



CITY OF CRESCENT CITY PUBLIC WORKS DEPARTMENT

NOTICE INVITING SEALED BIDS, SPECIAL PROVISIONS, PROPOSAL AND CONTRACT

FRONT STREET GATEWAY IMPROVEMENTS PHASE 1C RE-ISSUE

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 2025-1002.33

Bids Open: August 11, 2025

Dated: July 14, 2025

IMPORTANT SPECIAL NOTICES

The Bidder's attention is directed to the following:

- An addenda will be issued to include all Section 3 requirements required for the use of Federal Funding for a Community Development Block Grant. This addenda will be issued to allow time for the solicitation of Minority Business Enterprises and Women-owned Business Enterprises, as well as other contractor requirements. These documents refer to an Attachment C for this information. Attachment C will be included in this future addenda.
- There is a Base Bid with 116 bid items listed. This bid item total includes reserved bid items and not in contract (NIC) bid items. There are no Alternatives. A bid must be submitted for **all** bid items. The Contract award will be based on the lowest Base Bid.
- There are two sets of Plans for this project.
 - 2025 City of Crescent City Front Street Improvements Play to L Street
 - Crescent City Cultural Gateways and Beautification Project
- An on-site disposal site for clean soil disposal of excavated materials suitable for future fill construction as allowable per Coastal Development Permit. Per CDP this disposal site will be limited to permissible dates, primarily between April 15th and October 15th, 2026. Grading and erosion control for this area must be installed prior to October 15th, 2026.
- All work south of the Front Street back of sidewalk is subject to the requirement of the Coastal Development Permit, included within bid documents.

The Engineering Cost Estimate is \$4,750,000. This value excludes the cost of the Tolowa Cultural Trail under a separate contract and the cost of the City supplied precast drainage structures as indicated in their respective bid items.

Changes to the Plans

1. "2025.06.11 Front Street Improvements Play to L Streets Plans.pdf" Sheet S-1 corrects the 25.8 LF of 6" PVC to a 4" PVC lateral and cleanout at station 3+60.85 and a 26.2LF 6" PVC lateral to a 4" PVC lateral and cleanout at station 3+56.86.
2. Clarifying Sheet W-1. The City will supply all domestic and irrigation meters.

Clarifications to this projects specifications and plan sheets

1. Clean compactable earth spoils from either the earthwork on Front Street or the grading excavation required for the Gateway project may be placed at the designated soil waste area. No asphalt, concrete, tsunami debris, rocks larger than 6 inches in diameter, or organic materials in excess of 3 inches in diameter may be placed at this location.

2. For exterior wall demolition limits to Porte Cochere, please reference sheet L3.01, Note 31, and Sheet A2.11, Detail 1, limiting the first floor demolition to a single panel to be sawcut and removed to an overall width of 13 feet, five inches. This the only panel in the existing exterior of the Porte Cochere concrete wall to be removed.
3. Library parking lot to remain open for the duration of this project.
4. 2nd Street from K Street to L Street to remain open for the duration of the project.
5. The Chamber of Commerce offices and visitor center will remain open and be ADA compliant for the duration of the project. Any additional work to accommodate their access will be considered to be a changed condition and will be paid for as a Change Order by the City.
6. The Door Replacement shown on Sheet A2.12 is not a part of this Base Bid. This work is necessary to the contract to comply with the Second Floor Life and Safety Plan. But as this detail does not provide enough specific information to fairly bid the work, the City elects to delete all the work shown on Sheet A2.12, including the localized cross-decking handrail. This deletion will be a scope reduction to Bid Item 116, "Discovery Center Renovations". This work will be included in a future Change Order upon selection of the successful bidding contractor.
7. No cross sections are available for the roadwork other than the typical plan sheets provided.
8. The City will not be providing the Survey for this construction project.
9. The water from dewatered excavations be dumped in the sewer system, but the City may have to restrict this disposal method based on seasonal precipitation and ground water intrusion into the sewer system.
10. Sheet L4.01 and Sheet L4.05 Details show the locations of these items. There are a total of 16 seat wall/step lights shown, 8 in the stair treads, 6 in the curved seat walls, and 2 in the seat wall facing the stairs.
11. The point of connection for the electrical elements included in the Gateway set of plans has yet to be determined. As addressed in Bid Item 108, all source wiring and conduits to electrical bid items are not included in the base bid at this time. All costs associated with this are NOT to be included in the base bid as currently shown. Once electrical drawings are available they will be issued via addendum or will be a part of a future change order.

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.

END OF SECTION

CRESCENT CITY
FRONT STREET GATEWAY IMPROVEMENTS PHASE 1C
DOCUMENT 00 01 10

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END OF SECTION

SECTION 00 10 00

INVITATION TO BID

FRONT STREET GATEWAY IMPROVEMENTS PHASE 1C RE-ISSUE CONTRACT # 2025-1002.33

The previously issued “FRONT STREET GATEWAY IMPROVEMENTS PHASE 1C” construction project requesting Invitations to Bid has been cancelled due to material changes in the Scope and bidding requirements. This Invitation to Bid under the new project named “FRONT STREET GATEWAY IMPROVEMENTS PHASE 1C RE-ISSUE” is the reissuance of a similar project, including revised plan sets and bidding requirements. This Invitation to Bid is available to all potential qualified bidders. There is a mandatory pre-bid walkthrough required of all contractors seeking to bid this project.

Sealed bids for the construction of the FRONT STREET GATEWAY IMPROVEMENTS PHASE 1C RE-ISSUE will be received by the Owner, the City of Crescent City, at the Crescent City Public Works Department office until 2:00 PM on August 11, 2025. The bids will be opened publicly and read aloud at 2:00 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 95531

Bids must be labeled "Bid for the 'FRONT STREET GATEWAY IMPROVEMENTS PHASE 1C RE-ISSUE 2025-1002.33'".

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

This project includes street and utility improvements on Front Street between Play and L Street, and K Street between Front Street and Second Street. This project also includes Beachfront Park Gateway improvements requiring excavation and grading, pathways, landscaping, and cultural and art element installations on the south side of Front Street between Play Street and L Street.

The street work includes the furnishing of the labor, materials, and equipment for the installation of a replacement storm drain system, replacement water mains, fire hydrants, valving and services, sewer main installation, gas line relocation, irrigation piping and controls, curbs, gutters, sidewalks, and pedestrian crossings, a reconstructed road section for Front and K Streets, and new street lighting fixtures, all in accordance with the drawings and specifications.

The Gateway improvements include demolition, earthwork and grading around the Cultural Center on Front Street, new concrete pathways for building access and a cultural trail, decorative concrete elements and concrete retaining/seat walls, irrigation piping and controls, landscaping, area lighting, installation of kiosks with informational and cultural signage, and the construction of foundations for Gateway signage as well as cultural trail structural elements.

The project manual may be inspected at the following locations:

City of Crescent City
Public Works Department
377 J Street
Crescent City CA 95531
(707) 464-9506

Humboldt Builders Exchange
624 C Street
Eureka, CA 95501
(707) 442-3708
Shasta Builders Exchange
2985 Innsbruck Drive
Redding, CA 96003
(530) 221-5556

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

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

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

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

Full-size and half-size copies of the project manual may be obtained from the City of Crescent City Public Works Department located at 377 J Street, Crescent City, CA 95531,

(707) 464-9506. One set of full-size plans will be made available at the City office to each bidding contractor or may be obtained on-line. Specifications should be downloaded.

A mandatory pre-bid conference will be held at the City's Cultural Center located at 1001 Front Street, Crescent City CA 95531 on July 30, 2025 at 10:30 am.

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 also be required to furnish performance and payment bonds, each in an amount not less than one hundred percent (100%) of the contract price in the form provided herein.

At the successful Bidder's option, securities may be substituted for the required retention, in accordance with the provisions of Section 22300 of the 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. The Owner also reserves the right to waive any immaterial deviations in any bid and to delete items listed in the bid.

Bids received after the time established for receiving bids will not be considered and will be returned unopened. Except as provided in paragraph 00 20 00-1.04(A), no bidder may withdraw his or her 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.

This is a Public Works Project subject to the rate of prevailing wages as established by the California Department of Industrial Relations and the U.S. Department of Labor. Bidders are notified that the higher of either the Davis-Bacon or the State prevailing wage rate shall apply.

This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations and the U.S. Department of Labor. Full original payrolls must be provided to the City on the WH-347 form as provided in the Labor Compliance Book as well as file or hard copies of DIR weekly payroll reporting.

Bidders are hereby notified that pursuant to Section 1773 et seq. of the California Labor Code, 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. Owner has also provided Davis-Bacon wage rates. 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 agreement is for services related to a project that is subject to the Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act ("IIJA"), Pub. L. 177-58. Absent an approved waiver, all iron, steel, manufactured products, and construction materials used in this project must be produced in the United States, as further outlined by the Office of Management and Budget's Memorandum M-22-11, Initial Implementation Guidance on Application of Buy America Preference in Federal Financial Assistance Programs for Infrastructure, April 18, 2022.

This project is in-part funded through a Community Development Block Grant (CDGB) and therefore compliance with "SECTION 3" IS REQUIRED. Compliance with the provisions of Section 3 of the HUD Act of 1968, as amended, and as implemented by the regulations set forth in 24 CFR Part 75, and all applicable rules and orders issued hereunder prior to the execution of this Agreement, are to be a condition of this contract and binding upon the Contractor and any subcontractors.

The Contractor further agrees to ensure that opportunities for training and employment arising in connection with a housing rehabilitation, housing construction, or other public construction project are given to low- and very low-income persons residing within the metropolitan area in which the CDBG-funded project is located; where feasible, priority should be given to low- and very low-income persons within the service area of the project or the neighborhood in which the project is located, and to low- and very low-income participants in other HUD programs; and award contracts.

Date: 7-14-25

By:
David Yeager
Public Works Director

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 should plan to inspect the site of the work during the pre-bid meeting and can schedule additional time by special arrangement with the Owner.

Entrance by bidders to the site of the work for purposes of making exploratory excavations will be by special arrangement with the Owner and under conditions established by the Owner. If, during the course of his or her examination, a bidder finds facts or conditions which appear to be in conflict with the letter or spirit of the project manual, he or she may apply to the Owner, in writing, for additional information and explanation before submitting a 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 his or her 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 he or she has 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 his 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 David Yeager, Director of Public Works, dyeager@crescentcity.org, 377 J Street, Crescent City, CA 95531 (707) 464-9506. 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 the 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.

Reference information has been made available on the City's website that includes information used by the Engineer to prepare the Contract. The information provided on the website is for use by bidder during preparation of the bid and execution of the Contract. The Owner disclaims responsibility for the interpretation by bidders of the reference information. In some cases, the information was prepared for design purposes and is not intended to provide all the information required by the bidder to tender a bid, construct the system, and provide start up and commissioning services. Reference information is available on the City's website https://www.crescentcity.org/rfp_bid.html and includes:

- Plans
- Specifications
- Appendices
 - Appendix A – SHN Geotechnical Report
 - Appendix B – LACO Geotechnical Report
 - Appendix C – Busch Geotechnical Report
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- Attachment A: Applicable Current Federal Prevailing Wage Rates
- Attachment B: State Prevailing Wage Rates
- Attachment C: Section 3 and CDBG Labor Compliance Program

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 the management, superintendence, labor and services, and bonds. Bid prices must include allowance for federal, state, and local taxes. 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 or her 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. Any person signing the bid must certify that they are duly authorized to execute contracts on behalf of the bidder.

4. **BID IRREGULARITIES:** Each bid and the information requested, bound in the project manual, must 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 business days after the opening of bids, a bidder may withdraw his or her bid, if he or she 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 must provide the name of the manufacturer of the equipment to be provided for all major equipment. Only one manufacturer may 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 must 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 must

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 must select and submit for review equipment of another manufacturer which does meet the contract, and no increase in the total amount of the contract will 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 must 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 will not be used in determining the basis of award. Selection of any offered alternate or substitution will 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.

Any request for substitute or "or equal" shall include the Manufacturer's Certification of compliance with the Build America, Buy America Act (BABAA) requirements mandated by Title IX of the Infrastructure Investment and Jobs Act ("IIJA"), Pub. L. 177-58.

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 bond 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 subcontract portions of the work. (Note: All subcontractors must be listed no matter how small the amount of the subcontract). For the purpose 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 unresponsive and may be grounds for rejection of the bid.

E. HUD SECTION 3 DOCUMENTATION:

This project is partially funded by the State Department of Housing and Community Development (HCD) and the Federal Department of Housing and Urban Development (HUD) and is subject to Section 3 of the Housing and Urban Development Act of 1968 as amended, 12 U.S.C. 1702 u (Section 3).

Failure to complete and provide these forms could result in the bid being considered unresponsive. Bidders must provide completed Section 3 documents as provided in this document.

- Bidder's Proposed Section 3 Contracts/Subcontracts
- Bidder's Section 3 Proposed New Hires

F. HUD SECTION 3 COMPLIANCE

1. Compliance with the provisions of Section 3 of the HUD Act of 1968, as amended, and as implemented by the regulations set forth in 24 CFR Part 75, and all applicable rules and orders issued hereunder prior to the execution of this Agreement, are a condition of this contract and binding upon the Contractor and any subcontractors. Failure to fulfill these requirements will subject the Owner, the Contractor and any subcontractors, their successors and assigns, to those sanctions specified by the Agreement through which Federal assistance is provided. The Contractor certifies and agrees that no contractual or other disability exists that would prevent compliance with these requirements.

2. The Contractor further agrees to comply with these "Section 3" requirements and to include the following language in all subcontracts executed under this Agreement:

“The work to be performed under this Agreement is a project assisted under a program providing direct Federal financial assistance from HUD and is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended (12 U.S.C. 1701 et seq.). Section 3 requires that to the greatest extent feasible opportunities for training and employment be given to low- and very low-income residents of the project area, and that contracts for work in connection with the project be awarded to business concerns that provide economic opportunities for low- and very low-income persons residing in the metropolitan area in which the project is located.”

3. The Contractor further agrees to ensure that opportunities for training and employment arising in connection with a housing rehabilitation (including reduction and abatement of lead-based paint hazards), housing construction, or other public construction project are given to low- and very low-income persons residing within the metropolitan area in which the CDBG-funded project is located; where feasible, priority should be given to low- and very low-income persons within the service area of the project or the neighborhood in which the project is located, and to low- and very low-income participants in other HUD programs; and award contracts for work undertaken in connection with a housing rehabilitation (including reduction and abatement of lead-based paint hazards), housing construction, or other public construction project to business concerns that provide economic opportunities for low- and very low-income persons residing within the metropolitan area in which the CDBG-funded project is located; where feasible, priority should be given to business concerns that provide economic opportunities to low- and very low-income residents within the service area or the neighborhood in which the project is located, and to low- and very low-income participants in other HUD programs.

