and incidentals as necessary to:

1. Place and compact base courses for concrete paving, asphalt paving, sidewalks, and curbs;

2. Place and compact rock courses and sand beds under slabs on grade.

B. Volume 1 - Contracting Requirements, and Division - 01 General Requirements apply to the Work of this Section.

1.02 REFERENCES

A. Section 26 of the Caltrans Standard Specifications.

B. Geotechnical Investigation: Project Geotechnical Investigation.

C. American Society of Testing and Materials:

1. ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

2. ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

1.03 SUBMITTALS

A. Submit under provisions of Section 01 33 00 Submittal Procedures.

1. Material test data for aggregate base, rock course, and sand.

1.04 QUALITY ASSURANCE

A. Obtain materials from same source throughout.

B. Perform Sieve Analysis test in accordance with ASTM C 117 and ASTM C 136.

C. Determine Liquid Limit and Plasticity Index in accordance with ASTM D 4318.

D. Moisture Density and optimum moisture content in accordance with ASTM D 1557.

E. ASTM D 6938, nuclear gage, may be used.

1.05 ENVIRONMENTAL REQUIREMENTS

A. When unfavorable weather conditions necessitate interrupting placement operations, prepare areas by compaction of surface and grading to avoid collection of water. Provide adequate temporary drainage to prevent erosion. After interruption, re-establish compaction specified in last layer before resuming work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Class 2 Aggregate Base: Aggregate for Class 2 aggregate base shall be free from organic matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm, stable base. Aggregate must consist of any combination of broken stone, crushed gravel, natural rough surfaced gravel, sand, and up to 100% of any combination of processed asphalt concrete, Portland cement concrete, lean concrete base, cement treated base.

B. Aggregate base shall conform to the grading and quality requirements shown in the following tables. Either the 1-1/2 inch maximum or 3/4 inch maximum shall be used; except that once a grading is selected the grading shall not be changed.

1. Aggregate Grading Requirements:

Sieve Sizes	**Percentage Passing**			
	1-1/2" Maximum		**3/4" Maximum**	
	Range	**Compliance**	**Range**	**Compliance**
2"	100	100	--	--
1-1/2"	90-100	87-100	--	--
1"	--	--	100	100
¾"	50-85	45-90	90-100	87-100
No. 4	25-45	20-50	35-60	30-65
No. 30	10-25	6-29	10-30	5-35
No. 200	2-9	0-12	2-9	0-12

2. Quality Requirements:

Tests	Operating Range	Contract Compliance
Resistance (R-Value)	--	78 min
Sand Equivalent	25 min	22 min
Durability Index	--	35 min

C. The aggregate shall not be treated with lime, cement or other chemical material before the Durability Index test is performed. Untreated reclaimed asphalt concrete and Portland cement concrete will not be considered to be treated with lime, cement or other chemical material for purposes of performing the Durability Index test.

D. Rock Course under Building Slab:

1. Clean mineral aggregate (broken stone, crushed gravel, clean quarry waste, or combination thereof).

2. Free of adobe, organic matter, loam, volcanic tuff, or other deleterious material.

3. Absorption of water in saturated surface dry condition shall not exceed 3% of oven dry weight of sample.

4. Graded (Laboratory sieves, U.S. Series) to following: 100% passing 1inch sieve and 0 to 10% passing No. 4 sieve.

5. Class 2 aggregate base is acceptable, however reclaimed aggregate shall not be used.

E. Sand: Clean dry concrete sand of no special grading or compaction.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to placing Aggregate Base on subgrade for drives and parking lots, the stability of the subgrade shall be checked by proof rolling with a roller or laded water truck. Areas which are not stable shall be allowed to air dry until stable or shall be over excavated and backfilled with Aggregate Sub-base.

3.02 AGGREGATE BASE

A. All work shall be performed in compliance with Section 26 of the 2018 Caltrans California Department of Transportation Standard Specifications.

B. The subgrade to receive aggregate base, immediately prior to spreading shall conform to the compaction and elevation tolerance specified for the material involved and shall be free of loose or extraneous material.

C. At the time aggregate base is spread it shall have a moisture content sufficient to obtain the required compaction. The moisture shall be uniformly distributed throughout the material.

D. The aggregate base shall be spread and compacted as specified herein.

E. Compact upper 12 inches of subgrade to 95% relative compaction, moisture conditioned to at least optimum. Compact base course to a minimum of 95% compaction with densities in accordance with ASTM D1557. Compacted layers shall be no greater than 6 inches per lift nor less than 3 inches per lift.

F. Measure thickness of base course material once per every 2,000 square feet. All measurements shall be within 1/2 inch of the specified thickness; where measurements exceed ½ inch of specified thickness the section shall be considered as conforming.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The work includes, but is not limited to, the following:

1. Vehicular Paving
2. Pedestrian Paving
3. Curbs and gutters

B. RELATED SECTIONS

1. Section 312000: Earth Moving
2. Section 321726: Tactile Warning Surfacing
3. Section 321723: Concrete Paving Joint Sealants
4. Section 033000: Cast-in-Place Concrete
5. Section 321316: Decorative Concrete Paving

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.04 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

A. Samples: 5-lb sample of exposed aggregate.

B. Qualification Data: For manufacturer and testing agency.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

E. Field quality-control test reports.

F. Minutes of preinstallation conference.

1.05 QUALITY ASSURANCE

A. Contractor shall notify Owner's Representative if specified treatments, admixtures, or procedures conflict with proper concrete construction. Submit for approval, alternate conditions to remedy conflicts prior to commencement of construction. Do not proceed until all conflicts have been approved and corrected.

B. Proprietary items shown on the drawings and specified herein are shown to establish standards of quality, utility, design and function. Equivalent units by other manufacturers (substitutions) will be considered provided they are similar in characteristics. They shall be substituted only if approved by the Owner's Representative.

C. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

D. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

G. Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Owner's Representative.
2. Notify Owner's Representative seven days in advance of dates and times when mockups will be constructed.
3. Obtain Owner's Representative approval of mockups before starting construction.
4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
5. Demolish and remove approved mockups from the site when directed by Architect.
6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete producer.
d. Concrete pavement subcontractor.

1.06 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2. Products: Subject to compliance with requirements, provide one of the products specified.

3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.03 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

C. Epoxy-Coated Welded Wire Fabric: ASTM A 884/A 884M, Class A, plain steel.

D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.

F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.

G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

H. Plain Steel Wire: ASTM A 82, galvanized.

I. Deformed-Steel Wire: ASTM A 496.

J. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, plain.

K. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

L. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain steel bars.

M. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

N. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

O. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

P. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

Q. Zinc Repair Material: ASTM A 780.

2.04 CONCRETE MATERIALS

A. Concrete shall comply with Caltrans 2023 standard specifications for concrete curbs and sidewalks, and vehicular concrete.

B. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type I/II, gray.

C. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Water: ASTM C 94/C 94M.

E. Air-Entraining Admixture: ASTM C 260.

F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

2. Retarding Admixture: ASTM C 494/C 494M, Type B.

3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.05 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz. /sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

2.06 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

1. Available Manufacturers:

a. Bayer Corporation.
b. ChemMasters.
c. Conspec Marketing & Manufacturing Co., Inc.
d. Davis Colors.
e. Elementis Pigments, Inc.
f. Hoover Color Corporation.
g. Lambert Corporation.
h. Scofield, L. M.Company.
i. Solomon Colors.

2. Color: As selected by Owner's Representative from manufacturer's full range.

C. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

D. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

E. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

F. Chemical Surface Retarder: Water-soluble, liquid-set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.

1. Available Products:

a. Burke by Edeco; True Etch Surface Retarder.
b. ChemMasters; Exposee.

c. Conspec Marketing & Manufacturing Co., Inc.; Delay S.
d. Euclid Chemical Company (The); Surface Retarder S.
e. Kaufman Products, Inc.; Expose.
f. Metalcrete Industries; Surftard.
g. Nox-Crete Products Group, Kinsman Corporation; Crete-Nox TA.
h. Scofield, L. M. Company; Lithotex.
i. Sika Corporation, Inc.; Rugasol-S.
j. Vexcon Chemicals, Inc.; Certi-Vex Envioset.

2. Color: As selected by Owner's Representative from manufacturer's full range.

2.07 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 3600 psi.

2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.

3. Slump Limit: 4-6 inches..

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use high-range, water-reducing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.08 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph.

2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.

3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section "Earth Moving".

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.02 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.03 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.04 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.05 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.

2. Provide tie bars at sides of pavement strips where indicated.

3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of no more than 30 feet, unless otherwise indicated.

2. Extend joint fillers full width and depth of joint.

3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.

4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.

5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.06 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand

spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.

J. Screed pavement surfaces with a straightedge and strike off.

K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. Curbs: When automatic machine placement is used for curb placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

N. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

O. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.

2. Do not use frozen materials or materials containing ice or snow.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 degrees Fat time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.07 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.08 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lbs. /sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.

   b. Continuous water-fog spray.

   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.09 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/3 depth of pavement.
10. Joint Width: Plus 1/8 inch, no minus.

3.10 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Owner's Representative.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

1. Spread glass beads uniformly into wet pavement markings at a rate of 6 lbs. /gal.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 5000 sq. ft. or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.12 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Owner's Representative, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 13 16

DECORATIVE CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Integrally colored concrete paving.
   a. Glass-embedded concrete

B. Related Requirements:

1. Section 32 13 13 "Concrete Paving" for cast-in-place concrete paving with other finishes, curbs, and gutters, and stamped detectable warnings.
2. Section 32 13 73 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within decorative concrete paving and in joints between decorative concrete paving and other paving or adjacent construction.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color, pattern, or texture selection.

C. Samples for Verification: For each type of exposed color, pattern, or texture indicated.

D. Design Mixtures: For each decorative concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

C. Material Test Reports: For each of the following:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Field quality-control reports.

1.06 QUALITY ASSURANCE.

A. Installer Qualifications: An employer of workers trained and approved by manufacturer of decorative concrete paving systems.

B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Source Limitations: Obtain **decorative cement concrete pavement products, recycled glass, and** each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate through one source.

E. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of full-thickness sections of decorative concrete paving to demonstrate typical joints (including portion along typical concrete); surface color, pattern, and texture; curing; and standard of workmanship.
2. In presence of **Owner's Representative**, damage part of the exposed surface of decorative cement concrete pavement for each finish, color, and texture required, and demonstrate materials and techniques proposed for repair to match adjacent undamaged surfaces.
3. Build standalone mockups of decorative concrete paving no less than 96 inches by 96 inches in size. Mockups should include all types of concrete paving material (standard, decorative colored or glass embedded, and decorative stamped) all joining within one mockup.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Landscape Architect specifically approves such deviations in writing.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. Concrete shall comply with Caltrans Minor Concrete Standards.

B. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.02 RECYCLED GLASS MATERIALS

A. Recycled glass chips [BID ALT]: Recycled glass aggregate, comprised of 100% post-industrial recycled content.
1. Color to be selected by owner's representative.

2.03 CURING AND SEALING MATERIALS

A. Curing Paper: Nonstaining, waterproof paper, consisting of two layers of kraft paper cemented together and reinforced with fiber, and complying with ASTM C171.

B. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

C. Waterborne, Membrane-Forming, Curing Compound: ASTM C309, Type 1, Class B, non-dissipating, non-yellowing, manufactured for use with colored concrete.

1. Curing compound shall be pigmented type matching color of integrally colored concrete and shall be approved by coloring admixture manufacturer.
2. For concrete indicated to be sealed, curing compound shall be compatible with sealer.

2.04 INTEGRALLY COLORED CONCRETE FINISH

A. Integrally Colored Concrete Finish: After final floating, apply the following finish:

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

2. Sand blast: Apply a medium sandblast finish.

2.05 GLASS EMBED FINISH [BID ALT]

A. Glass-embedded Concrete Finish: After gauge raking and bull floating, apply the following process and finish:
1. Broadcast: Broadcast the recycled glass by spreading the glass mixture out evenly on the concrete surface using the quantity, colors, mixes specified. Timing is important to ensure adhesion without sinking.
2. Trowel: Lightly trowel the glass into the concrete, gently pushing the glass into the wet concrete mixture.
3. Cure: Allow the concrete to cure.
4. Sandblast: Apply a medium sandblast finish.

2.06 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lbs. /sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

2.07 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/3 depth of pavement.
10. Joint Width: Plus 1/8 inch, no minus.

2.08 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.

3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/3 depth of pavement.
10. Joint Width: Plus 1/8 inch, no minus.

2.09 DECORATIVE CONCRETE PAVING SCHEDULE

A. Colored Decorative Concrete Paving:

1. Locations: See drawings.
2. Coloring Method: Integrally colored

    a. Color: To be integral black to match previously provided concrete mix design.

3. Finishing Method: Washed

    a. Finish texture: Sand blasted finish

B. [Bid Alternative to Colored Decorative Concrete] Glass Embedded Decorative Concrete Paving:

1. Locations: See drawings for colored concrete paving.
2. Coloring Method: Integrally colored

    a. Color: Standard color, match adjacent walkways

3. Glass Embed

    a. Glass: Match existing color pallet used on existing colored glass concrete. Sample pattern adjacent to Marine Mammal Center on Howe Drive, Crescent City.

4. Finishing Method:

    a. Finish texture: Washed and brushed. Surface to be free of any pitting or exposed aggregate. To be approved in mockup.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Pavement markings are to meet the requirements of Standard Specifications (2023) of California DOT, Section 84.

1.2 SUMMARY

A. Section Includes:

1. Painted markings applied to asphalt paving.

2. Painted markings applied to concrete surfaces.

1.3 ACTION SUBMITTALS

A. Product Data: Include technical data and tested physical and performance properties.

1. Pavement-marking paint, alkyd.

2. Pavement-marking paint, solvent-borne.

3. Pavement-marking paint, acrylic.

4. Pavement-marking paint, latex.

5. Glass beads.

1.4 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design", the ABA standards of the Federal agency having jurisdiction and ICC A117.1

1.5 PAVEMENT-MARKING PAINT

A. Pavement-Marking Paint, Latex: MPI #97, latex traffic-marking paint.

1. Color: See requirements of Standard Specifications (2023) of California DOT, Section 84 Markings, colors as indicated on the Drawings.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Verify that pavement-marking substrate is dry and in suitable condition to begin pavement marking in accordance with manufacturer's written instructions.

B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

2.2 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Owner's Representative.

B. Allow asphalt paving or concrete surfaces to age for a minimum of **30** days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

2.3 THERMOPLASTIC MARKING

A. All marking on named traveled roads must utilize thermoplastic marking only for traffic marking, lanes, arrows, and stop bars. Apply thickness and install and according to Standard Specifications (2023) of California DOT, Section 84 Markings

2.4 PROTECTING AND CLEANING

A. Protect pavement markings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 32 17 26

TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. CALTRANS 2023 Standard Specifications

1.2 SUMMARY

A. Section Includes:

1. Cast-in-place detectable warning tiles.

B. Related Requirements:

1. Section 32 13 13 "Concrete Paving" for concrete walkways serving as substrates for tactile warning surfacing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Warranties: Submit a 5-year manufacturer's replacement warranty against defects in a prefabricated detectable warning surface.

PART 2 - PRODUCTS

2.1 TACTILE WARNING SURFACING, GENERAL

A. Accessibility Requirements: Comply with applicable provisions in **the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities** for tactile warning surfaces.

1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.

2.2 DETECTABLE WARNING TILES

A. Cast-in-Place Detectable Warning Tiles: Accessible truncated-dome detectable warning tiles **with replaceable surface** configured for setting flush in new

concrete walkway surfaces, with slip-resistant surface treatment on domes and field of tile. Per CALTRANS 2023 Standard Specifications, product must be on the Authorized Material List for detectable warning surfaces and must match yellow color no. 33538 of AMS-STD-595.

a. Replaceable detectable warning tile wet-set into freshly poured concrete and surface-fastened to permanently embedded anchors.

PART 3 - EXECUTION

3.1 INSTALLATION OF TACTILE WARNING SURFACING

A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.

B. Place tactile warning surfacing units in dimensions and orientation indicated. Comply with location requirements of AASHTO MP 12.

3.2 INSTALLATION OF DETECTABLE WARNING TILES

A. Cast-in-Place Detectable Warning Tiles:

1. Concrete Paving Installation: Comply with installation requirements in Section 32 13 13 "Concrete Paving." Mix, place, and finish concrete to conditions complying with detectable warning tile manufacturer's written requirements for satisfactory embedment of tile.

2. Set each detectable warning tile accurately and firmly in place and completely seat tile back and embedments in wet concrete by tamping or vibrating. If necessary, temporarily apply weight to tiles to ensure full contact with concrete.

3. Set surface of tile flush with surrounding concrete and adjacent tiles, with variations between tiles and between concrete and tiles not exceeding plus or minus 1/8 inch from flush.

4. Protect exposed surfaces of installed tiles from contact with wet concrete. Complete finishing of concrete paving surrounding tiles. Remove concrete from tile surfaces.

5. Clean tiles using methods recommended in writing by manufacturer.

END OF SECTION

SECTION 32 18 16

PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. PVC Tile Mat Surfacing with Foam Impact Attenuation Pad

1.3 DEFINITIONS

A. Critical Height: Standard measure of shock attenuation. According to CPSC No. 325, this means "the fall height below which a life-threatening head injury would not be expected to occur."

B. Fall Height: According to ASTM F 1487, "the vertical distance between a designated play surface and the protective surfacing beneath it."

C. Use Zone: According to ASTM F 1487, the "area beneath and immediately adjacent to a play structure or equipment that is designated for unrestricted circulation around the equipment and on whose surface it is predicted that a user would land when falling from or exiting the equipment."

1.4 PERFORMANCE REQUIREMENTS

A. Impact Attenuation: According to ASTM F 1292.

B. Accessibility of Surface Systems: According to ASTM F 1951.

C. PVC Tile Surfacing Vendor and Installer Qualifications: The PVC tile surfacing vendor and installer must be IPEMA Certified with no less than three completed playground installations. Installer must be competent in the installation of this material, including attachment of seams.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each playground surface system, include materials, plans, cross sections, drainage, installation, and edge.

C. Samples for Initial Selection: For each type of playground surface system indicated.

D. Include similar samples of playground surface systems and accessories involving color selection.

B. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Extent of surface systems and use zones for equipment and thickness/depth of fall attenuation cushioning layer (to be coordinated with GC for depth of base layer and finish grade.
2. Critical heights for playground surfaces and fall heights for equipment.

C. Qualification Data: For qualified Installer.

D. Material Certificates: For each type of playground surface system, from manufacturer.

E. Material Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each playground surface system.

F. Product Certificates: For each type of playground surface system, from manufacturer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each unitary synthetic playground surface system.

H. Field quality-control reports.

I. Maintenance Data: For playground surface system to include in maintenance manuals.

J. Warranty: Sample of special warranty.

K. PVC Tile Vendor and Installer Qualifications.

L. Extra Materials:
1. PVC Tile Surfacing: 2 square foot of surfacing for each color and 2 square foot of impact attenuation pad.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer. Requires certified installer of specified equipment.

B. Source Limitations: Obtain playground surface system materials, including primers and binders, from single source from single manufacturer.

1. Provide secondary materials including adhesives, primers, geosynthetics, and repair materials of type and from source recommended by manufacturer of playground surface system materials.

C. Standards and Guidelines: Comply with CPSC No. 325, "Handbook for Public Playground Safety"; ASTM F 1292; and ASTM F 1487.