4. The Contractor certifies and agrees that no contractual or other legal incapacity exists that would prevent compliance with these requirements.

a. NOTIFICATIONS: The Contractor agrees to send to each labor organization or representative of workers with which it has a collective bargaining agreement or other contract or understanding, if any, a notice advising said labor organization or worker's representative of its commitments under this Section 3 clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment or training.

b. SUBCONTRACTS: The Contractor will include this Section 3 clause in every subcontract and will take appropriate action pursuant to the subcontract upon a finding that the subcontractor is in violation of regulations issued by the grantor agency. Contractor will not subcontract with any entity where it has notice or knowledge that the latter has been found in violation of regulations under 24 CFR Part 75 and will not let any subcontract unless the entity has first provided it with a preliminary statement of ability to comply with the requirements of these regulations.

G. SMALL AND MINORITY BUSINESSES, WOMEN'S BUSINESS ENTERPRISES AND LABOR SUPPLUS AREA FIRMS:

If subcontractors are to be used, then Contractor must take the following affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible:

1. Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
2. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
3. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;
4. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises; and
5. Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.

1.05 BIDDER'S CERTIFICATIONS

A. QUALIFICATION OF BIDDER:

Bidder must certify that he or she 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 or she 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 or she 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.

D. ANTI-LOBBYING CERTIFICATION:

The bidder shall require that the language of this certification be included in all contracts or subcontracts entered into in connection with this project and that all subrecipients shall certify and disclose accordingly. The anti-lobbying certification must be executed by the bidder on the form provided in Section 00 45 21 of this project manual.

E. DEBARMENT AND SUSPENSION CERTIFICATION.

Contractor's signature affixed to the BID form shall constitute a certification under penalty of perjury under the laws of the State of California, that Contractor or any person associated therewith in the capacity of owner, partner, director, officer or manager:

6. Is not currently under suspension, debarment, voluntary exclusion, or determination of ineligibility by any federal agency;
7. Has not been suspended, debarred, voluntarily excluded, or determined ineligible by any federal agency within the past three (3) years;
8. Does not have a proposed debarment pending; and
9. Has not been indicted, convicted, or had a civil judgment rendered against it by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past three (3) years.

Any exceptions to this certification must be disclosed to the Owner. Exceptions will not necessarily result in denial of recommendation for award but will be considered in determining responsibility. Disclosures must indicate the party to whom the exceptions apply, the initiating agency, and the dates of agency action.

Exceptions to the Federal Government excluded parties (<https://sam.gov/content/home>) maintained by the U.S. General Services Administration are to be determined by FHWA.

F. IRAN CONTRACTING AND STATE OF CALIFORNIA EXECUTIVE ORDER N-6-22:

Bidders must not be on the most current DGS list of Entities Prohibited from Contracting with Public Entities in California per the Iran Contracting Act, 2010, before the Agreement has been executed, unless the bidder is exempted from the certification requirement by Public Contract Code Section 2205(c) or (d). If claiming an exemption, the bidder shall provide written evidence that supports an exemption under Public Contract Code Section 2203(c) or (d) before execution of the contract. Additionally, and to the extent applicable, the Owner shall adhere to State of California Executive Order N-6-22, issued on March 4, 2022, with regard to bidders.

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 that are incomplete, obscure, or irregular; bids that omit a bid on any one or more items for which bids are required; bids that 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 responsible bidder that submits a responsive bid.

1.10 BASIS OF AWARD

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

The Contract will be awarded, subject other provisions herein, to the Bidder submitting the lowest Base Bid.

If, at any time the contract is to be awarded, the total of the lowest acceptable bid 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 bids, and to waive any informalities and immaterial irregularities in said bids, delete certain items from the bid and postpone the award decision date to one that is mutually agreeable to the Owner and the lowest responsible bidder.

1.11 EXECUTION OF CONTRACT

Within 10 calendar days after receiving written notice of the award of the contract, the 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 evidence of insurance. After execution by the Owner, one copy of the agreement will be returned to the Contractor.

1.12 LABOR REQUIREMENTS

A. PREVAILING WAGE RATES AND APPRENTICESHIPS:

Employees of the Contractor and all subcontractors engaged on this project shall be compensated at or above the current highest prevailing wage rate determination issued by the Director of Industrial Relations and the Department of Labor. Copies of the applicable current **Federal prevailing wage rates** are provided in **Attachment A** to the project specifications. State prevailing wage rates are to be obtained from the Department of Industrial Relation website and are also provided in **Attachment B** to the project specifications. The Contractor and all subcontractors shall **pay the higher wage rate** in each craft, classification, or worker type. Wages to be paid laborers and mechanics on this project must be no less than the minimum either as determined by the Secretary of Labor or as determined by the Director of Industrial Relations in accordance with California Labor Code, Sections 1770, 1773 and 1773.1. Copies of the applicable prevailing wage rates must be posted at the work site.

Compliance with Section 1777.5 of the Labor Code, dealing with the employment of properly registered apprentices in all applicable occupations involved in the construction of this project, shall remain the responsibility of the Contractor. No apprentice may be placed on the job without prior submission of apprenticeship registration, allowable pay rates and approval of Owner's Representative. Failure to obtain prior approval will require payment of journeyman wages until approval is received. All apprentices must be registered with both the Department of Labor and the Department of Industrial Relations. All apprentices must be registered with both the Department of Labor and the Department of Industrial Relations.

B. SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION:

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

C. EMPLOYMENT PERMITS:

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

1.13 SOIL INFORMATION

Subsoil investigations have been conducted at the site of the work, and the corresponding reports are included as a reference document available on the City's website. Soil investigations were conducted for design purposes. The data shown in the reports are for subsurface conditions found at the time of the investigation.

The Owner disclaims responsibility for the interpretation by bidders of data, such as projecting or extrapolating from the test holes to other locations on the site of the work soil bearing values and profiles, soil stability and the presence, level, and extent of underground water for subsurface conditions during construction operations.

1.14 SHEETING, SHORING AND BRACING

In accordance with the provisions of Section 6707 of the California Labor Code, each bidder must list, in the bid item indicated, the amount included in his 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 is directed to refer to General Conditions paragraph 00 72 00-2.04 K for sales and use tax requirements for this project.

1.17 BID PROTEST PROCEDURES

Crescent City Municipal Code Chapter 14.24 Bid Protest Procedures

14.24.010 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 bid or proposal is referred to as a “bid.” (Ord. 808 § 2, 2019)

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 bid protests. A bidder may not rely on the bid protest submitted by another bidder but must timely pursue its own protest. (Ord. 808 § 2, 2019)

14.24.030 Bid protest deadline.

Any bid protest must be in writing and received by the city before five 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. (Ord. 808 § 2, 2019)

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. (Ord. 808 § 2, 2019)

14.24.050 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 the city before five 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. (Ord. 808 § 2, 2019)

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. (Ord. 808 § 2, 2019)

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. (Ord. 808 § 2, 2019)

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 Encroachment Permit (fee waived)
- B. Crescent City Business License
- C. General Permit for Storm Discharges Associated with Construction and Land Disturbance Activities (City to pay fees)
- D. Coastal Development Permit
- E. 401 Water Quality Permit
- F. 404 Army Corps of Engineers
- G. Other permits as required by State and Federal laws, rules and regulations.

PART 2 – PRODUCTS (NOT USED)

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 he or she has have received and examined the project manual entitled "FRONT STREET GATEWAY IMPROVEMENTS PHASE 1C - REISSUE" 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 of the project at the prices and on the terms and conditions herein contained.

The undersigned 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, specifically including Attachment C – CDBG Labor Compliance and Section 3 requirements.

The undersigned also 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
	Section 3 Requirements (Contractor, Subcontractor, and New Hires)
	MBE/WBE Outreach documentation (Good Faith Effort) will be required from low bidder.

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

Attached is a bid guaranty bond duly completed by a guaranty company authorized to carry on business in the State of California in the amount of at least ten (10) percent of the total amount of our bid, or alternatively, there is attached a certified or cashier's check payable to the Owner in the amount of at least ten (10) percent of the total amount of our bid.

By submitting this bid, I, the undersigned, verify that Contractor is not listed on the governmentwide exclusions list in the System for Award Management (SAM).

Bidder is familiar with all laws and regulations that may affect cost, progress, and performance of the work, including BABAA requirements.

If the bid is accepted, I, the undersigned, certify that I have authority 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.

I, the undersigned, further agree, that if the bid is accepted and a contract for performance of the work is entered into with the Owner, to so plan the work and to prosecute it with such diligence that the work will be completed within the time stipulated. It is expressly understood that time is of the essence.

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

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 – July 14, 2025**

PROJECT IDENTIFICATION: FRONT STREET GATEWAY IMPROVEMENTS
PHASE 1C - REISSUE

THE BID IS SUBMITTED TO: City of Crescent City

BASE BID ITEMS

ITEM NO.	Plan Set	ITEM DESCRIPTION	UNIT	QTY.	UNIT PRICE	TOTAL PRICE
1	FR	Mobilization	LS	1		
2	FR	SWPP Plan and Reporting	LS	1		
3	FR	Water Pollution Prevention BMPs	LS	1		
4	FR	Traffic Control	LS	1		
5	FR	2x CMS Boards	LS	1		
6	FR	Sheeting, Shoring, Bracing	LS	1		
7	FR	Quality Control	LS	1		
8	FR	Material Testing	LS	1		
9	FR	Demolition	LS	1		
10	FR	Excavation for Road & Walks	CY	3,096		
11	FR	Aggregate Base for paved section	CY	990		
12	FR	Hot Mix Asphalt Concrete	Ton	1,100		
13	FR	Storm Drain 54" HDPE	LF	145		
14	FR	Storm Drain 48" HDPE	LF	62		
15	FR	Storm Drain 36" HDPE	LF	698		
16	FR	Storm Drain 24" HDPE	LF	566		
17	FR	Storm Drain 18" HDPE	LF	188		
18	FR	Storm Drain 10"&12" HDPE	LF	168		
19	FR	Junction Box Double lid – City supplied box, frame and covers.	EA	2		
20	FR	Junction Box Single lid – City supplied box, frame and covers	EA	6		
21	FR	Modifying existing Junction Boxes	LS	1		
22	FR	Drainage Inlets (Caltrans Type G0) – City supplied box and grates.	EA	10		

23	FR	Drainage Inlets (Caltrans Type G1) – City supplied box and grates.	EA	1		
24	FR	6" Sanitary Sewer Mainline	LF	190		
25	FR	4" Sanitary Sewer Lateral	LF	70		
26	FR	Sanitary Sewer Clean-out with G-5 Boxes & Lids	EA	3		
27	FR	10" Water Line	LF	340		
28	FR	8" Water Line	LF	530		
29	FR	6" Water Line	LF	104		
30	FR	Fire Hydrants	EA	2		
31	FR	10" Gate Valves with G-5 Boxes & Lids	EA	3		
32	FR	8" Gate Valves with G-5 Boxes & Lids	EA	6		
33	FR	6" Gate Valves with G-5 Boxes & Lids	EA	4		
34	FR	4" Gate Valves with G-5 Boxes & Lids	EA	1		
35	FR	2" Gate Valves with G-5 Boxes & Lids	EA	3		
36	FR	1" and/or 2" Service Lines	LF	60		
37	FR	2" Irrigation Lines	LF	210		
38	FR	Water Meter Connections	EA	4		
39	FR	Relocate Gas Line	LF	390		
40	FR	Electrical	LS	1		
41	FR	Streetlights Single Head	EA	5		
42	FR	Streetlights Double Head	EA	3		
43	FR	Streetlights - Relocate salvaged Double Head to Station 33+50 – FR St. E-1	EA	1		
44	FR	Stamped Color Concrete Sidewalks – Northside Front	SF	4,800		
45	FR	Concrete Sidewalk non-stamped Southside Front St	SF	5,720		
46	FR	Concrete Sidewalks – K Street	SF	6,280		
47	FR	Reinforced Concrete Driveways	SF	2,352		
48	FR	Reinforced Stamped Color Concrete Crosswalks	SF	2,060		
49	FR	ADA Dome Panels	SF	405		
50	FR	Concrete Curb & Gutter	LF	2,130		
51	FR	Concrete Curb No Gutter	LF	1,240		

52	FR	Bike Lane Color Asphalt Treatment	SF	1,370		
53	FR	Pavement Striping and Signs	LS	1		
54	FR	Storm Drain 42" HDPE	LF	122		
55	FR	4" Water Line	LF	294		
56	FR	Reserved for future use				
57	FR	Reserved for future use				
58	FR	Reserved for future use				
59	FR	Reserved for future use				
60	FR	Reserved for future use				
61	CG	Mobilization	LS	1		
62	CG	SWPP Plan Reporting	LS	1		
63	CG	Water Pollution Prevention BMPs	LS	1		
64	CG	Pedestrian & Traffic Control	LS	1		
65	CG	Tree protection fencing installation & removal	LF	420		
66	CG	Clear, Grub & Tree Removal	LS	1		
67	CG	Demolition of Miscellaneous Fencing, Signs, Guard Rails, & Fixtures	LS	1		
68	CG	Demolition of Concrete Walls, Stairs, Art Panels, and Porte Cochere Wall	LS	1		
69	CG	Demolition of Asphalt	SF	9,400		
70	CG	Demolition of Building Deck & Handrail	LS	1		
71	CG	Mass Excavation and Fill Including Porte Cochere	LS	1		
72	CG	Excavation & Grading for Concrete Flatwork	SF	11,970		
73	CG	Aggregate Base for Flatwork	SF	11,970		
74	CG	Gateway Sign Foundation	EA	2	NIC	NIC
75	CG	Wave Sign Foundation	EA	1	NIC	NIC
76	CG	Concrete Vehicular Paving	SF	8,365		
77	CG	Concrete Sidewalks	SF	3,305		
78	FR/CG	ADA Dome panels – South side Front Street and Trail	SF	255		
79	FR	Permeable Concrete section including drain rock subgrade	SF	5,900		

80	CG	Concrete Slab at Porte Cochere	SF	2,120		
81	CG	Concrete Retaining Walls at Stairs	LF	24		
82	CG	Concrete Seat Walls	LF	88		
83	CG	Concrete Stairs	SF	216		
84	CG	Concrete Mow Curb	LF	115		
85	CG	Concrete Subgrade (rat) Slab at Redwood node	SF	165	NIC	NIC
86	CG	Reinforced Color Concrete Slabs for Cultural node surfacing	SF	400	NIC	NIC
87	CG	Surface colored reinforced Concrete Trail Markers	EA	6	NIC	NIC
88	CG	Lithocrete Basket Pattern	SF	212	NIC	NIC
89	CG	Lithocrete Pebble Pattern	SF	780	NIC	NIC
90	CG	Drainage Inlets (Caltrans Type G2 & GDO) – City supplied inlets with grates.	EA	3		
91	CG	Install Area Drains – City supplied drains with grates.	EA	8		
92	CG	Install French Drains	LF	130		
93	CG	Storm Drain 4-inch HDPE	LF	55		
94	CG	Storm Drain 12-inch HDPE	LF	360		
95	CG	Storm Drain 24-inch HDPE	LF	20		
96	CG	Storm Drain 36-inch HDPE	LF	40		
97	CG	Landscape Soil Import	CY	800		
98	CG	Lawn Irrigation	SF	22,400		
99	CG	Planting Areas Irrigation	LS	1		
100	CG	Planting Lawn	SF	22,400		
101	CG	Planting Ground Covers & Shrubs	LS	1		
102	CG	Planting Trees	EA	19		
103	CG	4 inches Bark Mulch	CY	50		
104	FR/CG	Landscaping Maintenance	LS	1		
105	FR	Landscape Rock	SF	1,610		
106	CG	Travel Planning Signs	EA	6		
107	CG	Tolowa Walk Entry Exhibit (Sheets F6 - F7)	LS	1	NIC	NIC
108	CG	Install Electrical Control Panels, conduit and wire for plaza lighting and power supply for cultural nodes and sound boxes.	LS	1	NIC	NIC

109	CG	Electrical Seat Wall & Steps Lighting	EA	16		
110	CG	Electrical Lighted Bollards	EA	8		
111	CG	Removable Bollards	EA	5		
112	CG	Install Stair Handrails	LF	45		
113	CG	Install Bicycle Racks	EA	3		
114	CG	Skate Deterrent Features	LS	1	NIC	NIC
115	CG	Drinking Fountain & Sanitary Sewer Line	LS	1		
116	CG	Discovery Center Renovations	LS	1		

TOTAL BASE BID AMOUNT _____
 _____ (\$_____).

Quantities shown on the Bid Schedule are estimated for the purposes of bidding only. Actual construction quantities may vary. **A bid price for all items in the Base Bid is required. The bid for each item shall include the cost to perform all the work necessary for a complete project, whether or not any such work is specifically designated on the Plans or in the Specifications.**

The cost of all work in the Contract Documents not specifically identified as an item or described as an item must be included in the items and no additional compensation will 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 **Base Bid** amount.

END OF SECTION

SECTION 00 43 13

BID GUARANTY BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____,
as Principal, and _____, as Surety,
are held and firmly bound unto the City of Crescent City, State of California, as 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 of which
sum we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly
and severally, firmly by these presents.

WHEREAS, the Principal has submitted or is about to submit a bid to the Obligee for
the work described as construction of the "FRONT STREET GATEWAY IMPROVEMENTS
PHASE 1C - REISSUE" and to which reference is hereby made for all particulars;

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 therein complete with evidences of insurance and files with the Obligee two bonds,
one to guarantee faithful performance and the other to guarantee payment for labor and
materials, as required by law, and in the form provided by Obligee, then this obligation will
be null and void; otherwise, this obligation will remain in full force and virtue.

AND IT IS HEREBY DECLARED AND AGREED that the Surety will be liable under
this obligation as Principal, and that nothing of any kind or nature whatsoever that will not
discharge the Principal may operate as a discharge or a release of liability of the Surety. In
the event suit is brought upon this bond by the Obligee and judgment is recovered, the
Surety shall pay all costs incurred by the Obligee in such suit.

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.

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, business address, and portion of work (description of work to be done) for each subcontractor that will be used in the work if the bidder is awarded the contract. 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 must be signed.)

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

All Subcontractors' contracts must include contract language that incorporates all requirements as stated in this contract.

Name	Location Place of Business	Description of Work	DIR NO.

Signature of Bidder

END OF SECTION

STATE OF CALIFORNIA
Department of Housing and Community Development
COMMUNITY DEVELOPMENT BLOCK GRANT (CDBG) Program

REQUIRED ITEM

BIDDER'S PROPOSED SECTION 3 CONTRACTS/SUBCONTRACTS

Type of Contract (Business or Profession)	Total No.	Total Approximate Dollar Amount	Estimated No. of Contracts to Section 3 Businesses	Estimated Dollar Amount to Section 3 Businesses

Section 3 Business Concern:

- 1. A business that is 51% or more owned by Section 3 residents, or**
- 2. A business whose permanent full time work force is at least 30% are Section 3 residents or,**
- 3. A business which contracts a dollar amount of all subcontracts with businesses as defined in numbers 1 and 2 above.**

Company

Project Name

Project Number

Person Completing Form

Date

STATE OF CALIFORNIA
Department of Housing and Community Development
COMMUNITY DEVELOPMENT BLOCK GRANT (CDBG) Program
REQUIRED ITEM

BIDDER'S SECTION 3 PROPOSED NEW HIRES

Job Category	Total Estimated Positions Needed for the Project	No. of Positions Occupied by Permanent Employees	Number of Positions Not Occupied	No. of Positions To be filled with Section 3 Residents
Officer/Supervisors				
Professionals				
Technical				
Housing Sales/ Rental Management				
Office/Clerical				
Service Workers				
Others				
Trade				
Journeyman				
Apprentices				
Trainees				
Others				
Trade				
Journeyman				
Apprentices				
Trainees				
Others				

Section 3 Resident:

Individual residing in a public housing project or within the non-metropolitan county in which the project is located and whose income does not exceed 80% of the higher of the median income, adjusted for family size, for the county of residence or the non-metropolitan area of the state.

Company

Project Name

Project Number

Person Completing Form

Date

SECTION 00 45 13

CERTIFICATION OF BIDDER'S

EXPERIENCE AND QUALIFICATIONS

The undersigned bidder certifies that he or she is, when the bid is submitted and will be, throughout the period of the contract, licensed by the State of California to do the type of work required under terms of the contract documents. Bidder further certifies that he or she 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 bidder represents that he or she 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 or she 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 he or she is aware of these peculiar risks and that he or she 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, NOTARIZED, AND
SUBMITTED WITH BID FOR PUBLIC WORKS**

STATE OF CALIFORNIA

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 will 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 45 21

ANTI-LOBBYING CERTIFICATION

The following certification and disclosure regarding payments to influence certain federal transactions are made per the provisions contained in 2 CFR 200 – Appendix II and 31 U.S.C. 1352, the “Byrd Anti-Lobbying Amendment.”

(a) 2 CFR 200 – Appendix II, “Contract Provisions for Non-Federal Entity Contracts Under Federal Awards” is hereby incorporated by reference into this certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of \$150,000 shall certify and disclose accordingly.

(c) This certification is a material representation of fact upon which reliance is placed when this transaction was made or entered into. Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person making an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000, for each such failure.

SIGNATURE: _____

COMPANY NAME: _____ DATE: _____

END OF SECTION

SECTION 00 52 00

AGREEMENT

THIS AGREEMENT is 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."

WHEREAS, the Owner has caused a project manual to be prepared comprised of one volume of bidding and contract requirements, technical specifications, and drawings for the construction of the "FRONT STREET GATEWAY IMPROVEMENTS PHASE 1C - REISSUE" 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;

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.

It is expressly understood and agreed by the parties that with regard to all dates and time periods set forth, or referred to, in this Agreement, time is of the essence.

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:

- 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.
- Attachment A, Federal Prevailing Wage Rates / Classifications
- Attachment B, State Prevailing Wage Rates / Classifications
- Attachment C: Section 3 and CDBG Labor Compliance Program

IN WITNESS WHEREOF, the parties have caused this agreement to be executed by their duly authorized representatives this ____ day of _____, 20____ at Crescent City, California.

Signature for Owner

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, California, a municipal corporation (hereinafter "Owner") and _____ (hereinafter "Principal") have entered into an agreement dated _____ for the construction of the "FRONT STREET GATEWAY IMPROVEMENTS PHASE 1C - REISSUE" (hereinafter "Project"), which agreement is hereby incorporated by reference and made a part hereof; and

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

NOW, THEREFORE, WE, the Principal, and _____, a corporation organized and existing under the laws of the State of _____ and duly authorized to transact business under the laws of the State of California, as Surety, are held and firmly bound unto the Owner, as obligee, in the penal sum of _____ dollars (\$_____), lawful money of the United States, said sum being not less than one hundred percent (100%) of the estimated amount payable by Owner under the terms of the Agreement for which payment 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 its heirs, executors, administrators, successors, or assigns, must 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 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 will indemnify and save harmless, the Owner, its officers and agents as therein stipulated, then this obligation will become null and void; otherwise it will 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 and costs 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 its heirs, executors, administrators, successors or assigns should 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.

(Seal)

Principal

Signature for Principal

Title of Signatory

(Seal)

Surety

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 "FRONT STREET GATEWAY IMPROVEMENTS PHASE 1C - REISSUE"; 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 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 18806 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, 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.

(Seal)

Principal

Signature for Principal

Title

(Seal)

Surety

Signature for Surety

Title

END OF SECTION

SECTION 00 62 00

CERTIFICATES AND OTHER FORMS

The forms listed below and included in this Section will 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.

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

¹See 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 to 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.

Business Day. Days that City Hall are open to the public.

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 comprises the following documents included in Part A, Part B, and Part C:

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 includes 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.

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.

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 refers 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.

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 does 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.

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

Working Day. Calendar days.

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.

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. 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 Department of Industrial Relations, State of California, or the Secretary of the Department of Labor, whichever is greater. 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/FEDERAL: State prevailing wages as set by the California Department of Industrial Relations and Federal (Davis-Bacon) prevailing wage rates as set by the Department of Labor for the work to be performed under this contract are included in Attachments A and B hereto.

3. PENALTY: 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.

4. PAYMENT OF WAGES: Pursuant to the Davis-Bacon Wage Act, Contractor and its subcontractors are required to pay wages not less than once per week.

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:

Pursuant to the California Labor Code, eight hours of labor constitutes a legal day's work. The Contractor or any subcontractor may not require any more than eight hours of labor in a day from any person employed in the performance of the work under this contract. Failure of the Contractor to perform the work in accordance with this policy of the State of California is a failure on his part to comply with the provisions of this contract.

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.

All work over eight hours per day and/or 40 hours per week is considered overtime. Hours over 8 in a day and/or 40 hours in a week must be paid at 1.5 times the rate of regular hours. Double time is required and due for work beyond 12 hours in a workday or eight hours on the seventh day of a work week.

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. COPELAND ANTI-KICKBACK ACT: Contractor agrees that it will comply with the Copland "Anti-Kickback" Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 CFR Part 3). As applied to this contract, the Copland "Anti-Kickback" Act make is unlawful to induce, by force, intimidation, threat or procuring dismissal from employment, or otherwise, any person employed in the construction or repair of public buildings or public works, financed in whole or part in part by the Unites States, to give up any part of the compensation to which that person is entitled under a contract of employment.

F. APPRENTICES:

The Contractor and subcontractors under him must comply with the requirements of Sections 1777.5 and 1777.6 of the Labor Code in the employment of apprentices.

Information relative to apprenticeship standards, wage schedules, and other requirements may be obtained from the Director of Industrial Relations, ex-officio the Administrator of Apprenticeship, San Francisco, California, or from the Division of Apprenticeship Standards and its branch offices.

All apprentices must be certified from the Department of Industrial Relations and the Department of Labor. Certificates from each program must be submitted with first payroll the apprentice works. Failure to provide the required certificates shall result in non-payment of the pay request(s) until the proper documents are provided.

G. 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.

H. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT (40 USC 3701-3708):

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and onehalf times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in sub paragraph (1) of this paragraph.

3. Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

5. No laborer or mechanic may be required to work in surrounding or under working conditions which are unsanitary, hazardous, or dangerous as established by Secretary of Labor pursuant to the Contract Work Hours and Safety Standards Act (codified at 40 USC 3701-3708).

I. STATE OF CALIFORNIA LABOR CODE § 1810 AND §1811

Contractor shall comply with Labor Code §1810 and §1811 which stipulates that eight hour labor constitutes a legal day's work, and §1812 which stipulates that the contractor and subcontractors shall keep an accurate record showing the name of and actual hours worked each calendar day and each calendar week by each worker employed by him in connection with the work performed under the terms of the contract. Failure to comply with these sections of the of the Labor Code will subject the contractors to penalty and forfeiture provisions of the Labor Code §1813.

J. DRUG FREE WORKPLACE COMPLIANCE

Contractor certifies that it shall comply with the Drug Free Workplace Act of 1988, as amended, 2 CFR Part 182 – Governmentwide Requirements for Drug-Free Workplace (Financial Assistance), and the appropriate Federal Agency Regulations for Grants and Agreements, whichever would be applicable under Federal law, regarding Drug Free Workplace compliance. Contractor shall require compliance, if applicable, from subcontractors.

K. ELIGIBLE WORKERS

Contractor shall ensure that all employees complete the I-9 form to certify that they are eligible for lawful employment under the Immigration and Nationality Act (8 U.S.C. 1324a). Contractor shall comply with regulations regarding certification and retention of the completed forms. These requirements also apply to any subcontract awarded under this contract. Contractor agrees to make these forms available in accordance with the access to records and record retention provisions of this contract.

L. "SECTION 3" CLAUSE

1. This is a HUD Section 3 construction contract. Contractors and subcontractors must address the Section 3 employment work hours benchmarks for Section 3 Workers and Targeted Section 3 Workers as established by the U.S. Department of Housing and Urban Development at 24 CFR Part 75.

- a. This is a Section 3 covered project. Section 3 projects mean housing rehabilitation, housing construction, and other public construction projects assisted under HUD programs that provide housing and community development financial assistance when the total amount of assistance to the project exceeds \$200,000. The project is the site or sites together with any building(s) and improvements located on the site(s) that are under common ownership, management, and financing.

- b. The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (Section 3). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by the U.S. Department of Housing and Urban Development (HUD) assistance or HUD assisted projects covered by

Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

c. The parties to this contract will comply with HUD's regulations as set forth in 24 CFR Part 75, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the Part 75 regulations.

d. The Contractor agrees or representative of workers with which the Contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the Contractor's commitments under this Section 3 clause and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

e. The Section 3 requirements apply to all contractors and subcontractors performing work in connection with a Section 3 covered project. Contractor means any entity entering into a contract with (a) a recipient to perform work in connection with work in connection with a Section 3 project; or (b) a subrecipient for work in connection with a Section 3 project. Subcontractor means any entity that has a contract with a Contractor to undertake a portion of the contractor's obligation to perform work in connection with a Section 3 project.

f. The contractor agrees to include this Section 3 Clause in every subcontract subject to compliance with regulations in 24 CFR Part 75, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 Clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 75. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of regulations under 24 CFR Part 75.

g. The Contractor acknowledges that subrecipients, contractors, and subcontractors are required to meet the employment, training, and contraction requirements of 24 CFR 75.19, regardless of whether Section 3 language is included in recipient or subrecipient agreements, program regulatory agreements, or contracts.

h. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected, but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR Part 75 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR Part 75.

i. Noncompliance with HUD's regulations in 24 CFR Part 75 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

j. The Contractor agrees to submit, and shall require its Subcontractors to submit

to them, annual reports detailing the total number of labor hours worked on the Section 3 Project, the total number of labor hours worked by Section 3 Workers, and the total number of hours worked by Targeted Section 3 Workers, and any affirmative efforts made during the quarter to direct hiring efforts to low- and very low-income persons, particularly persons who are Section 3 workers and Targeted Section 3 workers.