D. Play Surface Performance:

1. New and 5-year-old systems shall have "G" impact ratings of not more than 120g for the 12-inch deep system at 12 foot fall heights.
2. New and 5 year old materials shall be accessible and meet requirements of Americans with Disabilities Act.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit playground surface system installation to be performed according to manufacturers' written instructions and warranty requirements.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of the playground surface system that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Reduction in impact attenuation.
    b. Deterioration of surface and other materials beyond normal weathering.
    c. Puckering, splitting or folding of material.
    d. Seam Failure
2. Warranty Period:
    a. PVC Tile Surfacing: Per listed manufacturer's warranty.

PART 2 - PRODUCTS

2.1 SAFETY SURFACING

A. PVC Tile Surfacing:

1. Products: PlayMatta by Matta
3. Colors: Per Manufacturer plan exhibit, to be reviewed by Owner's Representative
4. Installation: Per Manufacturers Specifications
5. Impact Attenuation Padding: Thickness per Manufacturers Specifications for proposed play equipment critical fall heights.

2.2 GEOSYNTHETICS

A. Geotextile Fabric: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 DRAIN ROCK

A. Drain Rock: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content, subgrade and substrate conditions, drainage, and other conditions affecting performance of the Work.

B. Hard-Surface Substrates: Verify that substrates are satisfactory for unitary playground surface system installation and that substrate surfaces are dry, cured, and uniformly sloped to drain within recommended tolerances according to playground surface system manufacturer's written requirements for cross-section profile.

1. Concrete Substrates: Verify that substrates are dry, free from surface defects, and free of laitance, glaze, efflorescence, curing compounds,

form-release agents, hardeners, dust, dirt, loose particles, grease, oil, and other contaminants incompatible with playground surface system or that may interfere with adhesive bond. Determine adhesion, dryness, and acidity characteristics by performing procedures recommended in writing by playground surface system manufacturer.

2. Drain Rock Substrates: Verify that substrates are dry, free from surface defects, and free of laitance, glaze, efflorescence, curing compounds, form-release agents, hardeners, dust, dirt, loose particles, grease, oil, and other contaminants incompatible with playground surface system.
3. Aggregate Base Substrates: Verify that substrates are dry, free from surface defects, and free of laitance, glaze, efflorescence, curing compounds, form-release agents, hardeners, dust, dirt, loose particles, grease, oil, and other contaminants incompatible with playground surface system.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare substrates to receive surfacing products according to playground surface system manufacturer's written instructions. Verify that substrates are sound and without high spots, ridges, holes, and depressions.

B. Concrete Substrates: Provide sound surface free of laitance, efflorescence, curing compounds, and other contaminants incompatible with playground surface system.

1. Repair unsatisfactory surfaces and fill holes and depressions.
2. Saw cut concrete for terminal edges of playground surface systems as indicated.
3. Treat control joints and other nonmoving substrate cracks to prevent telegraphing through playground surface system.

C. Drain Rock Substrates: Provide sound surface free of laitance, efflorescence, curing compounds, and other contaminants incompatible with playground surface system.

1. Repair unsatisfactory surfaces and fill holes and depressions.
2. Lightly compact drain rock substrate to ensure uniform installation and solid placement.
3. Place and secure geotextile fabric.

3.3 INSTALLATION, GENERAL

A. General: Comply with playground surface system manufacturer's written installation instructions. Install playground surface system over area and in thickness indicated.

3.4 GEOSYNTHETIC INSTALLATION

A. General: Install geosynthetics according to playground surface system manufacturer's and geosynthetic manufacturer's written instructions.

1. Geotextiles: Completely cover area indicated, overlapping sides and edges a minimum of 8 inches with adhesively bonded seams
2. Perimeter: Adhere edges on all sides to top of perimeter curb, edging, or footing.

3.5 INSTALLATION OF SURFACING AND PADDING

A. General: Comply with surface system manufacturer's written installation instructions. Install surfacing tiles over concrete subbase in area shown, and over aggregate in areas shown. Install fall attenuation padding in a thickness to meet critical heights of final equipment locations, per manufacturer requirements. Attach surfacing to concrete curb edges per manufacturer's required attachment method. Add PVC seam bands around base of GFRC features and playground equipment per manufacturer's recommendations and requirements.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: At Owner's discretion, Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of completed applications of playground surface system shall take place according to ASTM F 1292.

C. Remove and replace applications of playground surface system where test results indicate that it does not comply with requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with requirements.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Chain-link fences.

2. Chain-link swing gates.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for cast-in-place concrete and post footings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Fence and gate posts, rails, and fittings.

b. Chain-link fabric, reinforcements, and attachments.

c. Gates and hardware.

B. Shop Drawings: For each type of fence and gate assembly.

1. Include plans, elevations, sections, details, and attachments to other work.

2. Include accessories, hardware, and operational clearances.

3. Confirm the details match existing fence and identify location of attachment to existing fence.

C. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:

1. Polymer-Coated Components: In 6-inch lengths for components and on full-sized units for accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For **professional engineer**.

B. Product Certificates: For each type of chain-link fence and gate.

C. Product Test Reports: For framework strength according to ASTM F1043, for tests performed by **manufacturer and witnessed by a qualified testing agency**.

D. Field quality-control reports.

E. Sample Warranty: For special warranty.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.6 WARRANTY

A. Special Warranty: Manufacturer or Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to comply with performance requirements.

b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design chain-link fence and gate frameworks.

B. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to **ASCE/SEI 7.**

1. Design Wind Load~~: to be designed by qualified professional engineer.~~

a. Minimum Post Size: Determine according to ASTM F1043 and existing fence post size for post spacing not to exceed **10 feet** for Material **Group IA, ASTM F1043, Schedule 40 steel pipe**.

b. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on existing mesh size and pattern.

2.2 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:

1. Fabric Height: Match existing fence height

2. Steel Wire for Fabric: Wire diameter to match existing chain link fence wire

a. Mesh Size: Mesh size to match existing chain link fence

b. Mesh Coating: Coating match existing chain link fence

1) Color: Color to match existing chain link fence

2.3 SWING GATES

A. General: ASTM F900 for gate posts and **single** swing gate types.

1. Gate Leaf Width: match existing single swing gates.

B. Hardware:

1. Hinges: match existing gate hinges.

2. Latch: Permitting operation from both sides of gate. Match existing latch.

2.4 FITTINGS

A. Provide fittings according to ASTM F626.

B. Post Caps: Provide for each post.

C. Finish:

1. Match finish of existing chain link fence and gates.

2.5 GROUT AND ANCHORING CEMENT

A. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site

to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

PART 3 - EXECUTION

3.1 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.2 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F567 and more stringent requirements specified.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

C. Post Setting: Set posts **in concrete** at spacing matching existing posts into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.

2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

a. Concealed Concrete: Place top of concrete **2 inches** below grade to allow covering with surface material.

D. Post Bracing and Intermediate Rails: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

E. Top Rail: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post

caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

F. Chain-Link Fabric: Apply fabric to side of enclosing framework that matches existing condition. Leave bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

G. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches o.c.

H. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

I. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side.

3.3 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

3.4 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

END OF SECTION

SECTION 32 33 00

SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Bicycle Racks.
2. Bollard lights.
3. Post light.
4. Drinking Fountains.
5. Benches.
6. Playground Fence.
7. Trench Drain.
8. Skate Deterrents.

B. Related Requirements:

1. Section 321313 "Concrete Paving" for placement of site furnishings on or through concrete paving.

1.3 UNIT PRICES

A. Work of this Section is affected by each as listed in bid item description and bid item listing.

1.4 DEFINITIONS

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each product.

B. Full-Size Samples for Verification:

1. Bicycle Rack
2. Bollard Light
3. Drinking Fountain
4. Playground Fence
5. Skate Deterrents

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Manufacturer.

B. Product Certificates: For each type of Product.

1. Bike rack
2. Bollard light
3. Post light
4. Drinking fountain
5. Bench
6. Playground Fence
7. Skate Deterrents

C. Product Test Reports: For each product, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Evaluation Reports: For products from ICC-ES.

E. Source quality-control reports.

F. Sample Warranty: For manufacturer's warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For products to include in maintenance manuals.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components of **bike rack** that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period: one year from date of Substantial Completion for defects in materials or workmanship.

2. Warranty Period: one year from date of Substantial Completion for structural failure.

3. Warranty Period: five years from date of Substantial Completion for corrosion.

B. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components of **bollard light** that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period: confirm warranty period and terms with manufacturer.

C. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components of **drinking fountain** that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period: confirm warranty period and terms with manufacturer.

D. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components of **bench** that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period: confirm warranty period and terms with manufacturer.

E. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components of **trench drain** that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period: five years from date of shipment from manufacturer.

PART 2 - PRODUCTS

2.1 SITE FURNISHINGS MANUFACTURERS

A. Bicycle Rack

1. Products:

a. Manufacturer: Madrax

b. Model: 'UX' 190 Bike Rack; with lean bar

c. Tube size: 1-7/8"

d. Mounting Option: Embedded

e. Material: Electro-polish marine grade 316 stainless steel

f. Color: As selected by Architect from full range of industry colors and color densities.

B. Bollard Light

1. Products:

a. Manufacturer: Ligman

b. Model: # LH-10665, Lightsoft 1 Bollard Light

c. Color: Black

d. Mounting: Surface

C. Post Light

1. Products:

a. Manufacturer: Ligman

b. Model: # Tango 36 Single Head Post Top

c. LED 3000k, 2777LM

d. Color: Black

e. Mounting: Pole Mounted

D. Drinking Fountain

1. Products:

a. Manufacturer: Elkay

b. Model: # (LK)4420BF1UDB , ezH2O Outdoor Bottle Filler w/ Drinking Fountain & Pet Station

c. Color: Standard color to be selected by Owner's Representative

d. Mounting: Surface mounted per manufacturer instructions

E. Bench

1. Products:

    a. Manufacturer: Landscape Forms

    b. Model: Stay Bench, backed, with arms

    c. Mounting Option: Surface Mounted

    d. Material: Powder-coated steel

    e. Color: Gloss Black

F. Playground Fence

1. Products:

    a. Manufacturer: Ameristar Perimeter

    b. Model: Montage Plus PPP, 3-rail, 4' height, flush bottom rail, 3" play picket

    c. Style: Majestic

    d. Mounting Option: Surface Mounted

    e. Material: coated steel

    f. Color: Black

G. Trench Drain

1. Products:

    a. Manufacturer: Ironsmith, available through Northwest Playground. Contact: Jim Ringleberg, 503-680-7529.

    b. Model: Marina trench grating, 8"x24" sections with custom radius as indicated on plans, 1/4" max. slot openings.

    c. Grating Material: Cast iron, unfinished.

    d. Frame: galvanized steel frame for 8" grating with cement anchors, with custom radius as indicated on plans.

H. Skate Deterrent Type 1

1. Products:
    a. Manufacturer: Grind to a Halt
    b. Model: Cylinder Grinderminder

c. Material: Brushed Stainless Steel
d. Mounting: Epoxy set within concrete

I. Skate Deterrent Type 2
1. Products:
a. Manufacturer: Grind to a Halt
b. Model: Round Handrailminder
c. Material: Solid aluminum
d. Finish: Irridite Clear Coated
e. Mounting: Surface mounted

2.2 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.3 SOURCE QUALITY CONTROL

A. Testing: Verify with manufacturers that specified products and their components have been tested according to their relevant industry standards.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine with Installer present for compliance with requirements for installation instructions, tolerances, and other conditions affecting performance of the Work.

B. Examine roughing-in for water piping and electrical conduit to verify actual locations of piping and conduit connections before water fountain and bollard light installations.

C. Examine paving for suitable conditions where site furnishings will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

END OF SECTION

SECTION 32 84 00

PLANTING IRRIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Valves.
3. Quick Couplers.
4. Transition fittings.
5. Miscellaneous piping specialties.
6. Sprinklers.
7. Controllers and electrical control wiring connectors.
8. Boxes for irrigation equipment.

B. Related Sections:

1. Section 01 56 39 "Temporary Tree and Plant Protection" for tree protection requirements.
2. Section 31 20 00 "Earth Moving" for trench backfilling requirement.
3. Section 32 91 13 "Soil Preparation" for placement of planting soil.
4. Section 32 92 00 "Turf and Grasses" for turf and grass requirements.
5. Section 32 93 00 "Plants" for plant requirements.
6. Section 32 93 10 "Landscape Maintenance" for irrigation system maintenance.

1.3 DEFINITIONS

A. ASIC: American Society of Irrigation Consultants.

B. Controller: Programmable electronic device that operates automatic irrigation systems.

C. Drain Piping: Downstream from lateral-piping drain valves. Piping is not under pressure.

D. ET Controllers: Evapotranspiration Controllers. Irrigation controllers which use some method of weather-based adjustment of irrigation including use of historical monthly averages of ET; broadcasting of ET measurements; or use of on-site sensors to track ET.

E. Evapotranspiration: The process of evaporation from plant and soil surfaces and from within plant tissues; also referred to and abbreviated as "ET."

F. Flow: The volume of water moving over time through a system as measured in gallons per minute (gpm).

G. Lateral Line Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow; also called "laterals" or referred to as "circuit piping."

H. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

I. Mainline Piping: Pressurized pipe that is downstream from point of connection that feeds into remote control valves; also called "mainline" or "main."

J. Point of Connection: Place where the irrigation system is connected to a water supply; also referred to and abbreviated as "POC."

K. Water Pressure: Force of water exerted over a given area measured in psi.

L. Manual Valve: Manually operated device used for controlling water through pipes.

M. Remote Control Valve: Valve that is activated automatically and regulates water to an irrigation zone; also called "automatic control valve" or "control valve."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Zoning Chart: Indicate each irrigation zone and its remote-control valve.

B. Controller Timing Schedule: Indicate timing settings for each remote-control zone.

C. Field Quality-Control Submittals

1. Field Quality-Control Reports

D. Qualification Statements: For Installer.

E. Sample Warranty: For special warranty according to procedures in "Warranty" Article.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sprinklers, controllers, and remote-control valves to include in operation and maintenance manuals. Submit three copies of the following:

1. Catalog product data "cut sheets" of all irrigation products installed.

2. Contractor's name, address, email, and telephone number.

3. The duration of the Guarantee Period.

4. The name and address of the local manufacturer's representative.

5. List and description of routine maintenance procedures, including winterization, start-up, and recommended watering times for each zone.

6. Troubleshooting guide.

B. Record Copy Drawings: During the irrigation system installation, indicate field changes in red line on the Drawings. Drawings shall be labeled "Record Copy," and be made available for review. The status of the record copy drawing must correlate directly with the percentage of work complete described in the Contractor's Pay Request and may be used as a guide when approving payments.

1. Upon completion of the Work and as a condition of its acceptance; submit to the Owner's Representative the following:

a. As-Built Drawings: Submit three prints and one reproducible and/or electronic file of as-built drawings. As-built drawings shall clearly show all original components of the Record Copy and all changes documented in the Record Copy. Mainlines, drain valves, valve boxes,

valve markers, and other buried equipment shall be positively located by a minimum of two dimensions each from fixed reference points.

C. Controller Reference Chart: Submit one chart for each controller installed on site showing the area covered by each sprinkler zone. The chart shall be a reduced copy of the as-built drawings, color coded to differentiate zone areas, sized to fit the controller door, and hermetically sealed between 20 mil. plastic sheets.

D. Supplemental Equipment: Submit two key copies for each of the following: quick coupling valves, quick coupling valve lids, valve markers, manual drain valves, valve boxes, and controller cabinets to the Owner's Representative.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Rotor Sprinklers: Equal to 10 percent of amount installed for each type and size indicated, but no fewer than 20 units.

2. Rotator Spray Sprinklers: Equal to 10 percent of amount installed for each type and size indicated, but no fewer than 20 units.

3. Bubblers: Equal to 10 percent of amount installed for each type indicated, but no fewer than 20 units.

1.8 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Entity that employs a Certified Irrigation Designer - Landscape qualified by the Irrigation Association and maintaining a valid State issued landscape professional license for irrigation, whose work has resulted in successful establishment of similar irrigation installations.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Proprietary items shown on the Drawings and specified in this section are shown to establish standards of quality, utility, design, and function. Equivalent units by other manufacturers (substitutions) will be considered provided they are similar in characteristics. They shall be substituted only if approved by the Owner's Representative.

D. Weather Limitations: Trenching work shall be performed only when weather conditions do not detrimentally affect the quality of work or negatively degrade

surface soils, where runoff and compaction will negatively impact existing surface soils or subgrade. See Section 329113 "Soil Preparation" and Section 329300 "Plants". Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

E. All local, municipal, and state laws and rules and regulations governing or relating to any portion of this Work are incorporated into and made a part of these specifications and the Contractor shall carry out their provisions. Information contained within this specification shall not be construed to conflict with the above rules, regulations, or requirements.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic piping protected from direct sunlight. Support to prevent sagging, bending, or any other physical damage. Protect from damage due to on-site construction activities.

C. Store and protect all equipment and appurtenances from adverse weather conditions and physical damage.

D. Handle all components as directed by the manufacturer's written instructions. Damage from transportation or other handling of materials shall be the responsibility of the Contractor.

1.10 FIELD CONDITIONS

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

1. Notify Owner's Representative no fewer than two days in advance of proposed interruption of water service.

2. Do not proceed with interruption of water service without Owner's Representative's written permission.

B. Site Inspection: Inspect the site prior to construction and verify the extent of the Work required. Commencement of construction designates acceptance of the site condition. Obtain approval to access system components for inspection prior to commencement of construction.

C. Verify the locations of all existing utilities, structures, and services before commencing Work. The location of utilities, structures and services shown on the

Drawings are approximate. Any discrepancies between the Drawings and the actual field conditions shall be reported to the Owner's Representative immediately.

1.11 WARRANTY

A. Special Warranty: Installer agrees to repair or replace irrigation piping and equipment that fail in materials or workmanship, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Pipe breaks or leaks, except for defects resulting from abuse or neglect by Owner and including vandalism or natural disasters.

b. Faulty performance of controller control wires and valves.

c. Deterioration of piping and other irrigation equipment beyond normal use or weathering.

d. Trench failure, grade settlement, and soil erosion resulting from defects in irrigation installation.

B. Warranty Periods: One year from date of Substantial Completion.

C. Upon notice of failure of the irrigation system during the warranty period due to material or workmanship failures; new replacement parts shall be promptly furnished and installed at no cost to the Owner. Damage to property or adjacent site resulting from remedial actions shall be repaired promptly, at no additional cost to the Owner.

a. Provide extended warranty for period equal to original warranty period, for replaced materials.

PART 2 - PRODUCTS

2.1 GENERAL

A. All irrigation materials not specifically described or otherwise incidental to a complete, functioning irrigation system, shall be new and of working condition and approved of prior to installation.

2.2 PERFORMANCE REQUIREMENTS

A. Irrigation Zone Control: Automatic operation with controller and automatic, remote-control valves.

B. Location of Sprinklers and Specialties: Design location, as indicated on the Drawings, is approximate. Make minor adjustments necessary to avoid plantings

and obstructions such as signs and light standards. Maintain 100 percent irrigation coverage of areas indicated.

1. Soil Conditions: Anticipated soil conditions anticipated for irrigation design shall be based upon:

    a. Proposed soil according to Section 329113 "Soil Preparation."

    b. Available land records and Geotechnical report

2. Minimum Dynamic Pressures: The minimum pressure should not be less than what is required minimum pressure for optimal performance of sprinkler heads used in a zone. The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:

    a. Irrigation Main Piping: 200 psig

    b. Lateral Piping: 150 psig

3. Maximum Pipe Velocities: 5 ft/s in lateral lines and mainlines.

4. Sprinkler Heads: Single type, nozzle and manufacturer, matched precipitation rates throughout respective zones and manufactured by Hunter, Rain Bird, or approved equal. Do not mix head types within a zone or run valves together where heads have a precipitation rate that varies by more than 10 percent. Use manufacturer's recommended triangular or square spacing, allowing for 8 mph wind.