2. The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this Section 3 clause and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.
3. The contractor agrees to engage in qualitative efforts including but not limited to:
 - a. Engaging in outreach efforts to generate job applicants who are Targeted Section 3 Workers.
 - b. Providing training or apprenticeship opportunities.
 - c. Providing or referring Section 3 Workers to services supporting work readiness and retention (e.g., work readiness activities, interview clothing, test fees, transportation, childcare).
 - d. Engaging in outreach efforts to identify and secure bids from Section 3 business concerns.
 - e. Promoting the use of business registries designed to create opportunities for disadvantaged and small businesses.
 - f. Engaging in outreach and referrals with the state one-stop system of the workforce Innovation and Opportunity Act.
4. The contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 75, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 75. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 75.
5. The contractor must meet the requirements of 24 CFR part 75.19, regardless of whether Section 3 language is included in agreements, program regulatory agreements, or contracts. these requirements include:
 - a. Employment and Training
 - i. To the greatest extent feasible, and consistent with existing Federal, state and local laws and regulations, contractors covered by this subpart will ensure that employment and training opportunities

- arising in connection with Section 3 projects are provided to Section 3 Workers within the metropolitan area (or nonmetropolitan county) in which the project is located.
- ii. Where feasible, priority for opportunities and training should be given to:
 - 1. Section 3 Workers residing within the service area or the neighborhood of the project; and
 - 2. YouthBuild participants.
- b. Contracting
 - i. To the greatest extent feasible, and consistent with existing Federal, state and local laws and regulations, recipients covered by this subpart shall ensure contracts for work awarded in connection with Section 3 projects are provided to business concerns that provide economic opportunities to Section 3 Workers residing within the metropolitan area (or nonmetropolitan county) in which the project is located.
 - ii. Where feasible, priority for contracting opportunities should be given to:
 - 1. Section 3 business concerns that provide economic opportunities to Section 3 Workers residing within the service area or the neighborhood of the project; and
 - 2. YouthBuild programs.
- 7. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 75 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 75.
- 8. Noncompliance with HUD's regulations in 24 CFR part 75 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.
- 9. With respect to work performed in connection with Section 3 covered Indian housing assistance, Section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of Section 3 and section 7(b) agree to comply with Section 3 to the maximum extent feasible, but not in derogation of compliance with Section 7(b).
- 10. Contractor will retain all documentation, Contracts, and records for a minimum of five years.

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:

1. 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 Contractor's 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 attorneys' 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.

2. Should the Contractor, or the Contractor's agent, or 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, the Owner's 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.

D. COMPLIANCE WITH ENVIRONMENTAL LAWS:

Contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

E. HUMAN TRAFFICKING:

Pursuant to the Trafficking Victims Protection Act of 2000 (22 USC 7101 et seq.) and as required by 2 CFR part 175, the Contractor, its employees, subcontractors and their employees, must not:

1. Engage in severe forms of trafficking in persons during the contract term;
2. Procure a commercial sex act during the contract term; or
3. Use forced labor in the performance of the contract or any subcontract.

Definitions are contained at 22 U.S.C. 7102.

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 the Contractor's 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 Section 10410)

1. No officer or employee may 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 may 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

A. During the performance of this contract, Contractor shall not deny the contract's benefits to any person on the basis of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation, or military and veteran status, nor shall they discriminate unlawfully against any employee or applicant for employment because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation, or military and veteran status. Contractor shall ensure that the evaluation and treatment of employees and applicants for employment are free of such discrimination.

B. Contractor shall comply with the provisions of the Fair Employment and Housing Act (Gov. Code Sections 12900 et seq.), the regulations promulgated thereunder (California Code of Regulations, Title 2, Sections 11000 et seq.), the provisions of Article 9.5, Chapter 1, Part 1, Division 3, Title 2 of the Government Code (Gov. Code Sections 11135-11139.5), and the regulations or standards adopted by CALTRANS to implement such article.

C. Contractor shall permit access by representatives of the Department of Fair Employment and Housing, Caltrans and CITY upon reasonable notice at any time during the normal business hours, but in no case less than 24 hours' notice, to such of its books,

records, accounts, and all other sources of information and its facilities as said Department or Caltrans shall require to ascertain compliance with this clause.

D. Contractor and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.

E. Contractor shall include the nondiscrimination and compliance provisions of this clause in all agreements with its subcontractors, and shall include a requirement in all agreements with all of same that each of them in turn include the nondiscrimination and compliance provisions of this clause in all contracts and subcontracts they enter into to perform work under this contract

F. Contractor must also comply with regulations relative to non-discrimination in federally-assisted programs of the U.S. Department of Transportation (49 CFR 21 – Effectuation of Title VI of the Civil Rights Act of 1964). Specifically, the Contractor shall not participate either directly or indirectly in the discrimination prohibited by 49 CFR §21.5, including employment practices and the selection and retention of subcontractors.

1.10 FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CLAUSE

During the performance of this contract, Contractor agrees as follows:

(1) Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:

Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) Contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to

instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with Contractor's legal duty to furnish information.

(4) Contractor will send to each labor union or representative of workers with which s/he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(8) Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, Contractor may request the United States to enter into such litigation to protect the interests of the United States.

1.11 REHABILITATION ACT OF 1973:

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."

1.12 REBATES, KICKBACKS OR OTHER UNLAWFUL CONSIDERATION:

Contractor warrants that this Agreement was not obtained or secured through rebates, kickbacks or other unlawful consideration either promised or paid to any Crescent City employee. For breach or violation of this warranty, Crescent City shall have the right, in its discretion, to terminate this Agreement without liability, to pay only for the value of the work actually performed, or to deduct from this Agreement price or otherwise recover the full amount of such rebate, kickback or other unlawful consideration.

1.13 AMERICANS WITH DISABILITIES ACT:

Contractor agrees that during the course of performing work under this project, it will fully comply with the applicable provisions of the American with Disabilities Act (ADA) of 1990, as amended, which prohibits discrimination on the basis of disability, as well as all applicable regulations and guidelines issued pursuant to the AD (42 USC Section 12101 et seq.).

1.14 INTELLECTUAL PROPERTY TERMS:

A. GENERALLY: To the extent any intellectual property is created or produced for under this Agreement, and not covered in other provisions herein, Contractor agrees to take reasonable steps to ensure that the City and Caltrans have the rights necessary to allow for use of the intellectual property in a fashion substantially similar to other rights for non-commercial uses and State government purposes described in this Agreement.

B. INVENTIONS: Inventions are any idea, methodologies, design, concept, technique, invention, discovery, improvement, or development regardless of patentability made by Contractor and/or a subcontractor during the term of this Agreement and in performance of any work under this Agreement, provided that either the conception or reduction to practice thereof occurs during the term of this Agreement and in performance of work issued under this Agreement. Contractor and any subcontractor hereby grant the City and Caltrans Government Purpose Rights to any invention created as a result of the work performed under this Agreement. "Government Purpose Rights" are the unlimited,

irrevocable, worldwide, perpetual, royalty-free, non-exclusive rights, and licenses to use, modify, reproduce, perform, release, display, create derivative works from, and disclose any said invention. "Government Purpose Rights" also include the right to release or disclose said invention(s) outside Caltrans for any State government purpose and to authorize recipients to use, modify, reproduce, perform, release, display, create derivative works from, and disclose the invention(s) for any State government purpose. "Government Purpose Rights" do not include any rights to use, modify, reproduce, perform, release, display, create derivative works from, or disclose the invention(s) for any commercial purpose.

C. AVOIDANCE OF INFRINGEMENT: Contractor and subcontractors must agree to avoid designing or developing any items that infringe one (1) or more patents or other intellectual property rights of any third party. If Contractor or a subcontractor becomes aware of any such possible infringement in the course of performing any work under this Agreement, then the Contractor or subcontractor must immediately notify the City in writing, and the City will then immediately notify Caltrans in writing.

1.15 CHILD SUPPORT COMPLIANCE ACT

Contractor acknowledges and agrees to the following:

The Contractor recognizes the importance of child and family support obligations and shall fully comply with all applicable state and federal laws relating to child and family support enforcement, including, but not limited to, disclosure of information and compliance with earnings assignment orders, as provided in Chapter 8 (commencing with section 5200) of Part 5 of Division 9 of the Family Code; and

The Contractor, to the best of their knowledge, is fully complying with the earnings assignment orders of all employees and is providing the names of all new employees to the New Hire Registry maintained by the California Employment Development Department.

1.16 ENERGY EFFICIENCY:

The Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the California energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Public Law 94-163).

1.17 ARCHITECTURAL BARRIERS ACT AND THE AMERICANS WITH DISABILITIES ACT:

The Architectural Barriers Act of 1968 (42 U.S.C. 4151-4157) requires certain Federal and Federally funded buildings and other facilities to be designed, constructed, or altered in accordance with standards that ensure accessibility to, and use by, people with physical disabilities. A building or facility designed, constructed, or altered with funds allocated or reallocated under this subpart after November 21, 1996 and that meets the definition of residential structure as defined in 24 CFR 40.2, or the definition of building as

defined in 41 CFR 101-19.602(a), is subject to the requirements of the Architectural Barriers Act of 1968 and shall comply with the Uniform Federal Accessibility Standards.

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 its 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 must be granted 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 the Contractor's 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 its 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 must 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 Contractor's 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 Contractor's 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 Contractor's subcontractors to pay any and all accounts for services, equipment, and materials used by Contractor's and by 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 the Contractor's representative, must give personal attention to and manage the work so that it is prosecuted faithfully. When the Contractor's representative is not personally present at the project site, a 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 Contractor's employees and subcontractors' 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 the 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

Contractor must use an accounting system that conforms to Generally Accepted Accounting Principles (GAAP) and enables the determination of incurred costs at interim points of completion and provides support for reimbursement payment vouchers or invoices. All accounting records, books, records, accounts, documentation, and all other materials to this Contract must be maintained for a minimum of three (3) years from the date of final payment to Contractor and shall be held open to inspection, copying and audit by representatives of the Owner, Caltrans, the California State Auditor, and auditors representing the federal government, during reasonable times at Contractor's office.

Contractor must permit access to all records of employment, employment advertisements, employment application forms, and other pertinent data and records by the State Fair Employment Practices and Housing Commission or any other agency of the State of California designated by Caltrans, for the purpose of any investigation to ascertain compliance with grant agreement between Owner and Caltrans.

I. WORK SITE SECURITY

The Owner has limited security at the area the work is to take place; therefore, the Contractor may 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 must 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 must submit a daily report to the Construction Manager at the end of each shift worked. Daily reports will 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.

L. COST PRINCIPLES

Contractor agrees that (a) Contract Cost Principles and Procedures, 48 CFR, Federal Acquisition Regulations System, Chapter 1, Part 31, et seq., shall be used to determine the allowability of individual Project cost items and (b) all parties shall comply with Federal administrative procedures in accordance with 2 CFR, Part 200, Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards. Contractor shall comply with Federal administrative procedures in accordance with 2 CFR, Part 200, Uniform Administrative Requirements, Cost Principles and Audit Requirements for Federal Awards to the extent applicable.

M. MANDATORY ORGANIC WASTE RECYCLING

Pursuant to Public resources Code Sections 42649.8 et seq., if Contractor generates two (2) cubic yards or more of organic waste or commercial solid waste per week, the Contractor must arrange for organic waste or commercial waste recycling services that separate/source organic waste for organic waste recycling. The Contractor must provide the Owner with proof of compliance, i.e., organic waste recycling services or commercial waste recycling services that separate/source organic waste recycling.

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 Contractor's 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 one day after the date 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 the work and dispose of the 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 the hands of Contractor. The Contractor must join the work to that of others and perform the 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 a 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 must 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 must promptly investigate the conditions, and if Owner finds that such conditions do materially differ, or do involve hazardous waste and cause an increase or decrease 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 a decision. The Construction Manager must respond to the Contractor in writing with a 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 a 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 constitutes 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 a decision. Should the Contractor disagree with the Construction Manager's decision, the Contractor 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, the Contractor must immediately inform the Construction Manager in writing. The Construction Manager must promptly review the matter and if it is found that finds an error or omission has been made; the Construction Manager must then 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 the Contractor's risk unless authorized by the Construction Manager. In the event the Contractor disagrees with the determination of the Construction Manager under this provision, the Contractor 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 its 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 its 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 its 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 must 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 of the project manual.

3.05 CONTRACTOR'S COPIES OF PROJECT MANUALS

Within 10 business days after notice to proceed, the Owner will furnish to the Contractor 4 sets of project manuals including 2 sets of 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 models 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 of the project specifications.

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 Contractor's compliance with the contract requirements, the Contractor must assist the Construction Manager in the 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. Conflicts between manufacturer's installation instructions and these specifications require the Contractor to make a request for information (RFI).

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, the Contractor must immediately notify the Owner's Representative, in writing, setting forth the Contractor's 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 or her 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 the Contractor's 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 its 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 will 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.

4.11 DOMESTIC PREFERENCE

In accordance with 2 CFR 184.322, as appropriate and to the extent consistent with law, the Grantee should, to the greatest extent practicable under this contract, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this paragraph must be included in all subawards and in all contracts and purchase orders for work or products under this contract.

Additionally, the funding source dictates that the Grantee meet the 2 CFR 184 to Build America, Buy America (BABA) Act.

4.12 PROCUREMENT OF RECOVERED MATERIALS UNDER RCRA

Contractor must comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA) (42 U.S.C. 6962). The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental

Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of an item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

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 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, evidence of insurance from the insurer, certifying to the coverage of the insurance required herein. The evidence 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 evidence must include the agreement of the insurer to give, by certified 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 as its 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.

3. ACCEPTABILITY OF INSURERS. Insurance is to be placed with insurers authorized to conduct business in the State of California with a current A.M. Best rating of no less than A: VII, unless otherwise approved by the Owner.

B. MINIMUM SCOPE AND LIMIT OF INSURANCE:

1. Coverage shall be at least as broad as:

- a. Commercial General Liability (CGL): Insurance Services Office (ISO) Form CG 00 01 covering CGL on an "occurrence" basis, including products and completed operations, property damage, bodily injury and personal & advertising injury with limits no less than \$5,000,000 per occurrence. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location (ISO CG 25 03 or 25 04) or the general aggregate limit shall be twice the required occurrence limit. The required insurance must be maintained until final acceptance of the work and must continue for a period of 365 calendar days after the final acceptance of the work.
- b. Automobile Liability: Insurance Services Office Form CA 0001 covering Code 1 (any auto), with limits no less than \$5,000,000 per accident for bodily injury and property damage.
- c. Workers' Compensation insurance as required by the State of California, with Statutory Limits, and Employers' Liability insurance with a limit of no less than \$1,000,000 per accident for bodily injury or disease.
- d. Builder's Risk (Not required for this Contract) ~~{Course of Construction} insurance utilizing an "All Risk" (Special Perils) coverage form, with limits equal to the completed value of the project and no coinsurance penalty provisions. Such coverage shall name the Owner as a loss payee. 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.~~

2. If the contractor maintains broader coverage and/or higher limits than the minimums shown above, the Entity requires and shall be entitled to the broader coverage and/or the higher limits maintained by the contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the Entity.
3. The insurance policies are to contain or be endorsed to contain the following provisions:
 - a. The Owner, its officers, officials, employees, and volunteers are to be covered as additional insureds on the CGL policy with respect to liability arising out of work or operations performed by or on behalf of the Contractor including materials, parts, or equipment furnished in connection with such work or operations and automobiles owned, leased, hired, or borrowed by or on behalf of the Contractor. General liability coverage can be provided in the form of an endorsement to the Contractor's insurance (at least as broad as ISO Form CG 20 10, CG 11 85 or both CG 20 10, CG 20 26, CG 20 33, or CG 20 38; and CG 20 37 forms if later revisions used).
 - b. For any claims related to this project, the Contractor's insurance coverage shall be primary insurance coverage at least as broad as ISO CG 20 01 04 13 as respects the Entity, its officers, officials, employees, and volunteers. Any insurance or self-insurance maintained by the Entity, its officers, officials, employees, or volunteers shall be excess of the Contractor's insurance and shall not contribute with it.
4. Contractor hereby agrees to waive rights of subrogation which any insurer of Contractor may acquire from Contractor by virtue of the payment of any loss. Contractor agrees to obtain any endorsement that may be necessary to affect this waiver of subrogation. The Workers' Compensation policy shall be endorsed with a waiver of subrogation in favor of the Owner for all work performed by the Contractor, its employees, agents, and subcontractors.

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 **paragraph 1.01 of Section 01 21 43 "Time Allowances"**. 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 must 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 may 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 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 must 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 must be made in accordance with Section 01 33 00 Paragraph 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 or she 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 Construction Manager must also determine whether the delay is to be considered avoidable or unavoidable and notify the Contractor of his or her 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 its 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 its 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 its 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 or she deems it in its 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 Section 00 72 00 Paragraph 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 calendar days as set forth in Section 01 21 43 "Time Allowances," 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 One Thousand dollars (\$1,000.00) per day for each and every calendar day's delay in finishing the work in excess of the number of working days prescribed or for work completed after November 30, 2026; 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 its 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 DEFAULT PROCEDURES

A. EVENTS OF DEFAULT:

The Owner may declare the Contractor in default of the contract if any one or more of the following events occurs:

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, including completing the work within the time prescribed.

B. NOTICE OF DEFAULT AND OPPORTUNITY TO CURE:

In the event the Owner declares the Contractor be in default, the Owner will must give written notice of default to the Contractor's Representative either personally or by certified mail to the business address of the Contractor. Notice will be given as of the date of personal service or the date of delivery of the certified mail. Except for emergencies, the Contractor will have ten (10) days to cure the default after the date of the notice. If the default cannot be reasonably cured within ten (10) days, then Contractor must commence to cure the breach within ten (10) days and diligently and continuously prosecute such cure to completion within a reasonable amount of time, which in no event may be later than twenty-one (21) days after receipt of the notice.

C. REMEDIES FOR DEFAULT:

In the event that the Contractor fails to cure any default declared by Owner within the time period set forth above, then the Owner may pursue any remedies available under law or equity, including, without limitation, the following:

1. Invoke Performance Bond. The Owner may, with or without terminating the contract and reserving to itself all rights to damages related thereto, exercise its right under the performance bond.
2. Suspend the Contract. The Owner may, without terminating the contract and reserving to itself all rights to damages related thereto, suspend all or any portion of this contract for as long a period of time as the Owner determines, in its sole discretion, appropriate, in which event the Owner will have no obligation to adjust the contract price or contract time, and will have no liability to Contractor for damages if the Owner directs Contractor to resume work.
3. Perform and Withhold. The Owner may, without terminating the contract, engage others to perform the work or portion of the work that has not been performed by Contractor and withhold the cost thereof to the Owner from future payments to Contractor, reserving to itself all rights to damages related thereto.
4. Delete Certain Services. The Owner may, without terminating the contract, delete certain portions of the work, reserving to itself all rights to damages related thereto.

5. Terminate the Contract. The Owner may terminate all or any part of this contract for default in accordance with the provisions below, reserving to itself all rights to damages related thereto.
6. Additional Provisions. All of Owner's rights and remedies under this contract are cumulative and in addition to those rights and remedies available in law or in equity. Designation in the contract of certain breaches as material may not be construed as implying that other breaches not so designated are not material nor may such designations be construed as limiting Owner's right to terminate the contract, or the exercise of its other rights or remedies for default, to only material breaches. Owner's determination of whether there has been noncompliance with the contract so as to warrant exercise by Owner of its rights and remedies for default under the contract, will be binding on all parties. No termination or action taken by Owner after such termination will prejudice any other rights or remedies of Owner provided by law or equity or by the contract upon such termination; and Owner may proceed against Contractor to recover all damages, liquidates or otherwise, suffered by Owner.

6.05 TERMINATION PROCEDURES

A. TERMINATION FOR DEFAULT:

1. The Owner may terminate the contract upon 7 days' written notice to Contractor and to Contractor's surety whenever the Contractor is declared to be in default and fails to timely cure the default. Notice will be given as of the date of personal service or the date of delivery of the certified mail.
2. 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 and that are stored elsewhere. In such case, the Contractor is not entitled to receive any further payment until the work is finished.
3. 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 must 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.

4. 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 for damages 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 for said damages.
5. If the Owner terminates this contract for default, and it is thereafter determined that the Contractor had not 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 00-6.05 B.

B. TERMINATION BY OWNER FOR OTHER THAN DEFAULT:

1. 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, at any time by giving written notice to Contractor or its representative either personally or by certified mail. 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.
2. 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 either by personal delivery or certified mail, effective upon receipt. The Owner must implement procedures as set forth in paragraph 00 72 00-6.05 B.

PART 7 – MEASUREMENT AND PAYMENT

7.01 PAYMENTS TO CONTRACTOR

A. BREAKDOWN OF CONTRACT PRICES:

If the Contractor disagrees with the Measurement and Payment section of Part B and 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 its 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 will 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 must 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 or her concurrence with the estimate and the Construction Manager's recommendation that payment be made or (b) indicate in writing to the Contractor his or her 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 or her 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 material men 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 five (5) percent of each progress payment.

Under no circumstances may 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 may 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.
- e. Failure to submit required Labor Compliance documentation for the Contractor and/or subcontractor(s).

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.

4. 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.

D. FINAL PAYMENT:

On the condition that no liens or claims are outstanding, and all required labor compliance documentation has been received to the satisfaction of the City, 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 payment 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 its 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 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, the Contractor 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, the Owner may (1) do it itself, (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 its forces and the forces of its 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, the Contractor must 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 that the Owner has determined that such services are necessary and that 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 its 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, must 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 will so notify the Contractor in writing identifying the reasons for such a determination. If the Construction Manager finds the work substantially complete, he 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 will 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, will 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 that the Contractor may complete the work his or herself after giving the Contractor notice of its 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 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, then the Construction Manager 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. The final application for payment must also include all Labor Compliance documentation including all payrolls, forms, and outstanding restitution payments have been made and submitted to Owner's satisfaction.

If, after reviewing the Contractor's final application for payment, including all documentation required, the Construction Manager determines that the work is complete, then the Construction Manager 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

PART B – TECHNICAL SPECIFICATIONS GROUP

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 00 00

GENERAL REQUIREMENTS

PART 1 – GENERAL

Some of the following general and specific requirements are duplicated in other sections. Some requirements stated elsewhere may not be in this section. The Contractor must comply with all requirements set forth in this section, other sections and as set forth in any referenced documents.

A. GENERAL CONTRACTOR RESPONSIBILITIES

The Contractor must satisfy himself or herself as to the nature and location of the work, the general and local conditions, particularly those bearing upon availability of transportation, disposal areas, storage areas for materials, labor, water, electric power, and uncertainties of weather, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment or 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.

Any failure by the Contractor to acquaint himself or herself with all the available information will not relieve him or her from responsibility for properly estimating the difficulty or cost of successfully performing the work.

The Contractor will be solely and completely responsible for conditions of the job site, including the safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours.

The Contractor must maintain strict compliance with all job site rules, local, state, and federal regulations, and safety precautions.

Safety provisions must conform to U.S. Department of Labor (OSHA), the California Occupational Safety and Health Act, and all other applicable federal, state, county and local laws, ordinances, codes, the requirements set forth below, and any regulations that may be detailed in other parts of these Specifications.

Contractor must comply with all trench and excavation shoring and construction techniques required for general safety, worker protection and protection of adjacent property. The Contractor will be required to take extra precautions to protect buildings in close proximity to his work. See Section 01 71 33, "Protection of Property".

Contractor must comply with standards established by the Construction Safety Orders.

Contractor must keep the working area clean, safe, appropriately barricaded, and

illuminated.

Contractor must provide to the City the name of the Competent Person on excavation sites and ensure that all excavations are inspected and that safety procedures are implemented by the Competent Person.

Contractor must provide the City with documented training records for all employees, i.e., Trenching and Shoring, Confined Spaces in Construction, etc.

Contractor must provide all protective equipment (shoring, ladders, PPE, gas monitor, etc.) to be utilized by workers and ensure their proper use.

Contractor must provide site-specific safety reviews a minimum of once a week. Reviews are to be documented including the topics discussed, names of employees present, and be signed by Supervisor or Competent Person. Documentation is to be provided to Project Manager weekly.

Contractor agrees to immediately notify Project Manager of any injuries or near-miss events ("incidents") on the job site. The City reserves the right to perform its own investigation of any incidents and contractor must provide access to all personnel, equipment, maintenance records, and training documents pertinent to the investigation.

The Project Manager and Field Safety Officer have the authority to stop work if, in their opinion, the Contractor has created an unsafe working condition. Such work stoppage will be at the expense of the Contractor and will not add time to the Contract Time.

Contractor must maintain all documents required by Cal/OSHA on the job site and make them available to all employees and city representatives. Examples include Injury & Illness Prevention Program, Code of Safe Practices, and Heat Illness Prevention Program.

Contractor is responsible for screening all subcontractors with respect to safety and compliance with the requirements contained herein.

Contractor must report to the City and Engineer any condition which may pose a threat to the health and welfare of the City, Contractor's employees, or the general public.

Contractor must install the new sewer lines and manholes in such a manner as to not interrupt the normal flow of wastewater or cause surcharging of upstream sewer lines. Temporary bypass piping or pumps may be installed as required.

Contractor's operations must not cause a nuisance, a public health hazard or discharge of untreated wastewater to the surface or groundwater.

Contractor will be responsible for repairing any damage to existing streets and private property caused by his operations. The Engineer will determine the extent of the damage.

Contractor is responsible for the repairs. Contractor must get approval from engineer regarding the method of repair.

Contractor and all Subcontractors must be properly licensed in the State of California for any work they perform.

Contractor must obtain the required permits concerning equipment storage and work areas and for disposal of materials produced during excavation.

Contractor must ensure waste materials are properly handled and disposed in accordance with all applicable City, County, state, and federal regulations, and safety precautions.

All waste materials, debris, rubbish, and unsuitable materials must be removed and disposed of at sites to be provided by the Contractor. The Contractor must make his own arrangements for the disposal of materials.

B. PROGRESS SCHEDULE

Within ten (10) working days of the award of contract, the Contractor must submit to the Engineer, for review and approval, a progress schedule for the project. A revised progress schedule must be submitted every two weeks and when there is any change in the Contractors work schedule.

C. PUBLIC INFORMATION

The Contractor must keep all users/occupants (residents, business operators, etc.) of properties adjacent to, or impacted by, the project advised of any disruption in access or use of the property. This will be by written notice to the property user/occupant each week of activity expected over the following 2 weeks. The notices will include the weekly traffic diversion and closure information required in Section 01 55 26, "Traffic Control". Copies of all such notices must be delivered to the City also. Notices shall be reviewed and approved by the City before distribution to the public.

D. AIR AND WATER POLLUTION CONTROL

The Contractor must follow the Storm Water Pollution Prevention Plan (SWPPP) for the entire project conforming to Section 01 57 23, "Water Pollution Prevention" as well as all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended (33 USC 1251-1387) and the Clean Air Act (42 USC 7401-7671q).

E. TRAFFIC CONTROL

Contractor must prepare and submit a Traffic Control Plan conforming to Section 01 55 26, "Temporary Traffic Control". A schematic traffic control plan is included in the Project Plans. Please note that the traffic control plan will need to be staged in two phases to ensure access to Play Street during the entire construction.

F. SANITARY SEWER AND OTHER BYPASSES

Contractor must prepare and submit a Sanitary Sewer Bypass Plan, or other bypass plan for other utilities, if planning a bypass. Plan must be approved by Owner prior to implementing.

G. INFORMATION ON SITE CONDITIONS

Contractor's attention is directed to Section 02 00 00, "Existing Conditions" for specific information regarding the project site and surrounding area.

Information derived from inspection of logs, reports, or from Plans showing locations of utilities and structures will not in any way relieve the Contractor from any risk, or from properly examining the site and making such additional investigations as he may elect, or from properly fulfilling all the terms of the Contract Documents.

Some subsurface soil investigations information is provided in the Appendices. Also, see the geotechnical plan sheets for bore hole locations.

H. ADDITIONAL INFORMATION

Prior to bidding, Bidders may make their own subsurface investigations subject to time schedules and arrangements approved in advance by the City. Before starting any subsurface investigation, obtain all necessary permits for such work.

I. DISCREPANCIES

In the event of discrepancy in site conditions, Plans, or Specifications, immediately notify the Engineer. Do not proceed with any work of the nature or in the area of the discrepancy until the discrepancy has been fully resolved.