5. Additional Performance Requirements:

    a. Irrigation system shall be designed to be fully adjustable to fine-tune performance for specific zones. Indicate available system water pressure and flow (gallon per minute) requirements at available water source.

    b. Design irrigation system to factor in the proposed site and planting conditions that affect water requirements, including but not limited to slope, aspect, and vegetation type.

    c. Lateral lines on sloped banks shall be parallel to the bank.

    d. System design shall supply manufacturer's specified minimum operating pressure to all heads in all zones regardless of friction loss inputs. The zone or zones representing the "worst case" shall be identified and analyzed for operation by the designer which may include the zone with the highest flow rate, the zone farthest away from the point of connection, the zone containing heads at the highest

elevation away from the point of connection, or a combination of the above scenarios.

e. Irrigation equipment provided shall be sized to allow operation within manufacturer's specified tolerances for optimum performance. Undersized components will be rejected.

f. Identify water source for irrigation system. If water source is not a municipal water system, submit an engineer's report of operating criteria and the respective components specified of the water source.

g. The system shall be gravity drained with manual drain valves at appropriate low elevations of the site.

2.3 PIPES, TUBES, AND FITTINGS

A. Comply with all requirements for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

B. Mainlines:

1. PVC Pipe: ASTM D1785, PVC 1120 compound, Schedule 40. Pipe may be belled on one end according to ASTM D2672.

C. Lateral Lines:

1. PVC Pipe, Pressure Rated: ASTM D2241, PVC 1120 compound, Class 200, SDR 21. Pipe may be belled on one end according to ASTM D2672.

D. Sleeves:

1. PVC Pipe: ASTM D1785, PVC 1120 compound, Schedule 40.

E. Miscellaneous Fittings:

1. Risers and Nipples: ASTM D2464 and ASTM D1785, PVC Schedule 80 with threaded ends.

2. Fittings for PVC Pipe: ASTM D 2466, Schedule 80.

3. Fittings for PVC Pipe, Pressure Rated: ASTM D2467, Schedule 80.

a. PVC Socket Fittings: ASTM 2467, Schedule 80.

b. PVC Socket Unions: Construction similar to MSS SP-107, except both headpiece and tailpiece shall be PVC with socket or threaded ends.

4. Swing Joint: Manufacturer assembled, 3/4 inch or greater size.

5. Marlex Street Elbow: Black Marlex brand plastic material, 90-degree elbow, male and female pipe thread connections.

6. Pipe Caps: PVC Schedule 80.

2.4 PIPING JOINING MATERIALS

A. Solvent Cements for Joining PVC Piping: ASTM D2564, fast setting, high strength, low VOC. Include primer according to ASTM F656.

B. Teflon Tape for PVC Threaded Ends: PTFE tape, 3 mil minimum thickness.

C. Sealant for PVC Threaded Ends: Non-PTFE based, soft setting, slow drying, low VOC, lead free, safe for potable water systems, UL classified. Sealant material shall be safe and non-degrading to use with adjoining PVC materials.

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

a. RectorSeal No. 5.

b. Approved equal.

2.5 MANUAL VALVES

A. Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane; a Crane brand.
c. Hammond Valve.
d. Jenkins Valves; a Crane brand.
e. KITZ Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Powell Valves.
i. WATTS.
j. Zurn Industries, LLC.

2. Description:

a. Standard: MSS SP-80.
b. Class: 125.
c. CWP Rating: 200 psig.
d. Body Material: ASTM B62, with integral seat and screw-in bonnet.
e. Ends: Threaded.

f. Stem: Bronze, rising stem and non-rising stem as indicated on Drawings.
g. Disc: Solid wedge; bronze.
h. Packing: Asbestos free.
i. Handwheel: Malleable iron, bronze, or aluminum; rotary handle or cross-handle as indicated on Drawings.

3. Gate Valve Keys: Standard operating keys as provided for drain valves.

B. Angle Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane; a Crane brand.
b. Jenkins Valves; a Crane brand.
c. Milwaukee Valve Company.
d. NIBCO INC.

2. Description:

a. Size: 3/4-inch minimum size.
b. Standard: MSS SP-80.
c. Class: 125.
d. CWP Rating: 200 psig.
e. Body Material: Bronze, ASTM B62, with integral seat and screw-in or union bonnet.
f. Ends: Threaded.
g. Stem: Bronze, rising stem.
h. Disc: PTFE.
i. Packing: Asbestos free.
j. Handwheel: Cross handle; malleable iron, bronze, or aluminum.

3. Drain Valve Keys: One standard operating keys, 30-inch minimum length, fitted to operate valve.

C. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Apollo Flow Controls; Conbraco Industries, Inc.
c. Crane; a Crane brand.
d. Hammond Valve.
e. Lance Valves.
f. Legend Valve & Fitting, Inc.
g. Milwaukee Valve Company.

h. NIBCO INC.
i. Red-White Valve Corp.
j. WATTS.
k. Zurn Industries, LLC.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass or stainless steel.
j. Port: Full or regular, but not reduced.
k. Handle: Lever style.

2.6 PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Flow Controls; Conbraco Industries, Inc.
   b. Cash Acme, A Division of Reliance Worldwide Corporation.
   c. Honeywell.
   d. WATTS.
   e. Zurn Industries, LLC.

2. Description:

   a. Standard: ASSE 1003.
   b. Body Material: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
   c. Pressure Rating: Initial pressure of 150 psig.
   d. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.7 CONTROL VALVES

A. Remote Control Valves:

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

   a. Rain Bird Corporation: PEB Series or approved equal.

2. Description: Molded-plastic body, normally closed, diaphragm type with manual-flow adjustment, and operated by 24-V ac solenoid.

B. Master Valve:

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

a. Rain Bird Corporation: PEB Series or approved equal.

2. Description: Molded-plastic body, normally closed, diaphragm type with manual-flow adjustment, and operated by 24-V ac solenoid.

2.8 QUICK COUPLERS

A. Products: Subject to compliance with requirements, provide the following .

1. Rain Bird Corporation: 33DLRC or approved equal.

B. Description: Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.

1. Locking-Top Option: Vandal-resistant locking feature. Include two matching keys.

2.9 BACKFLOW PREVENTION DEVICES

A. General: Comply with state requirements and the local water authority for device assembly furnished.

B. Double-Check, Backflow-Prevention Assemblies:

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

a. Zurn (Wilkins): Model 350XL
b. Approved equal.

2. Standard: ASSE 1015 or AWWA C510.

3. Size: Match mainline pipe size, up to NPS 2.

4. Body: Bronze.

5. End Connections: Threaded.

6. Accessories: Ball valves with threaded ends on inlet and outlet.

2.10 AUTOMATIC DRAIN VALVES

A. Description: Spring-loaded-ball type of corrosion-resistant construction and designed to open for drainage if line pressure drops below 2-1/2 to 3 psig.

2.11 SPRINKLERS

A. General Requirements: ABS plastic body material, pressure compensating devices, integral check valve body option at low points, designed for uniform coverage over entire spray area indicated at available water pressure. Manufacturer, product, and sprinkler type as indicated on Drawings.

B. Pop-up Riser Heights: As indicated on Drawings.

C. Special Requirements: Bodies shall include an integral check valve body option for sprinklers installed at low points of system.

2.12 PLANT FLOOD BUBBLERS

A. Flood Bubblers: Adjustable, low-flow, full circle distribution, corrosion, and UV-resistant plastic material.

1. Products: Subject to compliance with requirements, provide the following]:

   a. Hunter Industries Incorporated; MSBN, Multi-stream, or approved equal.

2. Inlet: 1/2-inch, female threaded.

3. Accessory Fitting: Fitting adapter to connect female-threaded flood bubbler, as required according to manufacturer instructions.

2.13 ELECTRICAL WIRING AND CONNECTORS

A. Controller Power Wiring: UL 493, Type UF No. 12 AWG minimum solid-copper conductors, multiconductor or single conductor according to controller manufacturer's instructions; jacket colors according to American Society of Irrigation Consultants, ASIC Guideline 102-2004; between power source and controller.

B. Valve Wires: Wire cable, No. 12 AWG insulated solid-copper conductors; HDPE loose-tube outer jacket with color as recommended by manufacturer; wire type selection according to manufacturer requirements; between controllers and remote-control valves.

C. Waterproof Wire Connectors: Splicing kit as recommended by wire and controller manufacturer's specifications, consisting of insulating, spring-type connector, or

crimped joint and epoxy resin moisture seal; suitable for direct burial, UL approved.

2.14 CONTROLLERS

A. Products: Subject to compliance with requirements, provide the following:

1. Rain Bird Corporation; Rainbird ESP4ME3 with (3) ESP-SM6 Modules. Hybrid Modular Controller. LNK Wifi Module and Flow Sensor ready.

B. Description:

1. Controller Stations for Remote Control Valves: Each station is variable from approximately 5 to 60 minutes. Include switch for manual or automatic operation of each station.

2. Control Transformer: 24-V secondary, with primary fuse.

3. Timing Device: Adjustable, 24-hour, 14-day clock, with automatic operations to skip operation any day in timer period, to operate every other day, or to operate two or more times daily.

a. Manual or Semiautomatic Operation: Allows this mode without disturbing preset automatic operation.

b. Nickel-Cadmium Battery and Trickle Charger: Automatically powers timing device during power outages.

c. Surge Protection: Metal-oxide-varistor type on each station and primary power.

4. Moisture Rain Sensor: Adjustable from one to seven days, to shut off water flow during rain.

5. Smart Controllers: Use ET, tested in accordance with IA SWAT Climatological Based Controllers 8th Draft Testing Protocol and compliant with ASHRAE Standard 189.1.

6. Software Compatibility: IQ Central Control capable

2.15 CONTROLLER ENCLOSURES

A. Interior Controller Enclosures: NEMA 250, Type 12, drip proof, with locking cover and two matching keys.

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

a. Rain Bird Corporation: As indicated on drawings.
b. Approved equal.

2. Body Material: As indicated on Drawings.

3. Mounting: Surface type for wall.

2.16 IRRIGATION EQUIPMENT VALVE BOXES

A. Valve Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Carson / Old Castle.
   b. Orbit Irrigation Products, Inc.
   c. NDS, Inc.
   d. Rain Bird Corporation.
   e. MacLean Highline.
   f. Approved equal.

2. Description: Box and overlapping lid with locking mechanism, open bottom and openings slots for piping; designed for installing flush with grade.

   a. Size: As required for equipment operation and as indicated on Drawings.
   b. Shape: As indicated on Drawings.
   c. Lid: Green color, HDPE with UV inhibitors.
   d. Box Enclosure: Black color, HDPE with UV inhibitors.

2.17 MISCELLANEOUS PRODUCTS

A. Flow Sensor: In line spinning impeller design, PVC tee, line sized or sized per manufacturer requirements.

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

   a. Rainbird Corporation: FS-200P

B. In-Line Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Hunter Industries Incorporated.
   b. Netafim USA.
   c. NIBCO INC.
   d. Aqualine.
   e. Approved equal.

2. Body: PVC Schedule 80, bronze, or brass body.

3. Size: Line sized.

C. Concrete: Commercial grade concrete mix, compressive strength not less than 3,000 psi at 28 days.

D. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored according to APWA "Uniform Color Code".

E. Tracer Wire: 12-gauge (AWG) stranded solid copper or copper clad steel reinforced, 45-mil thickness high molecular weight polyethylene insulation; detectable by metal detector when wire is buried up to 30 inches deep, UL rated for 140 degrees F; colored according to APWA "Uniform Color Code".

F. Drainage Backfill: Cleaned gravel or crushed stone, graded from 3/4 inch minimum to 3 inches maximum.

G. Valve Tag: Weatherproof colored plastic material, incorporating an integral attachment neck and reinforced attachment hole, printed on at least one side, minimum size of at least 2 by 2 inches. Printed with valve identification or blank.

H. Filter Fabric: Nonwoven geotextile, polypropylene, or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Irrigation pipe layout and equipment as indicated on Drawings may be represented schematically and require field adjustment. Do not install any irrigation equipment or pipes if presented with obstructions, grade differences, access issues, or safety problems. Contact Owner's Representative with any issues anticipated or encountered immediately.

B. Prior to conducting any Work, inspect all existing conditions and previously installed components and verify they are complete, installed, and functional for the correct installation and operation of the irrigation system, including but not limited to identifying water source, electrical source, and installed pipe sleeves.

C. Verify all components and products to be installed are compatible together for the proper operation and durability of the irrigation system.

3.2 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

B. Install tracer wire in center of trench above all pressure piping and according to manufacturer instructions.

1. Planting Areas: Install tracer wire 1 to 2 inches above the upper-most pressure pipe or non-pressure pipe within trench.

2. Paved Areas: Install tracer wire directly above "pipe zone" backfill.

C. Install warning tape in center of trench above pressure piping under pavement only, 12 inches below finished grades including at least 6 inches below subbases under pavements, and above tracer wire installation.

D. Drain Pockets: Excavate and backfill with drainage backfill material providing 12 inches minimum coverage below finish grade and as indicated on Drawings.

E. Provide minimum cover over top of underground piping according to the following:

1. Irrigation Main Piping: 18 inches below finished grade, and not less than 6 inches below average local frost depth, whichever is deeper.

2. Lateral Line Piping: 12 inches.

3. Drain Piping: 18 inches.

4. Sleeves: 24 inches under pedestrian-rated paving or walkways and 36 inches under vehicular loaded paving.

F. Mainline and lateral piping shall have a minimum of 6 inches of vertical separation. Lateral piping shall have a 2-inch horizontal separation.

G. All piping shall be visually inspected, and pressure-tested prior to backfilling trenches.

3.3 PREPARATION

A. Set stakes to identify locations of proposed irrigation system. Obtain Owner's Representative's approval before excavation.

B. Installation of any irrigation piping or equipment that connects to potable water sources shall prevent cross connection in accordance with pertinent local jurisdictional code and state law. Refer to "Backflow Prevention Device Installation" Article.

C. Maintain the performance and proper operation of all existing components including the existing irrigation system, water utilities, electrical utilities, for any proposed irrigation work. The proposed irrigation equipment shall be functionally integrated into the existing equipment as to function as one complete system.

3.4 PIPING INSTALLATION

A. Location and Arrangement: Drawings indicate schematic location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.

B. Install piping at minimum uniform slope of 0.5 percent down toward drain valves.

C. Install piping free of sags and bends.

D. Install groups of pipes parallel to each other, spaced to permit valve servicing.

E. Install fittings for changes in direction and branch connections.

F. Install unions adjacent to valves and to final connections to other components with NPS 2 or smaller pipe connection.

G. Install flanges adjacent to valves and to final connections to other components with NPS 2-1/2 or larger pipe connection.

H. Lay piping on solid subbase, uniformly sloped without humps, depressions, sharp objects or debris.

I. Install PVC piping in dry weather when temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.

J. Install piping in sleeves under parking lots, roadways, and sidewalks as indicated on Drawings.

K. Install sleeves with socket fittings, and solvent-cemented joints.

3.5 PIPE PULLING

A. Installation of wire by means of vibratory plow may be used as an alternate to standard trenching methods if approved by the Owner's Representative.

B. Ensure, by means of an open pit or trench at the beginning, middle, and the end of pull; that wire is installed at the specified burial depths throughout the entire length of the pull. Burial depths shall be the same as specified for trenching.

C. Allow a minimum of five chain links between plow blade and pulling grip/bullet.

D. Pulling grip/bullet shall be a minimum of two-inch in diameter greater than the combined diameters of wire to be pulled.

E. Wire pulling shall only occur with proper wire blade feed attachment.

3.6 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds. Do not use solvent cement on threaded joints.

D. PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.

2. PVC Pressure Piping: Join schedule number, ASTM D1785, PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D2855.

3. PVC Nonpressure Piping: Join according to ASTM D2855.

E. Soil contaminated by solvents, pipe shavings, or materials that cannot be easily separated shall be excavated out and properly removed from site.

3.7 CONCRETE THRUST BLOCK INSTALLATION

A. Provide concrete thrust blocks all mainlines 2-1/2 inches and larger. Install in locations where mainline changes direction at all elbows, tees, and where the mainline piping ends. Pour concrete against pipe laid in firm soil with at least one cubic foot of concrete and generally form concrete thrust block in shape as indicated on Drawings.

B. Thrust blocks shall cure for a minimum of 5 days prior to mainline pressure test.

3.8 BACKFLOW PREVENTION DEVICE INSTALLATION

A. Comply with manufacturer's specifications, state requirements, and local water authority requirements for installation.

B. Test and certify all backflow prevention devices as needed to adhere to local jurisdictional code and state requirements.

C. Locate backflow prevention devices in planting beds where possible.

3.9 VALVE INSTALLATION

A. General Placement: Equipment and valve box locations shall be installed in a manner as to not interrupt plant massing or groups, hedge lines, or otherwise alter the character of the proposed plantings.

1. Place valves and valve boxes in low growing ground cover areas offset from adjacent paving by a minimum of two times the specified ground cover spacing unless indicated otherwise.

2. In areas where valves or valve boxes may be readily visible, verify location with Owner's Representative prior to installation.

3. Provide valve box supports, filter fabric, and drainage backfill as indicated on Drawings.

B. Remote Control Valves: Install in valve boxes as indicated on Drawings and according to manufacturer instructions.

C. Drain Valves: Install in valve boxes as indicated on Drawings and according to manufacturer instructions. Slope pipe leading to drain valve at 1.0 percent minimum.

D. Quick Coupling Valves: Install in valve boxes as indicated on Drawings and according to manufacturer instructions.

3.10 SYSTEM FLUSHING AND PRESSURE TEST

A. System Flushing: After piping, risers, backflow prevention devices and valves are installed but prior to irrigation head installation; flush dirt and debris from piping under full water head.

1. Maintain flushing for five minutes or until water flows clearly.

2. Cap risers immediately after flushing.

B. Hydrostatic Test: Perform hydrostatic pressure test after system flushing and after piping, risers, backflow prevention devices and valves are installed but prior to backfilling.

1. Mainlines: Purge all main lines of air and test with static water pressure of at least 125 psi for 60 minutes. Test with one pressure gauge installed on the line. Lines showing loss of pressure exceeding 5 psi at the end of the specified test period will be rejected. Correct rejected installations and retest for leaks.

2. Lateral Lines: Purge all lateral lines of air and test under operating line pressures with risers capped and drain valves closed. Maintain operating line pressures for 30 minutes through open valves and pressure regulating devices. Lines showing leaks when visually inspected at the end of the specified test periods will be rejected. Correct and retest lateral line installations that have been rejected.

3. Do not backfill trenches until the piping has been inspected and tested. Obtain Owner's Representative's approval prior to backfilling.

3.11 CONTROLLER AND ENCLOSURE INSTALLATION

A. Coordinate location of power source to controller according to the National Electronic Code and state and local laws. Verify final location of controller enclosure with Owner's Representative.

B. Equipment Mounting: Install interior controllers on wall.

1. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Controller: Install controller in enclosure in accordance with manufacturer's instructions and according to state and local laws.

D. Electrical Grounding: Provide grounding according to manufacturer specifications and ASIC guidelines.

3.12 ELECTRICAL WIRING INSTALLATION

A. Valve wire, General: Install wire cabling and decoder to remote control valves. Provide consistent wire jacket colors throughout site system installation; colors shall be typical of irrigation systems.