J. PROJECT LAYOUT

Horizontal and vertical control data is provided in the Plans. The Contractor is responsible to lay out the entire project including pipe alignment, manhole locations, sanitary sewer laterals, street alignment and curb grades and street grades. The maximum deviation for sewer and storm drainpipes is 0.25 feet for horizontal alignment and 0.02 feet for flow grade. The maximum deviation for street centerline is 0.1 foot for horizontal alignment and 0.05 foot for grade. Street curbs and gutters must follow plans within 0.02 feet.

K. WATER

Water for flushing lines, dust control, site cleanup or other construction related purposes is available from the City of Crescent City. Water will be paid for by the Contractor.

L. MATERIALS

Attention is directed to Section 01 33 00, "Submittal Procedures", and also to Section 6, "Control of Materials," of the Caltrans 2018 Standard Specifications.

The Contractor must submit detailed manufacturer's information, data or certifications for any materials, product or equipment proposed to be furnished and installed for this project, giving manufacturer's name, catalog number, and catalog cut for each item where applicable. The submittal must be accompanied by copies of the manufacturers' current recommended method of installation.

Contractor must comply with the Build America, Buy America (BABA) Act as stipulated in 2 CFR 184.

Contractor must comply with section 6002 of the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the EPA at 40 CFR part 2457 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition.

M. SUBSTITUTIONS

The Contract is based on the use of certain materials, equipment, and methods as shown on the Plans and described in these Special Provisions. The Engineer will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and all other information required by the Engineer to evaluate the proposed substitution. Do not proceed to substitute materials, equipment, or methods unless such substitution has been specifically approved by the Engineer.

When a specific product, material, equipment, or method is identified in the specifications, with or without an "or equal" phrase, do not assume that a substitute product, material, equipment, or method will be approved until the item has been specifically approved in writing by the Engineer.

Contractor must verify, prior to bidding, that all specified items will be available in time for timely progress of the work. Costs of delays because of non-availability of specified items will be borne by the Contractor.

N. TESTING

Attention is directed to the provisions in Section 6-3, "Quality," of the Standard Specifications.

Test methods designated in these specifications refer to the most current California Department of Transportation method as listed in the "Standard Specifications" unless otherwise noted. The test methods must be from the State of California, Business and Transportation Agency, Department of Transportation (Caltrans), Standard Specifications, latest edition.

In addition to any required tests, the Engineer may select random sample(s) of any material proposed to be used on the project. Such samples may be subjected to the appropriate test(s) to confirm compliance with the specifications.

O. SALVAGE OF EXISTING MATERIALS

Where indicated on the plans, salvage materials and deliver such materials to the City Corporation Yard, 900 Tenth Street, Crescent City. The Owner may direct salvage of other materials at Owners sole discretion. All other materials will become the property of the Contractor.

P. TRAFFIC

The Contractor will have to divert and/or control vehicular traffic through or around the project area. There is significant two-way vehicular traffic flow (estimated at 2000 vehicles per day) along the corridor of Front Street, Play Street, Stamps Way, and Howe Drive. This traffic must be diverted through and/or around these intersections during construction. Vehicular access to properties west of L Street and south of Second Street must be maintained at all times. The diversion of traffic around and/or through these intersections must be addressed in the Contractor's Traffic Control Plan. The Owner has provided a Traffic Control Plan that must be incorporated in the Contractor's Traffic Control Plan.

There is pedestrian traffic through the project area that must be maintained.

Q. PRIVATE PROPERTY

If excavation or construction materials or equipment are to be stored on private property, written permission must be obtained from the property owner granting permission and absolving the City of all responsibility for the consequences of such activity prior to use of the property.

There are existing buildings adjacent to the project. Access to these buildings must be maintained at all times. Precautions must be taken to prevent any damage to these buildings.

Any damage to private property due to Contractor's operations will be repaired at the Contractor's expense. Owner will obtain right(s) of entry onto private property for planned work.

R. ON-SITE STORAGE AND STAGING

The areas shown include Front Street between L Street and the Play Street intersection, and the public parking lot adjacent to Front Street between Play Street and K Street, as delineated on the Plans. These areas are available to the Contractor for his field office and to store materials and equipment. These areas are available at no cost, provided (1) the Contractor fence the area with a six-foot minimum height fence defining the boundary of the area being used for the Contractor's operations, and (2) the Contractor must restore the area to its pre-project condition at no cost to the City.

S. MANDATORY ORGANIC WASTE RECYCLING

It is understood and agreed that pursuant to Public Resources Code Sections 42649.8 et seq., if contractor generates two (2) cubic yards or more of organic waste or commercial solid waste per week, then Contractor must arrange for organic waste or commercial waste recycling services that separate/source organic waste for organic waste recycling. The Contractor shall provide the City with proof of compliance, i.e., organic waste recycling services or commercial waste recycling services that separate/source organic waste recycling.

T. DISCOVERY OF ARCHAEOLOGICAL MATERIAL

If buried archaeological material, items not shown on the plans, are encountered during any phase of construction within the public right-of-way, construction must be immediately halted at that location and the City must be notified. The Contractor must abide by the conditions of the Contract Documents and conform with the General Conditions., including but not limited to compliance with the National Historic Preservation Act of 1966 (16 U.S.C. Section 470).

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.
- C. The work will generally be performed on City property or within the 60-foot-wide right-of-way of on City streets, portions of adjacent side street rights-of-way, and other property owned by the City of Crescent City. Owner will obtain right(s) of entry needed for work to be performed on property not owned by the City.
- D. The Contractor must become acquainted with the nature and location of the work, the general and local conditions, particularly those bearing upon availability of transportation, disposal areas, storage areas for materials, labor, water, electric power, and uncertainties of weather, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment or 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.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. PROJECT SUMMARY

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

B. DESCRIPTION OF WORK:

Generally, the Work consists of furnishing all labor, materials, equipment, and incidentals, and performing all work required to complete the project. Where Owner supplies materials or equipment, Contractor is responsible for all other items to create a fully functional system. The work includes, but is not limited to:

This project includes street and utility improvements on Front Street between Play and L Street, and K Street between Front Street and Second Street. This project also includes Beachfront Park Gateway improvements requiring excavation and grading, pathways, landscaping, and cultural and art element installations on the south side of Front Street between Play Street and L Street.

The street work includes the furnishing of the labor, materials, and equipment for the installation of a replacement storm drain system, replacement water mains, fire hydrants, valving and services, sewer main installation, gas line relocation, irrigation piping and controls, curbs, gutters, sidewalks, and pedestrian crossings, a reconstructed road section for Front and K Streets, and new street lighting fixtures, all in accordance with the drawings and specifications.

The Gateway improvements include demolition, earthwork and grading around the Cultural Center on Front Street, new concrete pathways for building access and a cultural trail, decorative concrete elements and concrete retaining/seal walls, irrigation piping and controls, landscaping, area lighting, installation of kiosks with informational and cultural signage, and the construction of foundations for Gateway signage as well as cultural trail structural elements.

The Bidder must provide bids for all of the “Base Bid” items. The contract will be awarded, if awarded, to the low Bidder on the Base Bid. **The City may, at its sole discretion, award the contract for the “Base Bid” project only, or the “Base Bid” plus alternates, or the City may decide to remove portions of the work in the awarded contract at a later date.**

C. DESIGN/BUILD INTENT OF CONTRACT (NOT USED)

D. CONTRACTOR'S DUTIES:

1. Except as specifically noted, Contractor shall 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.
 - e. Temporary water and sewer hookups where required, whether shown not on the plans or not.
2. Building and all other demolition as needed and indicated on the plans. Obtain all necessary permits and perform asbestos and lead paint removal and disposal conforming to all regulations.
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 all 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 employees. Do not employ on the 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.

E. PERMITS AND AGREEMENTS:

Contractor shall obtain and comply with all permits not specifically obtained by Owner.

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

BASE BID – FRONT STREET GATEWAY IMPROVEMENTS PHASE 1C

1. Mobilization – Front: Mobilization is as described in Section 9-1.16D, “Mobilization” of the Standard Specifications. Mobilization will be paid on a lump sum basis in accordance with Public Contract Code as follows provided that total mobilization cost does not exceed 10 percent of the total bid: 50 percent when 5 percent of the project is earned. 75 percent when 10 percent is earned. 95 percent when 20 percent is earned. 100 percent when 50 percent is earned. Where mobilization exceeds 10 percent of the contract, see Public Contract Code.
2. SWPPP Plan and Reporting – Front: This item includes all additional work necessary for developing a stormwater pollution prevention plan by a qualified QSD and reporting results of work covered under this item in accordance with Specification Section 01 57 23. This lump sum item will be paid based on the percent of the project earned, rounded down to the nearest 10 percent.
3. Water Pollution Prevention BMPs – Front: 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. This lump sum

- item will be paid based on the percent of the project earned, rounded down to the nearest 10 percent.
4. Traffic Control – Front: Traffic Control is as described in Specification Section 01 55 26, “Temporary Traffic Control”. This lump sum item will be paid based on the percent of the project earned, rounded down to the nearest 10 percent.
 5. 2x CMS Boards – Front: This item shall include the placement, rental and maintenance of two Changeable Message Signs adequate for traffic control required for the detour off Highway 101 directing traffic flow around the construction site as required for completion of the project. This bid item will be paid at each progress payment based on the number of months completed for the duration of required traffic control of the project.
 6. Sheeting Shoring and Bracing – Front: 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. 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 – Front: Quality Control as described in Specification Section 01 45 00 shall be paid on a lump sum based on the percent of the project earned, rounded down to the nearest 10 percent.
 8. Materials Testing – Front: Materials Testing as described in Specification Section 01 45 29 shall be paid on a lump sum based on the percent of the project earned, rounded down to the nearest 10 percent.
 9. Demolition – Front: Demolition is as described in Specification Section 02 41 00, “Demolition.” Demolition shall cover all work identified on Plan Sheets DM 1-5 of “Front Street Improvements Play to L Streets” 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 sidewalks, curb and gutters, paving, aggregate base, light poles, trees and landscaping, logs, foundations, seawalls, signs, storm drainage, sanitary sewer manholes, and pipes. This lump sum item will be paid based on the percent of the project earned, rounded down to the nearest 10 percent.
 10. Excavation for Road and Walks – Front: This item will be paid based on the bid unit price per cubic yard. Excavation work includes: required removal to make sidewalk and road sections per plan detail. Scarification and compaction of subgrade to required 90% compaction prior to placement of aggregate base material for all paved areas and new curbs, gutters, and sidewalks. 40 percent will be paid based on excavation of native material. 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 aggregate base. This item will be paid based on Owner’s estimate of the percent complete for each of the above activities.

11. Aggregate Base for paved section – Front: 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. This item will be paid based on Owner's estimate of the percent of total aggregate base placed during each billing cycle.
12. Hot Mix Asphalt Concrete – Front: 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.
13. Storm Drain 54 inch HDPE – Front: Installation of 54-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 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.
14. Storm Drain 48 inch HDPE – Front: Installation of 48-inch Storm Drainpipe will be paid at the bid unit price per foot in accordance with item 13 above.
15. Storm Drain 36 inch HDPE – Front: Installation of 36-inch Storm Drainpipe will be paid at the bid unit price per foot in accordance with item 13 above.
16. Storm Drain 24 inch HDPE – Front: Installation of 24-inch Storm Drainpipe will be paid at the bid unit price per foot in accordance with item 13 above.
17. Storm Drain 18 inch HDPE – Front: Installation of 18-inch Storm Drainpipe will be paid at the bid unit price per foot in accordance with item 13 above.
18. Storm Drain 10 inch and 12 inch HDPE – Front: Installation of 12-inch Storm Drainpipe will be paid at the bid unit price per foot in accordance with item 13 above.
19. Junction Box Double Lid – Front: ***The City to supply the junction box, grade rings, and frame and covers.*** Installation of the precast concrete manholes will be paid for on a per each basis. Work shall include installation of the new manholes in accordance with all specifications. This item comprises the following: excavation and disposal of native material, removal and disposal of existing structures where

- shown, backfill material, and compaction of materials to subgrade (Aggregate base ready to receive HMA within 3 feet of box). 90 percent will be paid on completion of compaction to subgrade. Final 10 percent will be paid upon adjusting lids to grade and completion of paving.
20. Junction Box Single Lid – Front: ***The City to supply the junction box, grade rings, and frame and covers.*** Installation of the precast concrete manholes will be paid for on a per each basis. Work shall include installation of the new manholes in accordance with all specifications. This item comprises the following: excavation and disposal of native material, removal and disposal of existing structures where shown, backfill material, and compaction of materials to subgrade (Aggregate base ready to receive HMA within 3 feet of box). 90 percent will be paid on completion of compaction to subgrade. Final 10 percent will be paid upon adjusting lids to grade and completion of paving.
21. Modifying existing Junction Box – Front: Modification existing concrete manhole will be paid for on a lump sum based on the percent of project earned. Work shall include modification of the existing manhole in accordance with all plans and specifications. This item comprises the following: excavation and disposal of native material, removal and disposal of existing structures where shown, backfill material, and compaction of materials to subgrade (Aggregate base ready to receive HMA within 3 feet of box). Payment shall be rounded down to the nearest 10 percent, until 90 percent is earned on completion of compaction to subgrade. Final 10 percent will be paid upon adjusting lids to grade and completion of paving.
22. Drainage Inlets (Caltrans Type G0) – Front: ***The City to supply the drainage inlets and grates.*** 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.
23. Drainage Inlets (Caltrans Type G1) – Front: ***The City to supply the drainage inlets and grates.*** Installation of the concrete drop inlets (CalTrans Type G1) 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.
24. 6" Sanitary Sewer Mainline – Front: Installation of sewer lines will be paid at the bid unit price per 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).

25. 4" Sanitary Sewer Lateral – Front: Installation of sewer lines will be paid at the bid unit price per 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).
26. Sanitary Sewer Cleanout with G-5 Boxes & Lids – Front: 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.
27. 10" Water Line – Front: Installation of water lines will be paid at the bid unit price per 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). 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.
28. 8" Water Line – Front: Installation of water lines will be paid at the bid unit price per 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). 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.
29. 6" Water Line – Front: Installation of water lines will be paid at the bid unit price per 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). 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.

30. Fire Hydrants – Front: Installation of new fire hydrants assembly will be paid for on an installation per each basis. Work shall include the installation of the new hydrants 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, backfill material, installation of companion valve and G-5 box and lid, and compaction of materials to grade. 90 percent will be paid on completion of compaction to subgrade. Final 10 percent will be paid upon completion of all required testing, flushing, and disinfection is completed successfully.
31. 10" Gate Valves with G-5 Valve Boxes & Lids – Front: Installation of water valves and precast boxes will be paid for on a per each basis. Work shall include the installation of the new valves & boxes in accordance with all specifications. Water valves include mainline valves, valves for service connections and irrigation, combination air valves, and blow-off valves. This item comprises the following: excavation and disposal of native material, removal, and salvage of existing valves and/or structures where shown, backfill material, installation of valves and needed appurtenances, and compaction of materials to grade. 90 percent will be paid on completion of compaction to subgrade if all required testing, flushing, and disinfection are completed successfully. Final 10 percent will be paid upon completion of paving.
32. 8" Gate Valves with G-5 Valve Boxes & Lids – Front: Installation of water valves and precast boxes will be paid for on a per each basis. Work shall include the installation of the new valves & boxes in accordance with all specifications. Water valves include mainline valves, valves for service connections and irrigation, combination air valves, and blow-off valves. This item comprises the following: excavation and disposal of native material, removal, and salvage of existing valves and/or structures where shown, backfill material, installation of valves and needed appurtenances, and compaction of materials to grade. 90 percent will be paid on completion of compaction to subgrade if all required testing, flushing, and disinfection are completed successfully. Final 10 percent will be paid upon completion of paving.
33. 6" Gate Valves with G-5 Valve Boxes & Lids – Front: Installation of water valves and precast boxes will be paid for on a per each basis. Work shall include the installation of the new valves & boxes in accordance with all specifications. Water valves include mainline valves, valves for service connections and irrigation, combination air valves, and blow-off valves. This item comprises the following: excavation and disposal of native material, removal, and salvage of existing valves and/or structures where shown, backfill material, installation of valves and needed appurtenances, and compaction of materials to grade. 90 percent will be paid on completion of

- compaction to subgrade if all required testing, flushing, and disinfection are completed successfully. Final 10 percent will be paid upon completion of paving.
34. 4" Gate Valves with G-5 Valve Box & Lids – Front: Installation of water valves and precast boxes will be paid for on a per each basis. Work shall include the installation of the new valves & boxes in accordance with all specifications. Water valves include mainline valves, valves for service connections and irrigation, combination air valves, and blow-off valves. This item comprises the following: excavation and disposal of native material, removal, and salvage of existing valves and/or structures where shown, backfill material, installation of valves and needed appurtenances, and compaction of materials to grade. 90 percent will be paid on completion of compaction to subgrade if all required testing, flushing, and disinfection are completed successfully. Final 10 percent will be paid upon completion of paving.
35. 2" Gate Valves with G-5 Valve Box & Lids – Front: Installation of water valves and precast boxes will be paid for on a per each basis. Work shall include the installation of the new valves & boxes in accordance with all specifications. Water valves include mainline valves, valves for service connections and irrigation, combination air valves, and blow-off valves. This item comprises the following: excavation and disposal of native material, removal, and salvage of existing valves and/or structures where shown, backfill material, installation of valves and needed appurtenances, and compaction of materials to grade. 90 percent will be paid on completion of compaction to subgrade if all required testing, flushing, and disinfection are completed successfully. Final 10 percent will be paid upon completion of paving.
36. 1" and/or 2" Service Lines – Front: 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. 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 road base).
37. 2" Irrigation Lines – Front: Installation of irrigation 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, backfill material, and compaction of materials to subgrade (soil ready to receive landscaping). .
38. Water Meter Connections – Front: City to supply meters and boxes. 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.

39. Relocate Gas Line – Front: Gas materials and installation done by Blue Star Gas.. Excavation and backfill for gas lines will be paid at the bid unit price per linear foot. This item comprises the following: coordination with Blue Star Gas, 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 road base).
40. Electrical – Front: This item shall be paid on a lump sum basis and shall include all light pole foundations, foundations for meter pedestals, pull boxes, electrical conduit with pull tape, receptacles, covers, related conductors, electrical enclosures, breakers, needed appurtenances and other subsurface items related to the final buildout of the electrical system, as shown on the Plans. **Confirm on site the existing points of connection for all work inclusive with this contract.** 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.
41. Streetlights Single Head– Front: This item shall be paid on a per each basis and shall include all the work necessary to install light poles and all equipment needed for fully functional lights. 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: furnishing and installation of light poles (poles, mounting arms, luminaires, and hardware).
42. Streetlights Double Head – Front: This item shall be paid on a per each basis and shall include all the work necessary to install light poles and all equipment needed for fully functional lights. 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: and furnishing and installation of light poles (poles, mounting arms, luminaires, and hardware).
43. Streetlights Relocate Salvaged Double Head – Front: This item shall be paid on a per each basis and shall include all the work necessary to relocate the salvaged light pole included as shown in the demolition plan sheets and placed with on a new foundation in the planter island at approximately Station 33+50. The existing adjacent pull box has the necessary wiring to complete this item. This item comprises the following: furnishing and installation of light poles (poles, mounting arms, luminaires, and hardware).
44. Stamped Color Concrete Sidewalks – Northside Front Street: This item will be paid at the bid unit price per square foot. This item includes all work necessary to construct concrete sidewalks on the north side of Front Street including, subgrade preparation, placing and compaction of aggregate base, coloring the concrete, stamping of the concrete (using city provided stamps), and all other items needed to install the sidewalks in accordance with the specifications. The City will provide the stamps. Reference color notes in specification 32 13 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.

45. Concrete Sidewalks – Southside Front Street: This item will be paid at the bid unit price per square foot. This item includes all work necessary to construct concrete sidewalks on the south side of Front Street and Play Street including, subgrade preparation, placing and compaction of aggregate base, and all other items needed to install the sidewalks in accordance with the specifications. This item to be paid based on Owner's estimate of the square footage of sidewalk installed on the project during each billing cycle.
46. Concrete Sidewalks – K Street: This item will be paid at the bid unit price per square foot. This item includes all work necessary to construct concrete sidewalks on the K Street including, subgrade preparation, placing and compaction of aggregate base, and all other items needed to install the sidewalks in accordance with the specifications. This item to be paid based on Owner's estimate of the square footage of sidewalk installed on the project during each billing cycle.
47. Reinforced Concrete Driveways – Front: Reinforced concrete will be paid based on the bid unit price per square foot. This item includes all labor, materials, and equipment necessary to construct valley gutters, driveways, subgrade preparation, placing and compaction of aggregate base, rebar, and all other items needed to install the driveways in accordance with the plans and specifications. This item to be paid based on Owner's estimate of the square feet of concrete installed on the project during each billing cycle.
48. Reinforced Stamped Color Concrete Crosswalk – Front: Reinforced concrete will be paid based on the bid unit price per square foot. This item includes all labor, materials, and equipment necessary to construct colored and stamped concrete street crossings, subgrade preparation, placing and compaction of aggregate base, coloring the concrete, stamping of the concrete (using city provided stamps), rebar, and all other items needed to install the crossings, in accordance with the plans and specifications. Reference color notes in specification 32 13 13. This item to be paid based on Owner's estimate of the square feet of concrete installed on the project during each billing cycle.
49. ADA Dome Panels - Front: 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. 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.
50. Concrete Curb and Gutter – Front: This item will be paid on the bid unit price per linear foot and includes all work necessary to construct concrete curbs and gutters including excavation and disposal of native soils, subgrade preparation, aggregate

- base, compaction, and all other items needed for a complete and functioning curb and gutter system. This item to be paid based on Owner's estimate of the linear feet of curb and gutter installed on the project during each billing cycle.
51. Concrete Curb No Gutter – Front: This item will be paid on the bid unit price per linear foot and includes all work necessary to construct concrete curbs, including excavation and disposal of native soils, subgrade preparation, aggregate base, compaction, and all other items needed for a contiguous curb as shown on the Plans. This item to be paid based on Owner's estimate of the linear feet of curbs installed on the project during each billing cycle.
 52. Bike Lane Color Asphalt Treatment – Front: Asphalt coloring will be paid based on the bid unit price per square foot. This item includes all labor, materials, and equipment necessary to mark pavement in accordance with the plans, specifications, Chapter 3G of the California MUTCD, and chapter 84-2 of the CalTrans Standard specifications. This item to be paid based on Owner's estimate of the square feet of pavement marking installed on the project during each billing cycle.
 53. Pavement Striping and Signs – Front: This item includes all work necessary to stripe crosswalks, center lines, fog lines and other striping as shown on the Plans. This item will be paid for on a lump sum price basis based on Owner's estimate of the percent of striping completed during each billing cycle.
 54. Storm Drain 42 inch HDPE – Front: Installation of 42-inch Storm Drainpipe will be paid at the bid unit price per foot in accordance with item 13 above.
 55. 4" Water Line – Front: Installation of water lines will be paid at the bid unit price per 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). 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
 56. Reserved for future use
 57. Reserved for future use
 58. Reserved for future use
 59. Reserved for future use
 60. Reserved for future use

61. Mobilization – Gateway: Mobilization is as described in Section 9-1.16D, “Mobilization” of the Standard Specifications. Mobilization will be paid on a lump sum basis in accordance with Public Contract Code as follows provided that total mobilization cost does not exceed 10 percent of the total bid: 50 percent when 5 percent of the project is earned. 75 percent when 10 percent is earned. 95 percent when 20 percent is earned. 100 percent when 50 percent is earned. Where mobilization exceeds 10 percent of the contract, see Public Contract Code.
62. SWPPP Plan and Reporting – Gateway: This item includes all additional work necessary for developing a stormwater pollution prevention plan by a qualified QSD and reporting results of work covered under this item in accordance with Specification Section 01 57 23. This lump sum item will be paid based on the percent 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.
63. Water Pollution Prevention BMPs – Gateway: 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. This lump sum item will be paid based on the percent 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.
64. Pedestrian & Traffic Control – Gateway: Traffic Control is as described in Specification Section 01 55 26, “Temporary Traffic Control”. This lump sum item will be paid based on the percent of the project earned, rounded down to the nearest 10 percent.
65. Tree protection fencing installation and removal – Gateway: Installation (and removal after construction) of tree protection fencing will be paid at the bid unit price per foot. Work shall include the installation in accordance with all plans and specifications. 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. Some of the fencing shown on the plans is under the Beachfront Park Tolowa Cultural Trail Project contract.
66. Clear, Grub & Tree Removal – Gateway: 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 percent of the project earned, rounded down to the nearest 10 percent. Some of this work shown on the plans is under the Beachfront Park Tolowa Cultural Trail Project contract.
67. Demolition of Miscellaneous Fencing, Signs, Guard Rails & Fixtures – Gateway: Demolition is as described in Specification Section 02 41 00, “Demolition.” Demolition shall cover all work identified on Plan Sheets L3.01-3.04 of “Cultural Gateways and

- Beautification Project” 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 fencing, signs, guard rails and fixtures shown in plans. This lump sum item will be paid based on the percent of the project earned, rounded down to the nearest 10 percent.
68. Demolition of Concrete Walls, Stairs, Art Panels, and Porte Cochere – Gateway: Demolition is as described in Specification Section 02 41 00, “Demolition.” Demolition shall cover all work identified on Plan Sheets L3.01-3.04 of “Cultural Gateways and Beautification Project” 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 concrete walks, stairs, art panels and Porte Cochere wall panels to grades shown in the plan set. This lump sum item will be paid based on the percent of the project earned, rounded down to the nearest 10 percent.
69. Demolition of Asphalt – Gateway: This bid item will be paid based on the bid unit price per square foot. Demolition is as described in Specification Section 02 41 00, “Demolition.” Demolition shall cover all work identified on Plan Sheets L3.01-3.04 of “Cultural Gateways and Beautification Project” 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 asphalt surfaces shown in plans. This item will be paid based on Owner’s estimate of the square feet of asphalt demolished during each billing cycle. Some of this work shown on the plans is under the Beachfront Park Tolowa Cultural Trail Project contract.
70. Demolition of Building Deck & Handrail – Gateway: Demolition is as described in Specification Section 02 41 00, “Demolition.” Demolition shall cover the work identified on Plan Sheets S2.10 and S7.01 of “Cultural Gateways and Beautification Project”. Work includes but is not limited to removal and disposal or salvage of building deck and handrail. This lump sum item will be paid based on the percent of the project earned, rounded down to the nearest 10 percent.
71. Mass Excavation and Fill including Porte Cochere – Gateway: This item shall be paid on a lump sum basis and shall include removal and relocation of spoils to grade front of Cultural Center per plan detail. 50 percent will be paid based on excavation of native material. 10 percent will be paid based on completion of scarification and compaction. The remaining 40 percent will be paid once subgrade is prepared and ready to accept aggregate base and stockpile areas are all cleaned and graded out.
72. Excavation and Grading for Concrete Flatwork – Gateway: This bid item will be paid based on the bid unit price per square foot. Excavation work includes: required removal to make sidewalk and road sections per plan detail. Scarification and compaction of subgrade to required 90% compaction prior to placement of aggregate base material for all paved areas and new curbs, gutters, and sidewalks. 40 percent will be paid based on excavation of native material. 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 aggregate base. Some of this work

shown on the plans is under the Beachfront Park Tolowa Cultural Trail Project contract. The provided bid quantities have been adjusted to exclude this work.

73. Aggregate Base for Flatwork – Gateway: 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 (excluding street sidewalks). 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 percent of total aggregate base placed during each billing cycle. Some of this work shown on the plans is under the Beachfront Park Tolowa Cultural Trail Project contract. The provided bid quantities have been adjusted to exclude this work.
74. Gateway Sign Foundation @ Play Street: Not in Contract
75. Wave Sign Foundation @ M Street: Not in Contract
76. Concrete Vehicular Paving – Gateway: 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. This item to be paid based on Owner's estimate of the square footage of paving installed on the project during each billing cycle. Some of this work shown on the plans is under the Beachfront Park Tolowa Cultural Trail Project contract. The provided bid quantities have been adjusted to exclude this work.
77. Concrete Sidewalks – Gateway: 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 Cultural Gateways and Beautification Project plans & specifications. This item to be paid based on Owner's estimate of the square footage of sidewalk installed on the project during each billing cycle. Some of this work shown on the plans is under the Beachfront Park Tolowa Cultural Trail Project contract. The provided bid quantities have been adjusted to exclude this work.
78. ADA Dome Panels – Front & Gateway: 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 Front Street Improvements Play to L Streets Plans, Cultural Gateways and Beautification Project Plans **on the southside sidewalk on Front Street and the Cultural Trail**, and in accordance with the CalTrans Standard Plans and Specifications. 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. Some of this work shown on the plans is under the Beachfront Park Tolowa Cultural Trail Project contract. The provided bid quantities have been adjusted to exclude this work.