1. Provide conductors of size not smaller than recommended by controller manufacturer.

2. Bundle wiring at 15-foot intervals, or as necessary, with standard electrical cable ties.

3. Snake wire in trench to provide additional slack along the wire run.

4. Install valve wires to remote control valves according to manufacturer instructions.

5. Wire paths shall be grounded every 500 feet or every 15 devices, whichever is smaller. See manufacturer's written instructions.

6. Provide surge protection device at end of each wire path per manufacturer's recommendations.

B. Run valve wires from controller to remote control valves in electrical conduit, from the bottom of controller to outside of enclosure as indicated on Drawings in accordance with state and local requirements.

C. Wiring in Planting Area Trenches: Install valve wires in same trench as irrigation piping and at least two inches below the bottom-most irrigation pipe. When necessary to run wire separate from the irrigation pipe, place the wire under detectable warning tape.

D. Wiring Under Paving: Install all valve wires in separate sleeve under paved areas within the same trench as irrigation piping, where feasible. In locations that require a separate trench for wiring; provide a minimum cover of 18 inches to top of sleeve.

E. Splices: Utilize waterproof splice connectors as installed according to manufacturer's instructions. Provide coils of at least 30 inches minimum length, or as indicated. Splices not occurring within remote control valve boxes shall be installed in a separate valve box.

F. Spare Wires: Extend wire paths to the extent of project limits for future expansion. Provide grounded 36 inches of looped valve wire in valve box at each end and label wiring "Irrigation Wire."

3.13 SPRINKLER INSTALLATION

A. Install sprinklers after hydrostatic test is completed.

B. Install sprinklers according to manufacturer's instructions on flexible risers with swing-joint type as indicated on Drawings.

C. Install sprinklers according to the dimensions indicated on Drawings.

D. Locate part-circle sprinklers to maintain a minimum distance of 3 inches from walls and 1 inch from other boundaries unless otherwise indicated.

E. Install sprinklers with internal check valve at low elevation points of each zone to prevent low head drainage issues.

F. Install inline check valves on lateral pipes that have more than 12 feet in elevation change from the control valve to lowest head.

G. Sprinklers located on slopes which are less than three percent shall be installed plumb. Slopes greater than three percent shall be installed at an angle midway between plumb and perpendicular to the slope.

3.14 CONNECTIONS

A. Comply with requirements for piping specified in Section 221113 "Facility Water Distribution Piping" and 331415 "Site Water Distribution Piping" for water supply from exterior water service piping, water meters, protective enclosures, and backflow preventers. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment, valves, and devices to allow service and maintenance.

3.15 IDENTIFICATION

A. Identify all remote-control valves with valve tags inside valve boxes, labeled according to their valve number as indicated, installed according to manufacturer instructions. Identify all other related irrigation components in valve boxes with indelible markings or identification plate on inside of lid describing component. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on each controller.

1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Detectable Warning Tapes and Tracer Wire: Arrange for installation of continuous, underground, detectable warning tapes and tracer wire over underground piping during backfilling of trenches. See Section 312000 "Earth Moving."

3.16 FIELD QUALITY CONTROL TESTING

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections in the presence of the Owner's Representative and after all irrigation equipment is installed.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, operate controllers and remote-control valves to confirm proper system operation.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Any irrigation product will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.17 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup check according to manufacturer's written instructions.

2. Verify that controllers are installed and connected according to the Contract Documents.

3. Verify that electrical wiring installation and data communications comply with manufacturer's submittal.

3.18 SYSTEM PROGRAMMING

A. General: Irrigation zones shall be programmed to provide deep but infrequent irrigation to promote deeply rooted plant growth. System runtimes shall factor regional annual precipitation rates including local historical ET rates; plant type seasonal water demand for region; plant maturation requirements; solar exposure; soil conditions; and topography. Program system runtimes shall not cause runoff and not interrupt site activities.

B. Programming: Calculate three irrigation programs for spring to early summer; summer; and late summer to early fall.

3.19 ADJUSTING

Adjust settings of controller as necessary to meet irrigation requirements for plant health and site requirements.

A. Adjust remote control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.

B. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with finish grade.

C. Modify spray pattern of nozzles to reduce throw of water onto buildings, structures, vehicles, and paved surfaces. Monitor and re-adjust system operation until components operate continually as specified.

3.20 CLEANUP

A. Upon completion, wash clean all surfaces impacted by irrigation construction. Coordinate with Owner's Representative prior to cleaning.

B. Repair all grade ruts caused by irrigation system testing.

C. Repair any planting soils or subgrade that has been compacted, disturbed, or degraded during irrigation system installation.

D. Remove and properly dispose of excess backfill materials, packaging, and other material brought to the site.

3.21 MAINTENANCE

A. General: Provide maintenance of irrigation system according to 329310 "Landscape Maintenance."

3.22 DEMONSTRATION

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

B. Operate the system in the presence of the Owner's Representative to demonstrate satisfactory performance and coverage.

END OF SECTION

SECTION 32 91 13

SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes planting soils and layered soil assemblies specified by prescriptive requirements.

B. Related Requirements:

1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.

2. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.

3. Section 329300 "Plants" for placing planting soil for plantings, fertilizers, including biochar and mycorrhizae in backfill soil.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.4 DEFINITIONS

A. AAPFCO: Association of American Plant Food Control Officials.

B. Amendment: Physical, chemical or biological material additive that adjusts the physical and/or chemical structure of base soil. Materials may include sand, compost, fertilizer, biological additives and pH modifiers.

C. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.

D. CEC: Cation exchange capacity.

E. Coefficient of Uniformity: Numerical expression of distribution of dry weight soil particles in a sample, passed through sieves, that is the ratio between particles that are 60 percent finer and 10 percent finer within the sample (expressed as D60/D10).

F. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.

G. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

H. Field Capacity: The amount of water in soil after excess water has drained away and ceased two to three days after a wetted event.

I. Friable: Crumbly texture of soil where larger clumps of soil can be broken into smaller, crumbly pieces by light rubbing.

J. Imported Soil: Soil that is transported to Project site for use.

K. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.

L. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

M. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.

N. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

O. Planting Area: Areas on site to be planted or seeded within planting soil.

P. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

Q. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.

R. Saturated Soils: Water that fills the entirety of soil pores between soil particles.

S. Scarification/Scarify: Alleviation of compaction and consolidation of soil by any number of methods including loosening, turning, fracturing, or roughening through mechanized or manual means.

T. SSSA: Soil Science Society of America.

U. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

V. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

W. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

X. Stormwater Planting Soil: Planting medium used in a vegetated stormwater facility that is suitable for plant growth and vigor manufactured from existing on-site topsoil, imported topsoil, blended soil mix, or a combination thereof that includes necessary amendments and other soil additions further defined in this specification.

Y. Till: Scarification method, often with mechanized equipment, that turns, digs, or stirs soil to alleviate compaction and mix soil.

Z. USCC: U.S. Composting Council.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for application and use.

2. Include test data substantiating that products comply with requirements.

3. Include sieve analyses for aggregate materials.

4. Material Certificates: For each type of imported soil, soil amendment and fertilizer before delivery to the site, according to the following:

a. Manufacturer's qualified testing agency's certified analysis of standard products.

b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.

c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.

B. Samples: For each bulk-supplied material, 1-quart volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall

be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For each testing agency.

B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.

C. Field quality-control reports.

D. Soil Work Plan: 90 days prior to planting soil installation, submit a written statement that describes the soil design method(s) that will be utilized including the following:

1. Soil testing locations and timeline.

2. Ability to use existing surface soils for final planting soil design and location of surface soil stockpiles.

3. Location and source of amendments.

4. Soil blending material operations needed to create planting soil including potential equipment desired to use.

5. Responsibility of subgrade preparation.

6. Weed removal and abatement process.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1. Laboratories: Subject to compliance with requirements, provide testing by the following:

a. Soil and Plant Laboratory, Inc.; www.soilandplantlaboratory.com.

b. Western Agricultural Laboratories; www.al-labs-west.com.

c. Approved equal.

2. Multiple Laboratories: At Contractor's option, work may be divided among qualified testing laboratories specializing in physical testing, chemical testing, and fertility testing.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction soil analyses on existing, on-site soil.

1. Notify Owner's Representative seven days in advance of the dates and times when laboratory samples will be taken.

B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.

1. Have a testing agency identify and label samples and test reports according to sample collection and labeling requirements.

1.10 SOIL-SAMPLING REQUIREMENTS

A. General: Extract soil samples according to requirements in this article.

B. Sample Collection and Labeling: Have samples taken and labeled by Contractor in presence of Owner's Representative under the direction of the testing agency.

1. Number and Location of Samples: Minimum of three representative soil samples from varied locations where directed by Owner's Representative for each soil to be used or amended for landscaping purposes.

2. Procedures and Depth of Samples: 8 to 14 inches deep and a minimum two-quart sample, or as required by testing laboratory.

3. Division of Samples: Split each sample into two equal parts. Send half to the testing agency and half to Owner for its records.

4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.11 TESTING REQUIREMENTS

A. General: Perform tests on soil samples according to requirements in this article.

B. Physical Testing:

1. Soil Texture: Soil-particle, size-distribution analysis by one of the following methods according to SSSA's "Methods of Soil Analysis – Part 1 – Physical and Mineralogical Methods":

a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.

b. Hydrometer Method: Report percentages of sand, silt, and clay.

2. Bulk Density: Analysis according to clod method of SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."

3. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."

4. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."

5. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85 percent compaction according to ASTM D698 (Standard Proctor).

C. Chemical Testing:

1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."

2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."

3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.

4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.

D. Fertility Testing: Soil fertility analysis according to standard laboratory protocol including the following:

1. Percentage of organic matter.
2. CEC, calcium percent of CEC, and magnesium percent of CEC.
3. Soil reaction (acidity/alkalinity pH value).
4. Buffered acidity or alkalinity.
5. Nitrogen ppm.

6. Phosphorous ppm.
7. Potassium ppm.
8. Manganese ppm.
9. Manganese-availability ppm.
10. Zinc ppm.
11. Zinc availability ppm.
12. Copper ppm.
13. Sodium ppm and sodium absorption ratio.
14. Soluble-salts ppm.
15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
16. Other deleterious materials, including their characteristics and content of each.

E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3-Chemical Methods."

F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.

1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. for 6-inch depth of soil.

2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. for 6-inch depth of soil.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Do not move or handle materials when they are wet or frozen.

4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 - PRODUCTS

2.1 PLANTING SOILS, GENERAL

A. Planting soils may be created from on-site, existing, stockpiled or imported surface soils with the addition of imported inorganic soil amendments, organic soil amendments, and fertilizers as necessary that meets the requirements in "Planting Soils Specified According to Performance Requirements" and "Planting Soils Specified by Composition" Article.

B. Stormwater plantings soils shall only be imported, pre-blended mix from manufacturer.

2.2 PLANTING SOILS SPECIFIED BY COMPOSITION

A. General: Soil amendments, fertilizers, and rates of application specified in this article are guidelines that may need revision based on testing laboratory's recommendations after preconstruction soil analyses are performed.

B. Planting-Soil Type A: Imported, naturally formed soil from off-site sources and consisting of sandy loam soil according to USDA textures; and modified to produce viable planting soil. Soil to be placed at a depth of 4 inches in all planting areas.

1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; free of noxious weeds and invasive plants as classified by the California Department of Food and Agriculture as weeds and not limited to the following: Canada thistle, morning glory, scotch broom, common teasel, English ivy, Himalayan blackberry, velvet grass, purple loosestrife, reed canary grass, kudzu, butterfly bush, bentgrass, Italian arum, spurge laurel, yellow archangel, false brome, garlic mustard, lesser celandine, pokeweed, giant hogweed, Japanese knotweed, jointed goatgrass, tree of heaven, and tansy ragwort.

2. Additional Properties of Imported Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 6 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.

3. Unacceptable Properties: Clean soil of the following:

a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint

thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.

b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 5 percent by dry weight of the imported soil.

c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 1 inch in any dimension.

4. Amended Soil Composition: Blend imported, unamended soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:

a. Ratio of Loose Compost to Soil: As indicated and recommended from soil testing, by volume.

b. Weight of Lime: As indicated and recommended from soil testing per 1000 sq. ft. per 6 inches of soil depth.

c. Weight of Sulfur or Iron Sulfate: As indicated and recommended from soil testing per 1000 sq. ft. per 6 inches of soil depth.

d. Weight of Agricultural Gypsum: As indicated and recommended from soil testing per 1000 sq. ft. per 6 inches of soil depth.

e. Weight of Superphosphate: As indicated and recommended from soil testing per 1000 sq. ft. per 6 inches of soil depth.

f. Weight of Commercial Fertilizer: As indicated and recommended from soil testing per 1000 sq. ft. per 6 inches of soil depth.

g. Weight of Slow-Release Fertilizer: As indicated and recommended from soil testing per 1000 sq. ft. per 6 inches of soil depth.

C. Planting-Soil Type B: Harbor Dredge Spoils, with sand, stabilized organic soil amendments, and other materials to produce viable planting soil. Owner to provide specifications for amended harbor dredge spoils. Soil Type B to be utilized for rough grading of mounds; location of mounds indicated on drawings.

2.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.

2. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through a No. 60 sieve.

3. Form: Provide lime in form of ground dolomitic limestone.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.

E. Sand: Clean, washed, coarse, and sharp; free of limestone, shale and slate particles; natural or manufactured and free of toxic materials; with 100 percent passing a 3/8 inch sieve and zero to 5 percent passing a No. 200 Sieve.

2.4 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:

1. Feedstock: Limited to leaves.
2. Reaction: pH of 5.5 to 8.
3. Soluble-Salt Concentration: Less than 4 dS/m.
4. Primary Plant Nutrients: Reported as percent as-is or dry weight for nitrogen, phosphorus, potassium, calcium, and magnesium.
5. Moisture Content: 35 to 55 percent by weight.
6. Particle Size: Minimum of 98 percent passing through a 1/2-inch sieve.
7. Organic-Matter Content: 50 to 60 percent of dry weight.
8. Stability: Respirometry, equal to or less than 8 CO2-C per g OM per day.
9. Maturity: Bioassay, minimum 80 percent seed emergence and seedling vigor or 6 or greater on Solvita test.
10. Stability: Stable.
11. Inert materials and Foreign Debris: Less than 2 percent by dry weight.
12. Ratio of Carbon to Nitrogen: 25:1 minimum.
13. Meet or exceed US EPA Class A standard, 40 CFR Section 503.13.
14. Meet or exceed US EPA Class A standard, 40 CFR Section 503.32.

B. Manure: Well-rotted, un-leached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.5 FERTILIZERS

A. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

C. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

D. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

PART 3 - EXECUTION

3.1 GENERAL

A. Place planting soil and fertilizers according to requirements in other Specification Sections. Placing and mixing process may vary based up planting soil approach utilized.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

C. Proceed with placement only after unsatisfactory conditions have been corrected.

D. All materials removed from prepared soil areas shall be legally disposed of from Owner's property.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

A. Excavation: Excavate soil from designated area(s) to a depth of 6 inches and stockpile until amended.

B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner,

turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.

C. Unsuitable Materials: Clean soil to contain a combined maximum of 5 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.

D. Screening: Pass unamended soil through a 1-inch sieve to remove large materials.

3.3 PLACING AMENDED PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil over prepared subgrade. Do not apply materials, scarify, or till if existing soil or subgrade is frozen, muddy, saturated, or excessively wet.

B. Subgrade Preparation: Scarify subgrade to a minimum depth indicated on Drawings. Remove organic materials such as stones, sticks, and roots larger than 1-inch in any dimension. Remove all construction debris, trash, rubbish and other extraneous matter of any dimension from site.

1. Apply approximately half the thickness of unamended soil over prepared, loosened subgrade according to "Mixing" Paragraph below. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.

C. Application: Spread planting soil to total depth indicated on Drawings but not less than required to meet finish grades after settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.

1. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 12 inches in loose depth for material compacted by compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each blended lift of planting soil to 80 percent of maximum Standard Proctor density according to ASTM D698 except where a different compaction value is indicated on Drawings.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 APPLYING COMPOST TO SURFACE OF PLANTING SOIL

A. Application: Apply compost component of planting-soil mix bto surface of in-place planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, saturated, or excessively wet.

B. Blending: Till compost into surface of in-place planting soil and thoroughly incorporate to a depth of 6 inches.

C. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D698. Space tests at no less than one for each 2000 sq. ft. of in-place soil or part thereof.

2. Performance Testing: For each amended planting-soil type, demonstrating compliance with specified performance requirements. Perform testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.

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

D. Prepare test and inspection reports.

E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.6 PROTECTION

A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.

7. Excavation or other digging unless otherwise indicated.

C. If planting soil or subgrade is over-compacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Owner's Representative and replace contaminated planting soil with new planting soil.

3.7 CLEANING

A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION

SECTION 32 92 00

TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Hydroseeding.
3. Sodding.
4. Turf renovation.
5. Erosion-control materials.

B. Related Requirements:

1. Section 32 84 00 "Planting Irrigation" for irrigation components.
2. Section 32 91 13 "Soil Preparation" for planting soil mixes including amendments.
3. Section 32 93 00 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.
4. Section 32 93 10 "Landscape Maintenance" for maintenance of turf and grasses.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 32 91 13 "Soil Preparation" and drawing designations for planting soils.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.

C. Product Certificates: For fertilizers, from manufacturer.

D. Herbicides: Product label and manufacturer's application instructions specific to Project.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.

2. Experience: Five years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."

3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

4. Personnel Certifications: Installer's personnel assigned to the Work shall have certification in all of the following categories from the National Association of Landscape Professionals:

   a. Landscape Industry Certified Technician - Exterior.

   b. Landscape Industry Certified Lawn Care Manager.

   c. Landscape Industry Certified Lawn Care Technician.

5. Pesticide Applicator: State licensed, commercial.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.

C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Accompany each delivery of bulk materials with appropriate certificates.

1.9 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.

1. Spring Planting: April – May.

2. Fall Planting: August – September.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

A. Turf Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:

1. Quality, State Certified: State-certified seed of grass species as listed below for solar exposure.

2. Quality, Non-State Certified: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:

3. Sun and Partial Shade, Cool-Season Grass: Proportioned by weight as follows:

a. 50 percent Kentucky Bluegrass (Poa pratensis).

b. 30 percent Chewings Red Fescue (Festuca rubra variety).

c. 10 percent Perennial Ryegrass (Lolium perenne).

d. 10 percent Redtop (Agrostis alba).

2.2 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition:

a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition:

a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

C. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

2.4 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.5 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Owner's Representative and replace with new planting soil.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.

2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation." and Section 329115 "Soil Preparation (Performance Specification)."

B. Placing Planting Soil: Place amended planting soil over exposed subgrade.

1. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, obtain Owner's Representative's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

C. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 HYDROSEEDING

A. Hydroseeding: Mix specified seed, slow-release fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with non-asphaltic tackifier.

2. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.6 SODDING

A. Lay sod within 24 hours of harvesting unless a suitable preservation method is accepted by Owner's Representative prior to delivery time. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across slopes exceeding 1:3.

2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.7 TURF RENOVATION

A. Renovate existing turf where indicated.

B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.

2. Install new planting soil as required.

C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

E. Mow, dethatch, core aerate, and rake existing turf.

F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

I. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.

J. Apply seed and protect with straw mulch as required for new turf.

K. Water newly planted areas and keep moist until new turf is established.

3.8 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Owner's Representative:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.9 HERBICIDE APPLICATION

A. Apply herbicides according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.10 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures after grass establishment period.

3.11 MAINTENANCE SERVICE

A. Turf Maintenance Service: According to Section 329310 "Landscape Maintenance."

END OF SECTION

SECTION 32 93 00

PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Plants.
2. Fertilizers.
3. Pesticides and Herbicides.
4. Mulch.
5. Tree stabilization.

B. Related Requirements:

1. Section 01 56 39 "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.

2. Section 31 10 00 "Site Clearing" for clearing and preparation of plant beds prior to planting.

3. Section 31 10 70 "Erosion Control" for temporary erosion control measures related to plant installation.

4. Section 32 84 00 "Planting Irrigation" for installation of irrigation equipment around trees and shrubs.

5. Section 32 91 13 "Soil Preparation" for preparation of plant bed soil prior to or during planting.

6. Section 32 92 00 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

7. Section 32 96 00 "Transplanting" for transplanting non-nursery-grown trees.

8. Section 32 93 10 "Landscape Maintenance" for plant maintenance after installation.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 01 22 00 "Unit Prices."

B. Unit prices apply to authorized work covered by quantity allowances.

C. Unit prices apply to additions to and deletions from the Work as authorized by Change Orders.

1.4 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants established in the ground and dug with firm, natural balls of earth in which they were grown and wrapped with burlap and twine.

C. Balled and Potted Stock: Plants established in the ground dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container.

D. Bare-Root Stock: Plants established in the ground that are dug and delivered with soil or growing medium removed from its roots.

E. Branch: An outgrowing shoot, stem or twig that grows from the main stem or trunk.

F. Caliper: The measurement of a nursery stock tree as determined in the latest edition of the ANSI Z60.1.

G. Container-Grown Stock: Plants established above ground grown in a removable tub or pot container filled with growing medium.

H. Crown: The portion of a tree consisting of leaves and branches.

I. Defective Plant: Any plant that fails to meet the plant quality requirements of this Section.

J. Fabric Bag-Grown Stock: Plant grown within a fabric bag in-ground to manipulate root growth to develop a fibrous root system within the bag. Fabric bags may be used above ground as a container.

K. Finish Grade: Elevation of finished surface of planting soil.

L. Healthy: Description of quality related to living plants that are growing in a condition that expresses their leaf size, crown density, color and annual growth rates typical of their horticultural description in the region.

M. Included Bark: Ingrown bark tissues that develop where two or more stems grow closely together creating weak stem connections prone to breaking.

N. Kinked Root: A root within the root package that bends more than 90 degrees.

O. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

P. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

Q. Plug: Seeding or rooted cuttings grown in a cylinder of planting medium at a nursery. Sometimes referred to as a "tubeling."

R. Planting Area: Areas to be planted with any combination of groundcovers, shrubs, trees.

S. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See **Section 32 91 13 "Soil Preparation"** for drawing designations for planting soils.

T. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, plugs, tubelings, groundcovers, ornamental grasses, bulbs, corms, tubers, or any herbaceous vegetation.

U. Root Crown; Root Flare; Root Collar; Trunk Flare: The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots and "flares" away from the tree's trunk; the area of transition between the root system and the stem or trunk.

V. Root Ball: The mass of roots including any soil or substrate that is shipped with the tree within the root ball package.

W. Shrub: Wood plants with mature height approximately less than 15 feet.

X. Stem: Structure and support of a plant connecting the roots and leaves; may be woody or herbaceous.

Y. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

Z. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

AA. Tree: Single and multi-stemmed plants with mature height approximately greater than 15 feet.

BB. Trunk: Portion of woody stem or stems of a tree between the roots and the canopy.

CC. Vine: Woody or herbaceous climbing plant material.

DD. Whip: A young tree without branches

1.5 COORDINATION

A. Coordination with **Turf (Lawns) and Seeded** Areas: Plant trees, shrubs, and other plants after finish grades are established and before planting **turf and seeded** areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

2. Coordinate planting installation with planting soil installation according to Section 329113 "Soil Preparation."

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials. Invoices to be provided a maximum of one month after authorization to proceed. Copies must indicate source of supply by name, address, and phone number.

a. Photos: Include digital photographs of nursery site visits for all plants proposed to be purchased from sources.

2. Product Data: For each type of product indicated.

B. Samples for Verification: For each of the following:

1. **Bark and Compost Mulch**: 1-quart volume of each mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.

2. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Inspection Certificates: For plant materials furnished. Provide to Owner's Representative inspection certificates required by law for each shipment of plant materials.

C. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.

2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

D. Sample Warranty: For special warranty.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.

2. Experience: Five years' experience in landscape installation.

3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

4. Pesticide (Herbicide) Applicator: State licensed, commercial.

5. Personnel Certifications: Installer's **personnel assigned to the Work** shall have certification in the following categories from the National Association of Landscape Professionals:

a. Landscape Industry Certified Technician - Exterior.

b. Landscape Industry Certified Horticultural Technician.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.

2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

D. Plant Material Observation: Landscape **Architect** or **Owner's Representative** may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect or **Owner's Representative** may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Landscape Architect or **Owner's Representative** of sources of planting materials **30 days** in advance of delivery to site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Store fertilizers in a dry place and protect from moisture.

3. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

4. Accompany each delivery of bulk materials with appropriate certificates.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.

F. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

G. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist. Plant materials showing damage from shipping, storage or handling will be rejected and shall be replaced at the Contractor's expense.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.

2. Do not remove container-grown stock from containers before time of planting.

3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. West of Cascade Mountains: September 1 through May 15.

2. Plants with Automatic Irrigation: Installed outside the above planting periods only with prior written approval from Owner's Representative.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.

b. Visual presence of plant diseases or insect infestations.

c. Structural failures including plantings falling or blowing over.

d. Faulty performance of **tree stabilization**

e. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods: From date of **planting completion**

a. Trees, Shrubs, Vines, and Ornamental Grasses: 24 months.

b. Groundcovers, Biennials, Perennials, and Other Plants: 24 months.

3. General: The warranty period for plantings will include the healthy survival of **100** percent of the trees; the healthy survival of **100** percent of shrubs, ornamental grasses, and vines; and the healthy survival of **100** percent of groundcovers, plugs, perennials and biennials.

4. Include the following remedial actions as a minimum:

a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.

b. Replace plants that do not meet the minimum healthy survival percentage requirements at end of warranty period.

c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.

d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

5. Warranty Guarantee: A financial instrument as a warranty guarantee in the amount of 100 percent of the contract amount (including all labor, equipment and materials). Acceptable instruments for the warranty guarantee are as follows:

   a. A warranty guarantee incorporated with the performance guarantee.

   b. A maintenance bond.

   c. Cash deposit with Owner.

6. Warranty Exemptions: After **planting completion** acceptance and during the warranty period, incidents that exempt replacement include: plants removed by others, plants that are lost or damaged, plants impacted due to occupancy of project, plants lost or damaged by a third party, plants lost due to vandalism, or any natural disaster impacting plants.

7. Warranty Period Closure: During and by the end of the warranty period, remove all tree wraps, ties and guying. All trees that lack sufficient caliper to remain upright or those requiring further anchorage are to remain staked as approved by the Owner's Representative.

8. End of Warranty and Final Acceptance: Upon written request prior to the end of the warranty period date, the Owner's Representative will observe all warranted Work for final acceptance.

1.12 SUBSTITUTION REQUESTS

A. Size and species of plants that cannot be obtained due to lack of availability can be requested to be substituted. Submit all requests to Owner's Representative with a list of plant sizes, species, and nursery contact information for approval prior to issuing a formal submittal.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated on Drawings.

1. All plant materials furnished, including root ball dimensions or container size to trunk caliper ratio, shall comply with ANSI Z60.1 where applicable.

2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

3. Provide plants of sizes, grades, and ball or container sizes for types and form of plants. Plants of a larger size may be used if acceptable to Owner's Representative, with a proportionate increase in size of roots or balls.

4. Compliance: All plant materials shall comply with state and Federal laws and regulations for plant diseases, pests, and weeds.

5. Cold storage plants are not permitted.

B. Plant Quality: Furnish plants with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, conks, pests, eggs, larvae, and defects such as knots, gals, lesions, sun scald, injuries, abrasions, wood cracks, sap leakage, flush pruning cuts, and disfigurement.

1. Trees: Relatively straight, vertical trunk typical of species, capable of standing upright without supplemental staking, and with a single central leader. Crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable conditions.

2. Graft Unions: Unions, where applicable, are completely closed, without signs of rejection, healed, and visible above the root ball soil line.

3. Root-Ball Quality: Measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting. Root balls with roots favoring one side of the ball or with kinked roots are subject to be rejected.

4. Crown: Form and density typical of species, its stage of growth, and time of year.

5. Leaves: Size, color and appearance typical of species, its stage of growth, and time of year and be absent of wilted, shriveled, or dead leaves.

6. Branches: Even distribution of shoot growth throughout the crown typical of species, time of year, and absent of dead, diseased, broken, distorted or injured stems.

7. Trunk: Relatively straight or typical of species and free of wounds that penetrate to the wood, sunburned areas, conks, wood cracks, sap leakage, signs of boring insects, galls, cankers, girdling ties or lesions. Crooked

trunks with wounds, breaks, conks, cracks, lesions, or inadequate pruning scars are unacceptable conditions.

C. Balled and Burlapped Plants: Furnish field grown plants dug with firm, natural ball of earth in which they were grown in complying with ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine and optionally accompanied with a wire basket. Root flare to be visible at the surface of the ball as recommended by ANSI Z60.1. Burlap and twine materials to be natural and fully biodegradable.

D. Container Plants: Furnish healthy, vigorous, well-rooted plants grown in a removable and recyclable container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container but not root bound. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

E. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

F. Labeling: Label each individual tree and at least one plant of each variety and size for all other plant types with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

G. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

2.2 FERTILIZERS

A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots. Fertilizers to meet 0-F-241D, "Federal Specification, Fertilizer, Mixed, Commercial."

1. Size: **10-gram** tablets.

2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 MULCHES

A. Bark Mulch: Commercially produced, free from deleterious materials, sawdust, wood shavings, and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Ground or shredded bark **hemlock**

2. Size Range: **1-1/2 inch minus, fine to medium texture**

B. Compost Mulch: Commercially produced, well-composted, stable, and weed-free organic matter, pH of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through a 1-1/2 inch sieve; soluble-salt content of 2 to 5 dS/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.

2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

3. Ratio of Carbon to Nitrogen: **25:1**

2.4 HERBICIDES

A. General: Herbicide registered and approved by the EPA and state of California, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted herbicides unless authorized in writing by authorities having jurisdiction. Use of neonicotinoids class of pesticides are prohibited.

B. Pre-Emergent Herbicide (Selective and Nonselective): Registered and approved by the EPA and state of California. Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Registered and approved by the EPA and state of California. Effective for controlling weed growth that has already germinated.

2.5 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Tree Stakes: Straight, square or round, rough-sawn, sound, new softwood with specified wood pressure-preservative treatment, free of knots, holes,

cross grain, and other defects, nominal wood sizes and length indicated on Drawings, pointed on below grade end.

2. Tree Ties: UV resistant, flat, broad, flexible and nonabrasive material.

   a. Products: Subject to compliance with requirements, **provide one of the following**:

      1) Wide, flexible, adjustable, nonabrasive, with appropriate slack for trunk movement and lengths required to reach tree stakes.

         a) V.I.T. Products, Inc.; "Cinch-Tie."

         b) Villa Root Barrier, Villa Rubber Tree Tie.

         c) Webbing tie; 3/4-inch wide, soft woven polypropylene fabric with a 900-pound break strength; green or beige in color; new or reclaimed material.

         d) Approved equal.

1. Tree Tie Webbing: 1-inch-wide by 12 inch length minimum; UV-resistant woven polypropylene or nylon fabric webbing strap; green, beige or black in color with brass grommets.

2. Guy Cables: Five-strand, 3/16-inch-diameter, galvanized-steel cable, with zinc-coated **turnbuckles**, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.

3. Surveyor Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

B. Root-Ball Stabilization Materials:

1. Upright Stakes and Horizontal Hold-Down: Untreated, rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated; stakes pointed at one end.

2.6 MISCELLANEOUS PRODUCTS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

B. Burlap: Non-synthetic, biodegradable.

C. Planter Filter Fabric: **Nonwoven** geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.

D. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

E. Biochar: Commercially available soil amendment, high carbon fine-grained residue charcoal byproduct of sustainably sourced biomass material via pyrolysis, suitable for plant growth and soil health.

1. Cationic Exchange Capacity: 25 to 45 millieq/l.

2. Carbon: 85 wt percent C.

3. Moisture: 15 wt percent H20.

4. pH: 7.

F. Water: Suitable for planting irrigation and free from oil, acid, alkali, salt or other substances harmful to plant, animal or aquatic life.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.

3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

5. Verify the subgrade and planting soils are at appropriate elevations and meet all quality requirements for areas receiving plants.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Owner's Representative and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Owner's Representative acceptance of layout before excavating or planting. Make minor adjustments as required.

3.3 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil according to **Section 32 91 13 "Soil Preparation."**

B. Placing Planting Soil: Place and mix planting soil in-place over exposed subgrade

C. Before planting, obtain Owner's Representative's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

D. Application of Mycorrhizal Fungi: Broadcast dry product uniformly over prepared soil at application rate **according to soil test analysis**

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at an approximately 60-degree angle. Excavations with vertical sides, unless indicated otherwise, are unacceptable. Trim perimeter of tree pit leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base unless pedestal is overly compact or if additional soil needs to be added to bottom of the tree pit for proper planting elevation. Ensure that root ball will sit on stable base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

2. Excavate three times as wide as ball diameter, unless indicated otherwise or space does not allow, for **balled and burlapped**, and **container-grown** stock.

3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.

4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.

5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the additional soil to prevent settling.

6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.

7. Maintain supervision of excavations during working hours.

8. Keep excavations covered or otherwise protected **when unattended by Installer's personnel**.

B. Backfill Soil: Subsoil and topsoil removed from excavations may only be used if amended according to 329113 "Soil Preparation".

C. Obstructions: Notify Owner's Representative if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

D. Drainage: Notify Owner's Representative if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare above adjacent finish grades as indicated on Drawings.

1. Backfill Method: Backfill around root ball **with planting soil**.

2. After plant is set in hole, carefully cut and remove burlap, rope, and metal wire baskets as indicated on Drawings. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked, broken, or compromised where the plant cannot stand upright. Root balls that are cracked but not compromised shall have the burlap cut down to depth indicated on Drawings and loosely retied with twine to stabilize root ball before backfilling.

3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. Apply a one-half-inch layer of biochar if specified. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.

    a. Quantity: **Two per plant**

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. **Container-Grown** Stock: Set each plant plumb and in center of planting pit or trench with root flare above adjacent finish grades as indicated on Drawings.

1. Backfill Method: Backfill around root ball **with planting soil**.

2. Carefully remove root ball from container without damaging root ball or plant. Loosen root mass as indicated on Drawings.

3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. Apply a one-half-inch layer of biochar if specified. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.

    a. Quantity: **Two per plant**

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

3.6 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated

by Owner's Representative, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

B. Do not apply pruning paint to wounds.

3.7 TREE STABILIZATION

A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying

a. Stake trees 2-inch caliper or less with one stake; 2- through 3-inch caliper with two stakes; and 3- through 6-inch caliper with three stakes of length, penetrating below bottom of backfilled excavation and extending above grade to accept ties as indicated on Drawings. Set vertical stakes and space to avoid penetrating root balls or root masses with dimension indicated on Drawings.

2. Support trees with bands of flexible tree ties at contact points with tree trunk. Set ties around trunk to provide a minimum two inch clearance, providing enough slack to avoid rigid restraint of tree and allowing tree to reasonably flex in wind without failing.

B. Root-Ball Stabilization: Install at- or below-grade stabilization system to secure each new planting by the root ball unless otherwise indicated.

1. Wood Hold-Down Method: Place vertical stakes against side of root ball and drive them into subsoil; place horizontal wood hold-down stake across top of root ball and screw at each end to one of the vertical stakes.

a. Install stakes of length required to penetrate at least t**o the dimension indicated on Drawings**, below bottom of backfilled excavation. Saw stakes off at horizontal stake.

b. Install screws through horizontal hold-down and penetrating at least 1 inch into stakes. Predrill holes if necessary to prevent splitting wood.

c. Install second set of stakes on other side of root trunk for larger trees.

2. Proprietary Root-Ball Stabilization Device: Install root-ball stabilization system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

3.8 GROUNDCOVER AND PLANT PLANTING

A. Set out and space groundcover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.

B. Use planting soil for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 PLANTING AREA MULCHING

A. Mulch backfilled surfaces of areas indicated and around existing trees in turf areas.

1. Trees in Turf Areas: Apply **bark** mulch ring of **3-inch** average thickness with radius around trunks or stems matching drip zone, as indicated on Drawings. Do not place mulch directly onto trunks or stems of tree and maintain clear distance as indicated on Drawings.

3.10 EDGING INSTALLATION

A. Shovel-Cut Edging: Separate mulched areas from turf areas **curbs, and paving** with a 45-degree, 4- to 6-inch-deep, shovel-cut edge **as indicated on Drawings**.

3.11 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices, when possible, to minimize use of herbicides and reduce hazards.

3.12 HERBICIDE APPLICATION

A. Apply herbicides according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.13 REPAIR AND REPLACEMENT

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Owner's Representative.

1. Submit details of proposed pruning and repairs.

2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.

3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Owner's Representative.

B. Remove and replace dead or unhealthy plant materials as required in the "Warranty" Article before the end of the corrections period. Replace plants that are damaged during construction operations that the Owner's Representative determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size as those being replaced for each tree.

2. Provide one new tree in the original caliper size for each tree being replaced.

3. Species of Replacement Trees: **Same species being replaced**

3.14 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before [**Substantial Completion**] <**Insert time**>, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.15 MAINTENANCE SERVICE

A. Maintenance Service for Trees and Shrubs: According to Section 329310 "Landscape Maintenance."

END OF SECTION

SECTION 32 93 10

LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes maintenance of installed landscape areas including but not limited to plants, turf, seeded areas, and planting irrigation systems.

B. Related Requirements:

1. Section 32 84 00 "Planting Irrigation" for irrigation components.

2. Section 32 91 13 "Soil Preparation" for planting soil mixes including amendments.

3. Section 32 92 00 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

4. Section 32 93 00 "Plants" for trees, shrubs, groundcovers, and other plant materials.

1.3 DEFINITIONS

A. ISA: International Society of Arboriculture.

B. Herbicide: A type of pesticide that kill weeds and other unwanted plants.

C. Pesticide: Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest which includes herbicides.

D. Planting Area: Areas planted with any combination of groundcovers, shrubs, trees, and mulch, including turf and seeded areas.

1.4 LANDSCAPE MAINTENANCE SERVICE

A. Plant Maintenance Period: Services provided during the year, spread out from late winter through fall. The maintenance period shall start on the date of written acceptance of installation.

1. Plant Beds (Ornamental): Provide a **one-year** maintenance period **a minimum of three times a year**.

2. Stormwater Facilities: Provide a **one-year** maintenance period **a minimum of three times a year**.

B. Turf and Seeding Maintenance Period: Provide a **one-year** maintenance period **a minimum of three times a year**. The maintenance period shall start **on the date of written acceptance of installation**.

1.5 ACTION SUBMITTALS

A. Maintenance Work Plan: Written work plans, scaled plans, and related documents necessary to indicate understanding of areas to be maintained and services to be provided.

1. Schedule: At the beginning of each year, by January 15, submit a complete yearly schedule of maintenance operations indicating timing of scheduled visits and services outlined.

2. Weed Eradication Program: Identify methods of weed eradication. If herbicides are approved for use in weed eradication, identify areas on site anticipated for application in writing with diagrams or pictures as necessary to identify limits of application. Submit herbicide manufacturer product sheets, application rates, and schedule of application. Provide copies of manufacturer's federal registered label and material safety data sheet.

3. Pruning Services: Indicate methods of pruning to be employed, including understanding of acceptable pruning practices in accordance with this Section.

4. Water Source: Identify potential source(s) or water for supplemental irrigation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and personnel.

B. Pesticide Applicator License: Commercial Pesticide Applicator's License held in the individual's name and license number. Submit a certification each time a new applicator works on project.

C. Log of maintenance date with activities performed after each visit.

D. Annual Summary: At the end of each year, by December 1, submit a written summary of the maintenance activities conducted during year including:

1. Record of irrigation winterization and startup.

2. Irrigation schedule, repairs, and adjustments.

3. Herbicides applied, if any, including types and applications.

4. Water level conditions of planting areas.

5. Repair, replacement, or restoration activities.

6. Any conditions addressed outside of the scheduled maintenance tasks outlined this Section.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer, including personnel assigned to the Work.

1. Experience: Five years' experience in landscape maintenance in commercial or public settings of similar scope, size, and duration.

2. Personnel Certifications: According to Section 32 93 00 "Plants."

3. Licensed Landscape Contractor in the **State of California**.

B. All Work performed shall be done in manner that maintains the original integrity of the landscape design.

1.8 DELIVERY, STORAGE, AND HANDLING

A. According to 329300 "Plants", **32 84 00 "Planting Irrigation" and, 32 92 00 "Turf and Grasses"**.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with maintenance only when existing and forecasted weather conditions permit maintenance to be performed and when beneficial and optimum results may be obtained. Do not conduct any portion of the Work in planting areas if existing soil is saturated or has the potential to become compacted.

B. Plant and Seed Restrictions: Plants and seed may be replaced and installed outside of the planting restriction window and may require supplemental care for establishment.

1. Adhere to additional requirements according to 329300 "Plants", **32 84 00 "Planting Irrigation" and, 32 92 00 "Turf and Grasses"**.

1.10 WARRANTY

A. Plants: Warranty for replaced plants shall begin at date of installation and match duration according to Section 32 93 00 "Plants."

B. Planting Irrigation: Warranty for replaced irrigation parts shall begin at date of installation and match duration according to Section 32 84 00 "Irrigation."

PART 2 - PRODUCTS

2.1 GENERAL

A. All products provided as part of this Section, including replacement products, shall conform to the requirements of **Section 32 93 00 "Plants", 32 91 13 "Soil Preparation", 32 84 00 "Planting Irrigation" and 32 92 00 "Turf and Grasses"**.

2.2 FERTILIZERS

A. Fertilizer: Slow-release dry granular cottonseed meal or approved equal.

1. Nutrient Composition: 6 percent nitrogen, 2 percent phosphorous, and 2 percent potassium, by weight plus micronutrients, or approved alternative composition.

PART 3 - EXECUTION

3.1 DEBRIS

A. Trash Removal: Prior to commencing any other maintenance task, collect trash, litter, and other debris from planting areas.

B. Leaf Litter Removal: Rake and remove all leaf litter from site. Do not disturb plant beds or damage plants during leaf litter removal.

C. Sweep pedestrian walkways to maintain clean and safe walking surfaces. Remove accumulated clippings and plant debris from walkways and entrances. Clean all paved surfaces soiled by landscape maintenance operations.

D. Dispose of all trash, debris, and plant waste legally offsite.

3.2 PLANTING AREAS

A. General: Provide temporary fencing, flags, signage, or other measures as necessary to protect planting areas during establishment.

3.3 PLANT MAINTENANCE

A. General: Maintain plants by pruning, watering, weeding, fertilizing, mulching, restoring plant saucers, and performing other operations as required to establish healthy, viable plantings. Replace all damaged, dead, dying plants

covered during warranty period within 30 days of initial identification of condition.

B. Pruning: Design and installation of planting beds including individual plant spacing within beds assumes future plant growth and is planted to achieve a specific design intent. Provide standard professional horticultural and arboricultural practices for pruning techniques, as documented by ISA. Do not excessively prune, top, shear, or otherwise shape plants, and only prune to enhance natural plant form. Conduct major corrective or rejuvenation pruning only during the dormant season, unless otherwise specified. Improper pruning of plants, including harm to plant natural form, will require replacement and installation at cost to Contractor.

1. Tree Pruning: Performed by qualified personnel and conducted in accordance with the American National Standard (ANSI) A300 "Part 1 - Pruning Standard" and ANSI Z133 "Arboricultural Operations - Safety Requirements."

    a. Remove only dead, dying, crossed limbs, or broken branches.

    b. Do not apply pruning paint to wounds.

    c. Identify hazardous tree limbs of existing trees, if present, to **Owner's Representative**.

2. Shrub and Groundcover Pruning:

    a. Prune only dead, dying stems, including those causing visual obstructions, and conflicts with structures and walkways.

3. Ornamental Grass, Sedge, and Rush Pruning: Once a year in late winter, before sign of new growth, prune according to plant type:

    a. Warm Season Grasses: Cut back to a few inches above grade in late winter or early spring before new growth appears.

    b. Cool Season Grasses: Cut back to one-third of overall plant height in late winter or early spring, before new growth appears.

    c. Evergreen Grasses: Do not shear or cut back evergreen grasses. Comb plant with rake to tease out old plant material. Cut out dead or dying strands not removed from combing.

4. Perennial Pruning: Once a year in late winter or early spring, before first sign of new growth, prune perennials to three inches above grade.

C. Tree Stabilization Materials: Inspect all tree trunks and root balls for any damage caused by tree stabilization materials. Adjust stabilization devices

impacting any part of tree including trunk, branches, or roots. Adjust ties around trunk to provide a minimum two inch clearance, providing enough slack to avoid rigid restraint of tree and allowing tree to reasonably flex in wind without failing. Adjust and repair tree-stabilization devices where encountered, resetting to proper grades or vertical position.

D. Fertilizing at Planting Beds: Apply specified organic base commercial fertilizer at manufacturer's recommended rate, two times per growing season. First application on March 15 and the final application on June 15. All fertilizer shall be washed off foliage and watered in thoroughly, if not watered by normal rainfall.

E. Weeding: Maintain clean planting beds by pulling and removing all weeds.

F. Herbicides: Spraying shall occur only by a licensed pesticide applicator with prior written approval from Owner's Representative. Apply treatments as required to keep planting areas and soils weed free. Use integrated pest management practices, when possible, to minimize use of herbicides.

G. Mulching: Replenish **bark mulch** as needed to maintain original installation depth. Rake mulch in early spring before applying new mulch material to break "crust" of old mulch.

H. Watering: Water all plants using the installed permanent or temporary irrigation systems, or such means as has been established prior to maintenance service regime. Additional, supplemental watering may be required for plant establishment regardless of presence of irrigation system. Verify balance of watering and adjust schedule if evidence of excess puddling or runoff is encountered, or plants indicate stress. Watering frequencies shall at a minimum match local ET rates of plant or grass species, in addition to requirements specified in "Watering Requirements" Article.

I. Protect site from erosion and siltation. Utilize approved erosion control methods as required to contain and mitigate erosion. Fill in, as necessary, soil subsidence that may occur because of settling, erosion, or rutting. Monitor runoff conditions and notify Owner's Representative of drainage, erosion, plant diseases, animal browsing, vandalism, or other related issues affecting natural area health.

3.4 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.

2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.

3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Start water application as soon as season requires. Maintain turf uniformly moist to a depth of 4 inches or to sufficient quantity and frequency to maintain good color and health. Adjust watering as required to limit surface runoff. Cease watering operations when seasonal rains provide ample water to sustain lawn health.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing at least once a week to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Utilize clean, sharp equipment that is free from bacteria, fungi, chemicals, or contaminant detrimental to turfgrass growth prior to bringing onto the site. Clean and remove turfgrass clippings from mowing operations and dispose of legally offsite.

D. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow to a height of 1/2 inch or less.

E. Turf Postfertilization: Apply **slow-release fertilizer** after initial mowing and when grass is dry.

1. Use fertilizer that provides actual nitrogen of at least **1 lb/1000 sq. ft.** to turf area.

F. Edge planting beds and turfgrass perimeters every week after establishment.

G. Apply herbicide weed control by licensed applicator sufficient to control invasive broadleaf weeds and grasses.

3.5 SEEDING AREA MAINTENANCE

A. Start water application as soon as season requires. Apply water in sufficient quantities and frequency to maintain seeding area in good color and health. Do not allow surface runoff. Cease watering operations once seasonal rains provide ample water to maintain seeding area health and vigor.

B. Do not apply herbicide weed control measures in seeded areas.

C. Apply herbicide weed control measures according to the requirements of Section 329200 "Turf and Grasses."

3.6 STORMWATER FACILITY PLANTING AREAS

A. Do not mow stormwater facility areas.

B. Do not apply chemical weed control measures.

C. Prune plants according to **jurisdictional requirements**.

D. Water plants according to "Watering Requirements" Article.

E. Monitor runoff conditions in stormwater facility and notify **Owner's Representative** of drainage or erosion problems.

3.7 WATERING REQUIREMENTS

A. General: Watering requirements indicated are guidelines for planting area establishment, including areas receiving automatic irrigation or areas with no irrigation systems. Apply supplemental water as needed during extended dry or warm periods, or where irrigation system is not sufficiently irrigating plants, to maintain planting health and vigor.

1. Trees: Water all trees at a minimum frequency of once a week from the beginning of May through June and twice a week from July through October. Slowly apply **15** gallons of water to plant roots at each watering occurrence, allowing water to infiltrate into soil.

2. Shrubs and Groundcovers: Water all plants at frequency of once a week from the beginning of May through June and twice a week from July through October. Apply a minimum of two gallons of water to plant roots per installed one- and two-gallon container plants and a minimum of five gallons of water to plant roots per installed five-gallon container plant.

3. Turf Areas: Apply water according to minimum ET rate of turfgrass species. Apply water according to good horticultural practice under the prevailing conditions, as required to promote a healthy stand.

4. Seeded Areas: Apply water according to good horticultural practice under the prevailing conditions, as required to promote a healthy stand.

3.8 WEED ERADICATION

A. Weed Eradication: Shall include eradication by manual removal methods through a weed eradication program as approved. Identify all weeds prior to removal. Planting areas shall be free of noxious weeds and invasive plants **as classified by the California Department of Agriculture as type "A" or "B" weeds** and not limited to the following: Canada thistle, morning glory, scotch broom, common teasel, English ivy, Himalayan blackberry, velvet grass, purple loosestrife, reed canary grass, kudzu, butterfly bush, bentgrass, Italian arum, spurge laurel, yellow archangel, false brome, garlic mustard, lesser celandine, pokeweed, giant hogweed, Japanese knotweed, jointed goatgrass, tree of heaven, and tansy ragwort.

B. Herbicides: Apply herbicides according to city, county, state, and federal requirements including manufacturer's written instructions. Obtain approval and notify Owner's Representative prior to each application, including coordinating with Project operations and adjacent site uses in proximity to the Work. Herbicides in watersheds, waterway and drainage areas, or sensitive lands shall only be conducted after non-herbicide measures prove impractical and strictly applied according to all requirements.

1. Selective manual removal of weeds shall be utilized if herbicide application threatens planting areas. All planting areas indicating damage by herbicide application shall be replaced immediately at no additional cost to the Owner.

3.9 IRRIGATION SYSTEM INSPECTION AND MAINTENANCE

A. General: Irrigate all planting areas to maintain healthy and thriving conditions.

B. After two weeks of system operation, flush lines and remove particulates from system.

C. **Once a month** review site conditions and assess for signs of over or under watering. Inspect plant growth and vigor; adjust watering schedule, as necessary.

1. Inspect controller for proper functioning. Verify zone timing settings at each inspection visit.

2. Repair and adjust system throughout warranty period.

D. Perform seasonal winterization and system start-up services. Demonstrate start-up and winterization, including manual system shut off valve locations, in the presence of the **Owner's Representative**.

1. Late Fall Deactivation (Winterization): Turn off irrigation system at the point of connection, flush and open all manual drain valves, backup irrigation programs and set controller to "rain" mode or unplug from power source.

2. Spring Activation (Startup): Flush and close drain valves opened from previous winterization, turn point of connection on, activate or power on controller with restored irrigation program, test all zones from controller, and adjust nozzles and heads.

3. Summer Monitoring: Adjust nozzles and heads. Adjust the controller program as needed.

4. Provide a list to **Owner's Representative** for necessary repairs after each activation or deactivation service.

3.10 INSPECTIONS

A. During the maintenance service period, the **Owner's Representative** will make three inspections jointly with the Contractor at the following times:

1. Spring, early May.

2. Summer, mid-July.

3. Fall, later September.

B. Depending upon the beginning of the maintenance service and duration, one of these visits will be the final inspection.

C. After each inspection, the Owner may determine based upon the specified success criteria according to the project specifications, that corrective Work is required. If so, the Owner will provide the Contractor with a written notice of required corrective Work.

3.11 CORRECTIVE WORK

A. Provide plant replacements of the same variety, size, and quality as originally installed, unless otherwise approved.

1. Planting outside of planting season window allowed for corrective Work, after each periodic inspection.

B. Correct deficient items within 30 days after written notification.

3.12 CLEANING AND PROTECTION

A. According to Section 32 93 00 "Plants."

END OF SECTION

SECTION 33 10 00

WATER UTILITIES

PART 1 - GENERAL

1.01 GENERAL

A. The work encompassed by this section shall consist of performing all operations and furnishing all labor, materials, tools, equipment, and incidentals as necessary for the following:

1. Underground water distribution system complete, ready for operation, including all appurtenant structures, and connections to both new building service lines and to existing water supply, servicing the domestic and fire service water system piping.

2. Valves and other water system appurtenances.

1.02 QUALITY ASSURANCE

A. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to Public Water lines and the extension, and/or modifications to Public Utility systems.

B. Comply with all rules and regulations of Federal, State, and Local jurisdiction over the design, construction, and operation of potable water systems.

C. Water mains, services, and appurtenances shall be subject to hydrostatic and leakage tests and shall be disinfected prior to connection to existing systems.

D. The maximum allowable deflection (out of roundness) of PVC pipe under superimposed loads shall be 5%, or 75% of the manufacturers recommended maximum, whichever is smaller.

E. All material surfaces in contact with potable water shall comply with NSF 61.

1.03 REFERENCES

A. American Society for Testing and Materials:

1. ASTM D3139-98, Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

2. ASTM D2737, Specification for Polyethylene (PE) Plastic Tubing.

3. ASTM F477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

B. American Water Works Association:

1. AWWA C151, American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.

2. AWWA C153, Ductile-Iron Fittings 3" through 48" for Water and Other Liquids.

3. AWWA C104, American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

4. AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

5. AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution

6. AWWA C110-98, Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids

7. AWWA C800, Underground Service Line Valves and Fittings (Includes Collected Standards for Service Line Materials)

8. AWWA C509, Resilient-Seated Gate Valves for Water-Supply Service (includes addendum C509a-95).

9. AWWA C651, Disinfecting Water Mains.

C. National Fire Protection Association:

1. NFPA 24, 2013 Standard for the Installation of Private Fire Service Mains and Their Appurtenances

1.04 ACTION SUBMITTALS

A. No action submittals are necessary.

1.05 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

1. Product data for pipe, valves, and appurtenances.

2. Field quality control reports.

PART 2 - PRODUCTS

2.01 WATER PIPE

A. PVC Pipe: Fire Service shall be PVC pipe (new pipe), minimum Class 150 for building fire service main, conforming to the requirements of AWWA C900 "Standard for Polyvinyl Chloride Pressure Pipe, 4 inch through 12 inch for

Water". Pipe shall be furnished with either bell end or couplings designed to effect an elastomeric pressure seal.

1. Fittings: Ductile iron castings conforming to the applicable requirements of AWWA C153 for 150 psi working pressure.

2. Rubber rings, fittings, and appurtenances per ASTM F477.

3. Joints: ASTM C111 rubber gasketed.

4. Trace Wire: Number 12 insulated copper wire.

2.02 WATER SERVICES

A. Polyethylene Plastic Pipe: Class 160, conforming to the requirements of ASTM D2737.

B. PVC Pipe: Schedule 40 conforming to ASTM D1785 for rigid PVC compounds. It shall bear the NSF seal of approval and shall conform with the requirements of commercial standard 256 and ASTM D2241.

C. Copper Pipe: All copper tubing water service shall conform with the latest AWWA Standards as described in ANSI/AWWA C800 of the latest revision, and with ASTM B88, and shall be Type L soft temper tubing for 3/4" and 1" tubing and Type K hard temper for 2" tubing.

2.03 VALVES

A. Gate Valve Up to 3 Inches: Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, IPS ends, with extension box and valve key.

B. Gate Valves - 3 Inches and Over: AWWA C509, for resilient-seated valves. Iron body, bronze trim, non-rising stem with square nut, single wedge, flanged ends, extension box and valve key. Square wrench nut shall be brass and all other nuts, bolts, and washers throughout the valve and valve body shall be stainless steel, ASTM A276, Type 316. The working pressure rating of the gate valves shall meet or exceed the pressure rating of the pipe specified.

C. Ball Valves Up to 2 Inches: Brass body, teflon coated brass ball, rubber seats and stem seals, tee stem pre-drilled for control rod, IPS inlet end, IPS outlet with extension box and valve key.

D. Butterfly Valves: Butterfly valves shall be flanged or mechanical joint type only and shall conform to AWWA Standard C504 of latest revision and shall be of the rubber seat type. Valve discs shall rotate 90 degrees from the full open position to the tight shut position. The valve seat shall provide a tight shutoff at a pressure differential of 150 psi upstream and 0 psi downstream in either direction. The

valve operator shall be the traveling nut type. Valve shall open with a counter-clockwise rotation of the operating nut.

E. All valves shall have the manufacturer's name and pressure rating marked on valve body.

2.04 RESTRAINED JOINTS

A. Sections of piping requiring restrained joints shall be constructed using pipe and fittings with restrained "locked-type" joints and the joints shall be capable of holding against withdrawal for line pressures 50 percent above the normal working pressure but not less than 150 psi. The pipe and fittings shall be restrained push-on joints or restrained mechanical joints.

B. The minimum number of restrained joints required for resisting force at fittings and changes in direction of pipe shall be determined from the length of restrained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil.

C. Thrust blocks are permitted unless not allowed by the local governing authority.

D. PVC pipe bell and spigot joints shall be restrained with the Uni-Flange Corp. Series 1350 Restrainer or approved equal. The restraining device and Tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A536. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy steel meeting the requirements of ASTM A242.

E. Ductile iron mechanical joint fittings used with PVC pipe shall be restrained with UNI-Flange Corp. Series 1300 Restrainer, EBBA Iron, Inc, Series 2000PV Mechanical Joint Restrainer Gland, or approved equal. The restraining device and Tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A-536. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy steel meeting the requirements of ASTM A242.

~~2.05 FIRE HYDRANT~~

~~A. Size of main valve opening of each hydrant shall be 5 inches, minimum. Hose thread, size of fire apparatus connection, and shape, size and direction of rotation of operating head of hydrant shall be identical with the local fire department and/or water department standards.~~

~~B. Hydrant shall be type AWWA C502, heavy construction, of proper length to connect pipe without extra fittings, and shall be the traffic type with safety flange on barrel and safety couplings on the valve stem with the following features:~~

~~1. Interior removable without digging up hydrant; can be packed under pressure; 6-inch bell connection; one steamer nozzle and two hose nozzles with nozzle caps securely chained to barrel; suitable drainage device; single rubber or~~

~~leather-faced valve in base; nozzles, stuffing boxes, wedge nuts, seat rings, clamp plates, etc. Threaded joints or spindles shall be bronze. Upper and lower barrels shall be of equal diameters. Upper barrel shall be of sufficient length to permit setting hydrant with barrel flange not more than 2 inches above finished grade. All fire hydrants shall have 6 inch bottom connection.~~

~~2. Provide fire hydrants with finish paint as required by AHJ.~~

~~C. Provide a total of two wrenches with handles not less than 14 inches long.~~

2.06 BACKFLOW PREVENTER

A. Potable Water and Irrigation Water Service: Reduced Pressure Principle Type AWWA C511, except pressure drop at rated flow shall not exceed 15 psi. Gate valves installed on the assembly shall be resilient seated valve conforming to AWWA C509.

B. Fire Service: Double detector check valve with tamper switch. AWWA C510 and NFPA 14.

C. Provide backflow assemblies on "List of Approved Backflow Devices", by the University of Southern California Foundation for Cross Connection Control & Hydraulic Research. Valves shall include supervisory switches. Coordinate with electrical for connection to building fire alarm system.

D. Backflow preventer shall not be located in any area containing fumes that are toxic, poisonous or corrosive.

E. Direct connections between potable water piping and sewer connected wastes shall not exist under any condition with or without backflow protection.

F. Backflow preventer shall be accessed and have clearance for the required testing, maintenance and repair. Access and clearance shall require a minimum of one (1) foot between the lowest portion of the assembly and grade, floor or platform. Installations elevated more than five (5) feet above the floor or grade shall be provided with a permanent platform capable of supporting a tester or maintenance person.

2.07 DISINFECTION CHLORINE

A. Liquid chlorine shall conform to AWWA B301 and AWWA C651.

B. Sodium hypochlorite shall conform to AWWA B300 with 5 percent to 15 percent available chlorine.

C. Calcium hypochlorite shall conform to AWWA B300 supplied in granular form or 5.g tablets, and shall contain 65 percent chlorine by weight.

2.08 ACCESSORIES

A. Water Service: Water services for domestic shall include a corporation stop, tapping service saddle, and meter.

   1. Meter and meter box shall be supplied by the City.

B. Fittings: All fittings and accessories shall be manufactured and furnished by pipe supplier and shall be of same material as pipe, molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

C. Colored Tape: Provide blue colored tape over all pipes.

D. Restrained Joint Fittings: Restrained joint fittings shall be ductile iron in accordance with the applicable requirements of ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of the latest revision and shall be compatible with the type and pressure of pipe used.

PART 3 - EXECUTION

3.01 GENERAL

A. Water system installation shall be accordance with local jurisdiction providing service.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site in accordance with manufacturer's recommendations.

B. Deliver and store valves in shipping containers with labeling in place.

3.03 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.04 INSTALLATION

A. Excavate pipe trench in accordance with Section 31 23 33 of these specifications.

B. Pipe Bedding and Backfill: Per the requirements of the local jurisdiction or per Section 31 23 33 of these specifications.

C. Horizontal Separation-Water Mains and Sewers:

1. Refer to State of California, Department of Health Services Guidance Memo No. 2003-02 (or most recent version): Guidance Criteria for the Separation of Water Mains and Non-Potable Pipelines.

D. Perpendicular Vertical Separation-Water Mains and Sewers:

1. Refer to State of California, Department of Health Services Guidance Memo No. 2003-02 (or most recent version): Guidance Criteria for the Separation of Water Mains and Non-Potable Pipelines.

E. Maintain minimum horizontal separation of 5 feet between domestic water service and sewer lateral.

F. Route pipe in straight line. Use factory manufactured fittings for all turns, corners or radii.

G. Establish elevations of buried piping to ensure not less than 36 inches of cover from finish grade.

H. Install trace wire for plastic pipe and colored tape for all pipes continuous over top of pipe and bring up inside valve box and end of pipe runs.

I. Backfill trench in accordance with Section 31 23 33 of these specifications.

3.05 INSTALLATION - VALVES

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

3.06 VALVE BOXES, VAULTS AND PITS

A. Each gate valve shall be covered by a precast 8" valve box set flush with the street surface with cast iron ring and cover marked "WATER".

B. All meter boxes, vaults and pits shall be bedded on 3" minimum thick, 3/4" drain rock, or other clean material with typical sand equivalent of 20 minimum, uncontaminated by native soil or against compacted of undisturbed base. The gravel bed shall extend to a 4" minimum beyond all side of the meter box. Box shall be set flush with top of curb, sidewalk, or ground, whichever is applicable.

C. Meter boxes and vaults shall be set so that the reading lids are aligned over the meter registers as closely as possible.

3.07 ADJUSTING WATER VALVE BOXES

A. After street has been paved, mark location of all water valve boxes in white paint before the close of that work day. Within 48 hours of paving, adjust all water valve boxes up to grade.

3.08 CLEANING

A. Prior to field testing, the pipe shall be flushed so that the velocities of 5 feet per second are obtained sufficient to clean the entire length of pipe.

3.09 HYDROSTATIC TEST

A. Conduct pressure and leakage tests on all pipelines. Furnish all necessary equipment and material and make all taps in the pipe as required. All pipe testing is to be hydrostatic

B. Hydrostatic testing of the system shall occur prior to disinfecting the system.

C. Prior to pressurizing the line, all joint restraints shall be completely installed and inspected.

D. If the system is tested in sections, and at the temporary caps at connections to the existing system and buildings, the Contractor shall provide and install all required temporary thrust restraints required to safely conduct the test.

E. The Contractor shall install corporation stops in the line as required to purge the air out of the system. At the completion of the test, all corporation stops shall be capped.

F. The Contractor shall perform pressure and leakage tests for the new system for 2 hours to 200 psi. Leakage shall not exceed the following requirements.

   1. Copper Tubing: No leaks.

   2. Ductile Iron Pipe: AWWA C600.

   3. Polyvinyl Chloride (PVC) AWWA C605.

G. Gauges for testing shall be calibrated with a standardized test gauge at the start of each testing day. Conduct the tests on buried pipe after the trench has been completely backfilled. If field condition permit, partially backfill the trench and leave the joints open for inspection and conduct an initial test. The acceptance test shall not, however, be conducted until all backfilling has been completed. Conduct the tests on exposed piping after the piping has been completely installed, including all supports and hangers.

1. Pressure pipe procedure: After the pipe has been laid and backfilled and final compaction has been obtained, test pressure pipe between each valve section or pipe run. The pipe shall be slowly filled with water so that air is removed and the pipe shall be tested hydrostatically to a pressure of 50 psi above the working pressure and not less than 200 psi, at any point on the main for a minimum of one hour or to pressure as required by the local authority. Reaction blocking pipe restraints and the like shall be installed prior to test. All exposed pipe, fittings, valves and joints shall be examined during the test for seepage or other defects. Defects noted by this test shall be removed and replaced.

2. A leak test shall be conducted after the pressure test has been satisfactorily completed. The duration of each leakage test shall be two hours and during the test the main shall be subjected to a pressure of 200 psi unless otherwise specified. Leakage shall not exceed the amounts given in AWWA C600 for ductile iron pipe and AWWA C605 for PVC pipe. If any test discloses leakage greater than specified, locate and repair the defective joints until the leakage is within the specified allowance.

3. Requirements for exposed pipelines: All exposed pipelines shall have no visible leakage during the specified test period. Any exposed pipeline with leakage shall be repaired or replaced.

3.10 DISINFECTING AND FLUSHING

A. Disinfect new water piping system in accordance with AWWA C651.

B. Maintain disinfectant in system for 24 hours. A residual of not less than 25 parts per million shall be produced in all parts of the line for the 24-hour period.

C. The bacteriological test specified in AWWA C651 shall be performed by a laboratory approved by the State. The cost of sampling, transportation, and testing shall be the responsibility of the Contractor.

Pipe Diameter	**Flow Required to Produce 2.5 ft/sec (approx.) Velocity in Main**
In	gpm
4	100
6	200
8	400
10	600
12	900
16	1,600

D. The backflow preventers shall not be in place during the flushing.

E. Initial flushing shall obtain a minimum velocity in the main of 2.5 feet per second at 40 PSI residual pressure in water main. The duration of the flushing shall be adequate to remove all particles from the line.

F. The Contractor shall be responsible to provide the water source for filling, flushing, and disinfecting the lines. Only potable water shall be used, and the Contractor shall provide all required temporary pumps, storage facilities required to complete the specified flushing, and disinfection operations.

G. The Contractor shall be responsible for the disposal of all water used to flush and disinfect the system in accordance with all governing rules and regulations. The discharge water shall not be allowed to create a nuisance for activities occurring on or adjacent to the site.

H. Re-disinfection and bacteriological testing of failed sections of the system shall be the sole responsibility of the Contractor.

I. Before backflow preventers are installed, all upstream piping shall be thoroughly flushed.

J. Flush, circulate, and clean until required cleanliness is achieved.

K. Provide bacteriological sampling, testing, and certification that water conforms to bacterial standards.

3.11 BACKFLOW PREVENTOR TESTING:

A. All backflow preventers shall be tested and certified for proper operation prior to being placed in operation.

3.12 FINAL CLEANING

A. Prior to final acceptance, all pipelines installed under this Section shall be flushed out of all accumulated construction debris and other foreign matter removed. Cleaning shall be done in a manner that will keep flushed debris from entering equipment. Flush through hydrants, or other outlets. Provide a pipe velocity of 2.5 feet per second minimum.

END OF SECTION

SECTION 33 12 16

MANUAL VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

This Section includes materials, testing, and installation of manually operated valves and check valves.

1.2 SUBMITTALS

Furnish submittals in accordance with the requirements of technical specifications and plans. The following submittals are required:

1. Manufacturer's catalog data and detail construction sheets showing all valve parts and describing material of construction by material and specification (such as AISI, ASTM, SAE, or CDA)
2. Valve dimensions including laying lengths. Show dimensions and orientation of valve operators, as installed on the valves.
3. Valve linings and coatings

PART 2 – MATERIALS

2.1 GENERAL

Provide valves complete with operating handwheels, levers, chainwheels, extension stems, floor stands, worm gear operators, operating nuts, chains, and wrenches required for operation. Valves shall have the name of the manufacturer and the size of the valve cast or molded onto the valve body or bonnet or shown on a permanently attached plate.

1. All parts in contact with potable water shall be fabricated from approved no lead/ultra-low lead material containing residual lead levels that shall not exceed a maximum of 0.25% weighted average lead content as per California Health and Safety Code Section 116875. Moreover, said parts in contact with drinking water supply shall be certified as suitable for contact with potable water in compliance with ANSI/NSF Standard 61, Drinking Water System Components – Health Effects. Parts not in contact with potable water shall comply with the requirements of ASTM B62 and ASTM B584 Copper Alloy Number C83600 or C84400, respectively.

2.2 VALVE OPERATORS

A. Operators for Exposed Valves Smaller Than 6 Inches: Provide lever or wrench operators having adjustable, open stop memory positions for exposed valves smaller than 6 inches.
B. Operators for Buried and Submerged Valves
   1. Provide direct acting 2-inch square AWWA operating nuts for all buried and submerged valves less than 6 inches, and for buried and submerged gate valves less than 24 inches.
   2. Provide watertight shaft seals and watertight valve and actuator cover gaskets. Provide totally enclosed operators designed for buried or submerged service.
C. Operators for Valves 6 Inches and Larger
   1. Provide gear operators on butterfly, plug, and ball valves 6 inches and larger. Gear operators for valves 8 inches through 20 inches shall be of the worm and gear, or of the traveling nut type. Gear operators for valves 24 inches and larger shall be of the worm and gear type.

2. Enclose gear operators, suitable for running in oil, with seals provided on shafts to prevent entry of dirt and water into the operator. Gear operators for valves located above ground or in vaults and structures shall have handwheels. Minimum handwheel diameter shall be 12 inches.
3. Gear operators shall be of the totally enclosed design, proportioned to permit operation of the valve under full operating head with a maximum pull of 80 pounds on the handwheel or crank. Operators shall be provided with open and closed position stop limiting devices. Operators shall be of the self-locking type to prevent the disc or plug from creeping. Design operator components to withstand a pull of 200 pounds for handwheel or chainwheel operators between the input and stop limiting devices without damage, and an input torque of 300-foot-pounds for operating nuts when operating against the stops.
4. Self-locking worm gears shall be a one-piece design of gear bronze material (ASTM B 427), accurately machine cut. The worm shall be hardened alloy steel (ASTM A 322, Grade G 41500; or ASTM A 148, Grade 105-85), with thread ground and polished. The reduction gearing shall run in a proper lubricant. Operators shall be Limitorque Model T Series, EIM Model MG or approved equal.
5. Gear operators shall be able to rotate the valve element (disc, plug or ball) from the fully closed position to fully open in a number of turns of the operator not exceeding two times the valve diameter in inches (i.e., for a 12-inch valve, the number of turns of the operator shall not exceed 24).

D. Operating Torque Requirement for Buried Valves: Design operators on buried valves to produce the required torque on the operating nut with a maximum input of 150- foot pounds.
E. Opening Direction: Valve operators, handwheels, or levers shall open by turning counterclockwise.
F. Position Indicators: Provide valve position indicators for all above ground valves.

2.3 VALVE BOXES FOR BURIED VALVES

A. General: Valve boxes shall be 8-inch Class 100 asbestos cement pipe, 8-inch Schedule 40 PVC pipe, or 8-inch SDR sewer pipe.
B. Valve Box Caps: Valve box caps shall be cast iron, and shall be designed to rest without a frame on a cast-in-place concrete ring surrounding the valve extension pipe. Taper the cap skirt for a close fit inside the upper sleeve portion of the valve box. Minimum weight of nominal 10-inch cap shall be 40 pounds. Caps for potable water valve boxes shall be circular with the word WATER cast on the cap. Caps for reclaimed water valve boxes shall be triangular with the word "IRRIG" cast on the cap. Coat caps per manufacturer's recommendation. Color for potable waterlines shall be OSHA-ANSI safety yellow. Color for reclaimed waterlines shall be purple (Pantone 512).
C. Manufacturers: Valve boxes for potable water lines shall be Brooks 3RT, Eisel Enterprises, Inc. H & C No. 10, or approved equal. Valve boxes for reclaimed water lines shall be Brooks 4TT, Eisel Enterprises, Inc. H & C 4TT, or approved equal.

2.4 EXTENSION STEMS FOR BURIED VALVE OPERATORS

Where the depth of the valve is such that its operating nut is more than 3 feet below grade, provide operating extension stems to bring the operating nut to a point between 24 to 36 inches below the surface of the ground and/or box cover. Extension stems shall be steel and shall be complete with 2-inch-square operating nut. Provide stem with a 1/8-inch center guide to keep stem centered. Do not use pinned couplings.

2.5 BOLTS, NUTS, AND GASKETS FOR FLANGED VALVES

Describe bolts and nuts for flanged valves in the detailed individual piping specifications.

2.6 PAINTING AND COATING

A. Above Ground Valves or Valves in Vaults: Coat metal valves (except bronze and stainless steel valves) located above ground or in vaults and structures in accordance with manufacturer's recommendations. Apply the specified prime coat at the place of manufacture. Apply intermediate and finish coats in field. Finish coat shall match the color of the adjacent piping. Handwheels shall receive the same coating as the valves.
B. Buried Valves: Coat buried metal valves and extension stems at the factory per the manufacturer's recommendation.
C. Interior Coating: Coat metal valves 4 inches and larger on the interior metal parts, excluding seating areas and bronze and stainless steel pieces, per the manufacturer's recommendation. Coating shall be applied at the factory by the valve manufacturer.

2.7 VALVES

A. Above Ground Gate Valves 3 Inches and Smaller: Above ground gate valves, 1/4-inch through 3 inches, for water service shall be non-rising stem, screwed bonnet, solid wedge disc type designed for a minimum working pressure of 220 psi. Valves shall have threaded ends. Materials of construction shall be as follows:

Component	Material	Specification
Body, Bonnet, Disc Stem	Bronze Bronze or Copper Silicon	ASTM B62 ASTM B62, B99 Alloy 651), B584 (Alloy C87600), B371 (Alloy 694)

Stem material shall have a minimum tensile strength of 60,000 psi and a minimum yield strength of 30,000 psi. Handwheels shall be brass. Packing shall be Teflon asbestos. Valves shall be Crane 438, Stockham 103, or approved equal.

B. Buried Gate Valves Smaller Than 3 Inches: Buried gate valves for air or water service shall be non-rising stem type, double disc, parallel seat, and shall be designed for a minimum working pressure of 200 psi. Valves shall have flanged, PVC, or threaded ends as required for the type of pipe used. Materials of construction shall be as follows:

Component	Material	Specification
Body, Bonnet, Operating Nut, stuffing box	Cast Iron	ASTM A126, Class B
Bonnet Bolts Stuffing Box	Steel, Cadmium Plated	ASTM A307, Grade B; B766
Bolts		Class 25, Type II
Discs, Disc Nut, Disc Ring, Seat Nut	Bronze	ASTM B62
O-ring	Synthetic Rubber	ASTM D2000
Stem	Copper Silicon or Manganese Bronze	ASTM B584, Alloys C86200, C86300, C86400, C87500, or C87600

Valves shall be Stockham G-736, G-739, or G-745; Kennedy Figure 597X or 561X; Mueller Series A2380; or approved equal.

C. Gate Valves 3 Inches and Larger: Valves shall conform to AWWA C500 and the following. Valves shall be non-rising stem, parallel faced, bottom wedging double-discs, with O-ring seals. The

minimum designated water working pressure shall be 200 psi for valves 3 inches through 12 inches and 150 psi for larger valves. Bronze for internal working parts, including stems, shall not contain more than 2% aluminum nor more than 7% zinc. Bronze shall be ASTM B 62 (85-5-5-5) bronze, except that stem bronze shall have a minimum tensile strength of 60,000 psi, a minimum yield strength of 30,000 psi, and a minimum of 10% elongation in 2 inches. Materials of construction shall be as follows:

Component	Material	Specification
Body, Bonnet, Operating Nut Stuffing Box	Cast Iron	ASTM A126, Class B
Bonnet Bolts Stuffing Box Bolts	Stainless Steel	ASTM A276, Type 316
Disc, Disc Pin, Seat Ring	Bronze	ASTM B21, ASTM B62
Stem O-ring	Bronze Synthetic Rubber	ASTM B138 ASTM D2000

Valves shall be Clow AWWA gate valves, Kennedy AWWA gate valves, Mueller Series A2380, or approved equal.

D. Butterfly Valves 4 Inches and Larger, Class 150B: Butterfly valves shall be short body, flanged type, conforming to AWWA C504, Class 150B. Do not use wafer style valves. Unless otherwise noted, minimum working differential pressure across the valve disc shall be 150 psi. Valve ends shall be as shown on the drawings; flanged ends shall be Class 125, ANSI B16.1. Valve shafts shall be Type 304 or 316 stainless steel, or carbon steel with Type 316 stainless steel journals and static seals. Valve shafts shall be stub shaft or one-piece units extending completely through the valve disc. Test valve bodies at a pressure equal to twice the design working pressure. Materials of construction shall be as follows:

Component	Material	Specification
Body	Cast Iron or Ductile Iron	ASTM A48, Class 40; ASTM A126, Class B; or ASTM A536, Grade 65-45-12
Exposed Body Capscrews, and Bolts and Nuts	Stainless Steel	ASTM A276, Type 316
Discs	Cast Iron	ASTM 126, Class B Stainless Steel 316

The rubber seat shall be an integral part of the valve body. Rubber seats fastened to the disc by any means are not allowed. Valves shall be Pratt Monoflange MKII or approved equal.

E. Ball Valves 2 Inches and Smaller: Ball valves, 2 inches and smaller, for water service shall be stainless steel, and shall be rated at a pressure of 300 psi WOG at a temperature of 150°F. Valves shall have plastic coated lever operators. Valves shall have full bore ports, screwed ends, and non-blowout stems. Materials of construction shall be as follows:

Component	Material	Specification
Body, Ball, Stem	Stainless Steel	Type 316, ASTM A276
Seat, Seals	Teflon	

Valves shall be Stockham Figure S-127, or approved equal.

F. Ball Valves 2-1/2 Inches to 6 Inches: Ball valves 2-1/2 inches to 6 inches shall be rated for a minimum working pressure of 150 psi. Valves shall have flanged ends. Materials of construction shall be as follows:

Component	Material	Specification
Body, Ball	Ductile Iron	ASTM A395, ASTM A445
Stem	Carbon Steel	ASTM A216, Grade WCB
Seat, seals	Teflon	

Valves shall be Jamesbury Style 150F, Powell Figure 4222T, or approved equal.

G. Lubricated Plug Valves 4 Inches and Smaller: Lubricated plug valves of sizes 4 inches and smaller shall have carbon steel bodies and plugs and shall be short pattern with bolted glands and resilient packing. Plug coating shall be Teflon, permanently bonded to the plug. Unless noted otherwise on the drawings, valve ends shall be flanged, with face-to-face dimensions conforming to ANSI B16.1, Class 125. Valves shall have a pressure rating of 200 psi WOG. Lubricate valves with manufacturer's recommended lubricant for cold water service. Valves shall be Nordstrom Figure 1925 or approved equal.

H. Lubricated Plug Valves 6 Inches Through 20 Inches Class 125: Lubricated plug valves of sizes 4 inches through 20 inches shall have cast iron (ASTM A126, Class B) bodies and plugs. Valves shall be of the regular pattern with bolted glands and resilient packing. Plug coating shall be Teflon, permanently bonded to the plug. Unless noted otherwise on the drawings, valve ends shall be flanged, with face-to-face dimensions conforming to ANSI B16.1, Class 125. Valve shall have a pressure rating of 200-psi WOG. Valves shall be enclosed worm gear operated and watertight for submerged service. Lubricate valves with the manufacturer's recommended lubricant for cold-water service. Valves shall be Rockwell Figure 169, Powell, or approved equal.

I. Eccentric Plug Valves, 4 Inches Through 12 Inches: Eccentric plug valves, 4 inches through 12 inches, shall be of the non-lubricated type. Minimum pressure rating shall be 175 psi. Unless noted otherwise on the drawings, ends shall be flanged, Class 125 per ANSI B16.1. Materials of construction shall be as follows:

Component	Material	Specification
Body	Cast Iron	ASTM A126, Class B
Plug Ductile Iron	Cast Iron	ASTM A126, Class B ASTM A536, Grade 65-45-12 Ni-Resist, ASTM A436

Plugs shall have neoprene facing to provide drip-tight shutoff. Valve body seats shall have a raised welded-in overlay of not less than 90 percent nickel. Packing shall be replaceable with valve body under full pressure and with valve in the fully open position. Plug shall be of the one-piece design. Valves shall be DeZurik Series 100, Figure 118, or approved equal.

J. Resilient Seated Gate Valves, 3 Inches Through 12 Inches: Resilient seated gate valves shall conform to AWWA 509 and the following requirements. Valves shall be designed for a minimum working pressure of 200 psi and shall be bubble-tight at that pressure. Valves shall have non-rising stems. Stem nuts shall be independent of the gate and shall be made of solid bronze. All internal working parts, including the stem, shall be all bronze containing not more than 2 percent aluminum or more than 7 percent zinc. Bronze shall be ASTM B62 (85-5-5-5) bronze, except that stem bronze shall have a minimum tensile strength of 60,000 psi, a minimum yield strength of 30,000 psi, and a minimum of 10 percent elongation in 2 inches. Materials of construction shall be as follows:

Component	Material	Specification
Body Operating Nut, Bonnet, Seal Plate	Cast Iron	ASTM A126, Class B

Gate	Cast Iron Ductile Iron	ASTM A126, Class B ASTM A536, Grade 65-45-12
Bonnet and Seal Plate Nuts and Bolts	Stainless Steel	ASTM A276, Type 316
O-Rings	Synthetic Rubber	ASTM D2000

Provide low friction, torque reduction thrust bearings both above and below the stem collar. Stuffing boxes shall be O-ring seal type with two rings located in stem above thrust collar. Each valve shall have a smooth unobstructed waterway free from any sediment pockets. Encapsulate gates in Buna-S rubber or nitrile elastomer. Valves shall be Clow RW, Mueller A2360, American AVK, American Flow Control AFC500, and M&H Style 4067, or approved equal.

K. Check Valves 4 Inches and Larger:

1. Swing Check Valves: Swing check valves shall conform to AWWA C508, and shall be iron body, bronze mounted with the following materials of construction:

Component	Material	Specification
Disc or Clapper Seat Ring, Valve Body Seat Ring	Bronze or Brass	ASTM B62, B16, or B584 (alloys C84400 or C87600)
Body and Cap	Cast Iron	ASTM A126, Class B
Disc and Hinge or Arm	Cast Iron or Bronze	ASTM A126, Class B ASTM B62
Hinge Pin	Stainless Steel	ASTM A276, Type 303, 304 or 410
Cover Bolts and Nuts	Stainless Steel	ASTM A193, Grade B8M ASTM A194, Grade 8M

Ends shall be flanged, Class 125, ANSI B16.1. Design valves for a minimum working pressure of 150 psi. Equip valve with outside lever and spring. Valves shall be Clow f-5340, M&H Style 259, or approved equal.

2. Silent Check Valves, Class 150: Design silent check valves to be installed between the flanges of the adjoining pipe. Equip valves with a spring mechanism to provide for non-slam closure of the valve without backflow, in any position, and shall not be dependent on gravity or backflow for closure. Materials of construction shall be as follows.

Component	Material	Specification
Body	Cast Iron or Ductile Iron	ASTM A 126, Class B; or ASTM A 536, Grade 65-45-12
Plug and Seat Spring, Pin, Stops	Bronze Stainless Steel	ASTM B 584, AISI Type 316
Sealing Element	Buna-N	

Valves shall be APCO Series 600, or approved equal.

L. Solenoid Valves 1-1/2 Inches and Smaller: Solenoid valves of sizes 1/4-inch through 1½ inches for water and air service shall have forged brass (Alloy C23000) or bronze (ASTM B 62) bodies with Teflon main seats. Internal plunger, core tube, plunger spring, and cage assembly shall be stainless steel (Types 302, 304, or 305). Solenoid enclosures shall be NEMA Type IV. Valve actuators shall be 120-volt AC. Seals shall be Teflon. Valves shall have a maximum operating pressure and a maximum differential pressure of 250 psi. Energize solenoid valves to open or close, as required. Valves shall be ASCO "Red Hat", or approved equal.

M. Tapping Valves: Tapping valves shall conform with the requirements for gate valves 3 inches and larger. Valve ends shall be flanged, and the flange at one end shall have slotted boltholes to fit standard tapping machines. Seat rings shall be oversized to permit the use of full-size cutters. Tapping valves shall be Mueller, Kennedy, or approved equal.

N. Tapping Sleeves: Tapping sleeves shall be cast iron or steel. Cast iron tapping sleeves shall be mechanical joint. Steel tapping sleeves shall be epoxy-coated in accordance with the manufacturer's recommendation. Gaskets shall be Buna-N rubber with a wide cross section. Bolts, nuts, and washers shall be type 316 stainless steel. Tapping sleeves shall be Clow, Kennedy, Koppl CN-120 (with 1/4-inch wall thickness), Koppl AS-150, Mueller, Smith Blair CC-622, or approved equal.

O. Detector Check Valves: Detector check valves shall have flanged ends conforming to ANSI B16.1, Class 125. Pressure test valves to twice design working pressure. Valve casing shall be hot-dipped galvanized and body shall be tapped to accept by-pass meter piping. Materials of construction shall be as follows:

Component	Material	Specification
Body, Bonnet	Cast Iron	ASTM B126 Class B
Bonnet Bolts	Stainless Steel	ASTM A276 Type 304
Hinge Pin (Shaft)	Stainless Steel	ASTM A276 Type 304 or 316
Clapper	Bronze	ASTM B62
Clapper Seat Ring	Bronze (Tinned)	ASTM B62
Clapper Seal	Rubber	
Weight	Lead	

The mainline valve shall automatically open, permitting unrestricted flow, when the pressure loss through the by-pass meter is approximately 1.5 psi. Valves shall be Hersey EDC II, Grinnel, Mueller A-2133-6, or approved equal.

P. Corporation Stops: Corporation stops shall be manufactured of bronze conforming to ASTM B62. The inlet fitting shall be a male iron pipe thread when used with a saddle and the outlet connection shall be a flare type unless otherwise specified.

PART 3 - EXECUTION

3.1 JOINTS

A. Flanged Joints: Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. If flanges leak under pressure testing, loosen or remove nuts and bolts, reseat or replace the gasket; reinstall or re-tighten the bolts and nuts; and re-test the joint. Joints shall be watertight.

B. Threaded Joints: Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.

3.2 VALVE INSTALLATION

A. Valves in Horizontal Piping: Unless otherwise indicated on the drawings, install valves in horizontal runs of pipe having centerline elevations 4'-6", or less, above the floor, with their operating stems vertical. Install valves in horizontal runs of pipe having centerline elevations between 4'-6" and 6'-9" above the floor with their operating stems horizontal.

B. Valves in Vertical Piping: Install valves on vertical runs of pipe that are next to walls with their stems horizontal, away from the wall. Install valves on vertical runs of pipe that are not located next to walls with their stems horizontal, oriented to facilitate valve operation.
C. Buried Valves: Wrap buried valves with two layers of 8-mil polyethylene wrap per AWWA C105.
D. Valve Supports: Concrete supports are not required for valves bolted to flanged pipe or fittings.

3.3 VALVE BOXES

Firmly support valve boxes and keep them centered and plumb the valve over the operating nut of the valve. Do not use beveled sections of pipe at the top of the valve extension pipe. The top cut shall be square, and machine made. In new tracts, and where pavement has not been placed, the valve extension risers for "key valves" shall extend well above the ground level to permit ease of location in case of emergency shutoffs. The final valve box elevation shall be flush with the finished pavement surface or at the elevation noted on the plans.

3.4 TAPPING SLEEVES

Install tapping sleeves in accordance with the manufacturer's instructions. Thoroughly clean the pipe barrel with a wire brush to provide a smooth, hard surface for the sleeve. Support the sleeve independently of the pipe during the tapping operation. The sleeve shall be pressure-tested in the presence of the City prior to tapping. Provide thrust blocks at the tapping sleeve.

3.5 VALVE LEAKAGE TESTING

Test valves for leakage at the same time that the connecting pipelines are tested.

END OF SECTION

SECTION 33 13 00

CHLORINATION OF WATER MAINS FOR DISINFECTION

PART 1 - GENERAL

1.1 DESCRIPTION

This Section describes the disinfection of potable water mains, services, appurtenances, and connections by chlorination, in accordance with AWWA C601 and as specified herein.

1.2 JOB CONDITIONS

A. Discharge of chlorinated water into watercourses or surface waters is regulated by the National Pollutant Discharge Elimination System (NPDES).

B. The rate of flow and locations of discharges shall be scheduled in advance and coordination with the Owner.

C. Potable water shall be used for chlorination. The water will be supplied from the onsite temporary tank with a chlorine concentration of 1.0mg/l to 2.0 mg/L.

D. Perform chlorination prior to hydrostatic testing for pipelines having a diameter of 8 inches and larger. See Subsection 3.1 of this Section for concurrent testing of smaller diameter pipelines.

PART 2 - PRODUCTS

2.1 LIQUID CHLORINE SOLUTION

Liquid chlorine solution shall be in accordance with the requirements of ANSI/AWWA B301 and shall be injected with a solution feed chlorinator and a water booster pump.

2.2 CALCIUM HYPOCHLORITE (DRY)

Calcium Hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300 and shall be dissolved in water to a known concentration in a container and pumped into the pipeline at a measured rate.

2.3 SODIUM HYPOCHLORITE (SOLUTION)

Sodium Hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300 and shall be diluted in water to desired concentration and pumped into the pipeline at a measured rate.

2.4 CHLORINE RESIDUAL TEST KIT

For measuring chlorine concentration, use a medium range, drop count, titration kit or an orthotolidine indicator comparator with wide range color discs. The kit shall be capable of

determining chlorine concentration in the range 1.0 to 25 mg/L. Test kits shall be Hach Chemical, Hellige, or approved equal. Maintain an adequate number of kits in good working order and available for immediate test of residuals at points of sampling.

PART 3 - EXECUTION

3.1 PIPELINES

A. General: Before placing them into service, chlorinate all pipelines and appurtenances. Disinfect pipelines with a diameter of 10 inches or less by direct chlorine solution injection. Disinfect pipelines with a diameter of 12 inches and larger by direct chlorine solution injection. Disinfect steel pipelines by direct chlorine solution injection. Disinfect steel pipelines by direct chlorine solution injection. Bacteriological testing after disinfection will be performed by the Owner.

B. Chlorination Contractor: Chlorination shall be performed by a certified chlorination and testing contractor. Chlorination shall be in accordance with the instructions of the chlorinator manufacturer.

C. Groundwater: In the event groundwater is encountered and it is impossible to prevent its entrance into the mains, or the mains are not free from dirt, thoroughly flush them prior to disinfection. Disinfection shall be by direct chlorine solution injection.

D. Services: Tightly shut off every service connection served by a main being disinfected at the curb stop before water is applied to the main. Care shall be taken to expel all air from the main and services during the filling operation.

E. Chlorine Solution Injection by the Continuous Feed Method:

1. Apply chlorine solution at the beginning of the section to be chlorinated and inject through a corporation stop, a hydrant, or other approved connection to ensure treatment of the entire system being disinfected. Install all required corporation stops and other plumbing materials necessary for chlorination or flushing of the main.

2. Introduce potable water into the pipeline at a constant measured rate. Inject chlorine solution into the potable feed water at a measured rate. Proportion the two rates so that the chlorine concentration in the pipeline is maintained at a minimum to maximum concentration of 50 mg/L to 100 mg/L, with a chlorine residual of 25 mg/L after 24 hours in the pipe. Check the concentration at points downstream of the injection point and at each end of the pipe periodically during the filling to ascertain that sufficient chlorine is being added and has reached all sections of the pipe.

F. Disinfection of Valves and Appurtenances: During the period that the chlorine solution or slug is in the section of pipeline, open and close valves to obtain a chlorine residual at hydrants and other pipeline appurtenances. Care shall be taken to ensure that no chlorinated water enters any active pipeline. The chlorine concentration shall not exceed 100 mg/l in copper tubing or in contact with copper.

G. Concurrent Testing (for Pipelines with Diameter of 10 inches or Less): Disinfecting mains and appurtenances and hydrostatic testing may run concurrently for the required 24-hour test period. In the event there is leakage and repairs are necessary, repeat disinfection of the pipeline by injection of chlorine solution into the line as provided in this Section.

H. Confirmation of Residual: After the chlorine solution applied by the continuous feed method has been retained in the pipeline for 24 hours, take samples at air valves and other points of access to confirm that a chlorine residual of 25 mg/L minimum exists along the pipeline. With the slug method, take samples as the slug passes each access point and as it leaves the pipeline in order to confirm that a chlorine residual of 25 mg/L minimum is present.

I. Bacteriologic Tests: Collect sample on two consecutive days at each air-release valve or for each mile where valve intervals are greater and deliver to the Engineer within six hours. The Owner will perform a bacteriologic quality test to demonstrate the absence of coliform organisms in each separate section of the pipeline after chlorination and refilling.

J. Repetition of Procedure: If the initial chlorination fails to produce required residuals and bacteriologic tests, repeat chlorination and until satisfactory results are obtained.

K. Pipeline Flushing: After confirming the chlorine residual, flush excess chlorine solution from the pipeline until the chlorine concentration in the water leaving the pipe is within 1.0 to 2.0 mg/L of the replacement water. The flushed water shall be de-chlorinated prior to disposal in the drain.

L. Test Facility Removal: After satisfactory disinfection, replace air valves, restore the pipe coating and remove temporary disinfection and test facilities.

M. Connections to Existing System: Where connections are to be made to an existing potable water system, swab or spray the interior surfaces of all pipe and fittings used in making the connections shall be with a one percent hypochlorite solution before they are installed. Start thorough flushing as soon as the connection is completed and continue until all discolored water is eliminated.

END OF SECTION

SECTION 33 41 00

STORM DRAIN IMPROVEMENTS AND UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.01 SECTION REQUIREMENTS

A. Perform site survey, research public utility records and/or pothole as necessary to verify existing wet and dry utility locations. Contact utility locating service for area where project is located.

B. Drainage design shall conform to local requirements.

1.02 ACTION SUBMITTALS

A. No action submittals are necessary.

1.03 INFORMATIONAL SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.

2. Catch basins and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.

3. Trench drains: include plans, elevations, sections, details, frames, covers, and grates

C. Field quality-control reports.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. Polyethylene (PE) large diameter profile wall pipe conforming to ASTM F894, ASTM F2306, or Polyvinylchloride (PVC) large diameter profile wall pipe conforming to ASTM F794 will be acceptable.

B. The minimum allowable pipe size for privately maintained systems is 12 inches.

2.02 MANHOLES, DRAIN INLETS, AND TRENCH DRAINS

A. Precast Concrete Manholes and Drain Inlets: Meeting local requirements and conform to ASTM C478. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall be smoothed to a uniform surface on both

interior and exterior of the structure. Traffic rated structures required as noted on drawings.

B. Manhole Frames and Covers: Cast gray iron, ASTM A48, Class 35B; cast ductile iron, ASTM A536, Grade 65-45-12; or cast aluminum, ASTM B26, Alloy 356.OT6. Include indented top design with lettering cast into cover. Traffic rated frames and covers required as noted on drawings.

C. Trench drains will be a manufactures trench drain system. Trench drain systems shall be pre-engineered, manufactures systems that conforms to the design loading requirements of AASHTO H-20.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Verify existing elevations prior to extensive excavating and notify the State of any discrepancies. Contractor shall be liable for any premature construction, which must be modified due to unforeseen existing conditions.

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. Variation from the prescribed grade and alignment shall not exceed one-tenth (0.10) foot, and the rate of departure from, or return to, the established grade or alignment shall be not more than one!1) inch in ten (10) feet, unless approved by the Engineer. No deviation from grade shall cause a depression in the invert that could retain fluids or solids.

C. Installation of pipe bedding and backfill shall be in accordance with Section 31 23 33 of these specifications.

D. Install piping with 24-inch minimum cover. Minimum cover required within the street Right-of-Way shall be 30 inches or per local standards, whichever is more stringent.

E. Use manholes or drainage inlets for changes in direction or pipe size.

F. Install PVC pipe and gasketed fittings with gaskets according to ASTM D2321.

G. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.

END OF SECTION