79. Permeable Concrete – Front: This item will be paid at the bid unit price per square foot. This item includes all work necessary to construct vehicular permeable concrete pavement, subgrade preparation, placing and compaction of permeable aggregate base, and all other items needed to install the permeable concrete in accordance with the Front Street Improvements Play to L Streets plans & specifications. This item to be paid based on Owner's estimate of the square footage of permeable concrete installed on the project during each billing cycle. **This item does not receive reinforcing steel.**
80. Concrete Slab @ Porte Cochere– Gateway: This item will be paid at the bid unit price per square foot. This item includes all work necessary to construct a 4-inch thick non-reinforced concrete slab with a broom finish at the Porte Cochere, subgrade preparation, and all other items needed to install the slab in accordance with the Cultural Gateways and Beautification Project plans & specifications. This item to be paid based on Owner's estimate of the square footage of sidewalk installed on the project during each billing cycle.
81. Concrete Retaining Wall at Stairs – Gateway: This item will be paid at the bid unit price per linear foot. This item includes all work necessary to construct a retaining wall at the stairs including subgrade preparation, placing and compaction of aggregate base, and all other items needed to install the retaining wall in accordance with the Cultural Gateways and Beautification Project plans & 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.
82. Concrete Seat Wall – Gateway: 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, and all other items needed to install the seat wall in accordance with Detail 4 & 7 on L9.03 of the Cultural Gateways and Beautification Project plans & 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. Some of this work shown on the plans is under the Beachfront Park Tolowa Cultural Trail Project contract. The provided bid quantities have been adjusted to exclude this work.
83. Concrete Stairs – Gateway: This item will be paid at the bid unit price per square foot. This item includes all work necessary to construct concrete stairs including subgrade preparation, and all other items needed to install the stairs in accordance with L9.04 of the Cultural Gateways and Beautification Project plans & specifications. This item to be paid based on Owner's estimate of the square feet of wall installed on the project during each billing cycle.
84. Concrete Mow Curb – Gateway: 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 Detail 6 on L9.02 of the Cultural Gateways and Beautification Project plans & 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. Some of this work shown on the plans is under the Beachfront Park Tolowa Cultural Trail Project contract. The provided bid quantities have been adjusted to exclude this work.
85. Concrete Subgrade (rat) Slab – Gateway: Not in Contract.
 86. Reinforced Color Concrete Slabs for Cultural Node Surfacing – Gateway Nodes: Not in Contract
 87. Surface colored reinforced Concrete Trail Markers – Gateway: Not in Contract
 88. Lithocrete Basket Pattern: Not in Contract
 89. Lithocrete Pebble Pattern: Not in Contract
 90. Drainage Inlets (Caltrans Type G2 and GD0) – Gateway: ***The City to supply the drainage inlets and grates.*** Installation of the concrete drop inlets (CalTrans Type G2 and GD0) 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.
 91. Install Area Drains – Gateway: ***The City to supply the drainage inlets and grates.*** Installation of the concrete area drain inlets 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.
 92. Install French Drains – Gateway: Installation of the French drains, will be paid for per linear foot. Work shall include the installation of the filter wrapped perforated pipe and drain rock in accordance with all plans and specifications. This item comprises the following: excavation and disposal of native material, placement of drain rock, filter wrapped perforate pipe, and placement of backfill material.
 93. Storm Drain 4 inch HDPE – Gateway: Installation of 4-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 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 base rock if applicable). Pipe measurement will include the actual length

- of pipe installed and will not include waste pipe or measurement through junction structures or other structures.
94. Storm Drain 12 inch HDPE – Gateway: Installation of 12-inch Storm Drainpipe will be paid at the bid unit price per foot in accordance with item 93 above.
 95. Storm Drain 24 inch HDPE – Gateway: Installation of 24-inch Storm Drainpipe will be paid at the bid unit price per foot in accordance with item 93 above.
 96. Storm Drain 36 inch HDPE – Gateway: Installation of 36-inch Storm Drainpipe will be paid at the bid unit price per foot in accordance with item 93 above.
 97. Landscape Soil Import – Gateway: 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.
 98. Lawn Irrigation – Gateway: 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).
 99. Planting Areas Irrigation – Gateway: Installation of irrigation lines will be paid at the bid unit price per lump sum. Work shall include installation of the new lines, sprinklers, valves, fittings, controllers, sensors, backflow devices, meters, 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).
 100. Planting Lawn – Gateway: Seeding of lawn will be paid at the bid unit price per square foot. Work shall include soil preparation, approval of seed mixture, and seeding, etc. in accordance with all plans and specifications including Specification 32 92 00. 50 percent will be paid on completion of soil preparation and 40 percent will be paid on completion of seeding.
 101. Planting Ground Cover & Shrubs – Gateway: Planting of ground cover and shrubs will be paid at the bid unit price per lump sum. Work shall include soil preparation, approval of seed/plant selection, and placement, etc. in accordance with all plans and specifications including Specification 32 93 00.

102. Planting Trees – Gateway: 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.
103. 4 inches Bark Mulch – Gateway: 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.
104. Landscaping Maintenance – Front & Gateway: Landscape maintenance will be paid at the bid unit price per lump sum. Work shall include as required reseeding/replacement of trees/shrubs/plants which die for any cause, pruning, irrigation system inspection and maintenance, application of bark mulch, fertilizer, herbicide, and/or pesticide in accordance with all Front Street Improvements Play to L Streets plans, Cultural Gateways and Beautification Project plans, and specifications including Specification 32 93 10. 8.3 percent will be paid on a monthly progress payment over the course of one year starting with the City's issuance of a Substantial Completion letter.
105. Landscaping Rock - Front: Landscaping shall be paid on a square foot basis and shall include labor, materials, and equipment needed to install decorative rock, geotextile (filter fabric), and all other landscaping as shown on the Front Street Improvements Play to L Streets plans and specifications. This item will be paid based on Owner's estimate of the square feet of landscaping rock placed during each billing cycle.
106. Travel Planning Signs – Gateway: Installation of travel planning signs will be paid at the bid unit price per each. Work shall include assembly, placement and coordination with interpretive fabricator in accordance with all Detail 8 on L9.01 and sheet F8 in the Cultural Gateways and Beautification Project plans and specifications. The City to provide artwork and panels to be placed within Signs. This item will be paid based on Owner's estimate of the number of signs placed during each billing cycle.
107. Welcome Sign: Not in Contract
108. Install Electrical Control Panels, conduit and wire for lighted bollards, wall/stair plaza lighting, and power supply for cultural nodes and sound boxes: Not in Contract
109. Electrical Seat Wall & Steps Lighting – Gateway: The installation of recessed lighting shall be paid on a per each basis and shall include all labor, fixtures as shown in Detail 2 on L9.05 of the Cultural Gateways and Beautification Project 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 fixtures installed on the project during each billing cycle.

110. Electrical Lighted Bollards – Gateway: The installation of lighted bollards shall be paid on a per each basis and shall include all labor, foundation, fixtures as shown in Detail 6 on L9.05 of the Cultural Gateways and Beautification Project 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 bollards installed on the project during each billing cycle.
111. Removable Bollard – Gateway: 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 7 on L9.05 of the Cultural Gateways and Beautification Project 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 bollards installed on the project during each billing cycle.
112. Install Stair Handrails – Gateway: Installation of the handrails at concrete stairs will be paid for per linear foot. Work shall include the fabrication and installation of the handrail (excluding skate deterrence features) in accordance with page L9.04 & L9.05 of the Cultural Gateways and Beautification Project plans 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.
113. Install Bicycle Racks – Gateway: Installation of the bicycle racks at the Porte Cochere will be paid for per each. Work shall include the purchase and installation of the bicycle racks in accordance with detail 1 on page L9.05 of the Cultural Gateways and Beautification Project plans and specifications. 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.
114. Skate Deterrent Features – Gateway: Not in Contract
115. Drinking Fountain and Sanitary Sewer Line – Gateway: The installation of the accessible drinking fountain and the 4-inch sanitary sewer line will be paid at the bid unit price per lump sum. Installation of the accessible drinking fountain shall include foundation, surface mounting, and plumbing in accordance with detail 3 on sheet L9.05. Installation of the 4-inch sanitary sewer line with gravity drainage to the manhole on Play Street comprises the following: excavation and disposal of native material, removal and disposal of existing structures, backfill material, temporary sewer connections to provide continuous service, and compaction of materials per sheet C1.00 of the Cultural Gateways and Beautification Project plans, and specifications. 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.
116. Discovery Center Renovation – Gateway: Renovations will be paid at the bid unit price per lump sum. Work shown on sheets A2.11 (excluding A2.12) and structural

sheet S0.01 through S0.03 include first floor landscaping, concrete wall modifications, removal of steel railing, wood bridge, exit signage, and patch/repair balcony deck and handrailing in accordance with all Cultural Gateways and Beautification Project plans, and specifications.

END OF SECTION

SECTION 01 21 43

TIME ALLOWANCES

1.0 COMPLETION SCHEDULE

1.01 BASE BID

The Contractor will have until November 30, 2026 to complete all items associated with the California Clean Gateway Project.

The Contractor may, at his/her option, work seven days per week and holidays.

K Street and 2nd Street intersection must be only be shut down for a maximum of 75 calendar days. This work must be completed prior to reworking the Front Street entrance to this parking lot. If the contractor elects to perform this work on an alternate project schedule, this schedule change must be approved by the City. This parking lot will not at any time be entirely closed to the public.

1.02 ADDITIVE ALTERNATIVE 1 – N/A

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.
2. Landscape Architect's Action: If necessary, Landscape Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Landscape Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Landscape Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Landscape Architect does not issue a decision on use of a proposed substitution within time allocated.

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 shall also include, but not be limited to, mechanical, electrical and electronic equipment, systems, materials, reinforcing steel, fabricated items, piping, and conduit details. The Construction Superintendent 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.

~~The Contractor and his designees will be set up as users in the City's Virtual Project Manager (VPM). VPM is a cloud-based system that will be used to process all payments, RFI's, submittal, reports, and will act as a file for all other project documents. If a Contractor is unable to scan documents or provide digital submittals, the City will digitize and upload the documents required as part of this Contract at the Contractor's expense. These expenses will be billed to the Contractor on a monthly basis.~~

2.0 CONSTRUCTION SUPERINTENDENT'S RESPONSIBILITIES

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

The Construction Superintendent should coordinate submittals with the work so that work will not be delayed. He should coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another.

The Construction Superintendent should not proceed with work related to a submittal until the submittal process is complete. This requires that submittals for review and comment shall be returned to the Construction Superintendent stamped "No Exceptions Taken" or "Make Corrections Noted." The Construction Superintendent shall certify on each submittal document that he has reviewed the submittal, verified field conditions, and complied with the contract documents.

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 which are for information only are generally specified as PRODUCT DATA in Part 2 of applicable specification sections.

B. SUBMITTALS FOR REVIEW AND COMMENT

All submittals except where specified to be submitted as product data for information only shall be submitted by the Construction Superintendent to the Engineer for review and comment.

C. SUBMITTALS (PRODUCT DATA) FOR INFORMATION ONLY

Where specified, the Construction Superintendent shall furnish submittals (product data) to the Engineer for Information only. If required, submittal requirements for operation and maintenance manuals, which are included in this category, are specified elsewhere.

4.0 TRANSMITTAL PROCEDURE

A. GENERAL

~~Contractor must use VPM for submittal. If Contractor is unwilling or unable to use VPM, then follow the following procedure. City will charge Contractor for digitization and uploading of all paper submittals.~~

Unless otherwise specified, submittals regarding material and equipment shall be accompanied by Transmittal Form 01300-A specified in Section 00 62 00. Submittals for operation and maintenance manuals, information, and data shall be accompanied by Transmittal Form 01730-A specified in Section 01999. A separate form shall 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 shall be identified with all the appropriate equipment numbers. Submittals for various items shall 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, shall be noted on the transmittal form accompanying each item submitted. Original submittal numbers shall have the following format: "XXX"; where "XXX" is the sequential number assigned by the Construction Superintendent. Resubmittals shall 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

~~Contractor shall utilize VPM for this process.~~

If the Construction Superintendent proposes to provide material, equipment, or method of work which deviates from the project manual, he shall indicate so 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 Construction Superintendent's judgment of their conformance to the specified requirements. Other features and characteristics are specified in a manner which enables the Construction Superintendent to determine acceptable options without submittals. The review procedure is based on the Construction Superintendent's guarantee that all features and characteristics not requiring submittals conform as specified. Review shall 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 Construction Superintendent shall submit using VPM. Upon Construction Manager's or Owner's request, the Contractor shall provide:~~

1. Four (4) copies of all submitted information plus one reproducible original of all information shall be transmitted with submittals for review and comment.
2. Unless otherwise specified, 2 copies of all submitted information shall be transmitted with submittals (Product Data) for information only.

B. SUBMITTALS FOR REVIEW AND COMMENT:

~~Comments will normally be returned through VPM. If VPM is not able to be used for whatever reason, then the following procedure will apply.~~

Unless otherwise specified, within 20 calendar days after receipt of a submittal for review and comment, the Engineer 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 Engineer. The returned submittal shall 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 Construction Superintendent 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 Construction Superintendent may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in O&M data, a corrected copy shall be provided.
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 Construction Superintendent shall 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 which have not been identified clearly may be rejected. Except at his own risk, the Construction Superintendent shall 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 shall be provided as part of the work under this contract and its acceptability determined under normal inspection procedures.

6.0 EFFECT OF REVIEW OF CONSTRUCTION SUPERINTENDENT'S SUBMITTALS

Review of contract drawings, methods of work, or information regarding materials or equipment the Construction Superintendent proposes to provide, shall not relieve the Construction Superintendent of his responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Engineer, or by any officer or employee thereof, and the Construction Superintendent shall 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" shall mean that the Engineer has no objection to the Construction Superintendent, upon his own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

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 and 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. The City Building Official, City Manager, and City Public Works Director are each designated to act in this role.

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.
9. 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.
10. 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.
11. 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. 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)

D. 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.

1.06 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, 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.

C. 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.

D. 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.

E. 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 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 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 Coarse 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

Reference	Title
ASTM C42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
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 CI077	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
ASTM E994	Calibration and Testing Laboratory Accreditation Systems
IBC	General Requirements for Operation and Recognition 2022 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:

- 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 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.*
- B. Documentation of conformance with Testing Laboratory Qualifications as specified in paragraph 01 45 29-1.03 herein.
- C. Form A described in paragraph 01 45 29-3.03 herein, by both Testing Laboratory and Contractor.
- D. 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 20 00 and Section 31 23 33. 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 Section 31 20 00 and Section 32 12 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 30 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 shall be 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:

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.

~~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 10 14 53, Section 10 45 00, and Section 32 17 00.~~

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.
- ~~4. 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.~~
- ~~5. 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).~~

~~E. 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.~~

~~F. 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 8.9 for visual inspection and paragraphs 8.13 for ultra-sonic and 18.14.4 for 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.~~

~~G. 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.~~

~~H. 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
03 30 00 Cast-in-Place Concrete		
05 50 00 Metal Fabrications		
10 14 53 Traffic Signs		
10 45 00 Aluminum Signs		

31 20 00 Earth Moving		
32 12 00 Flexible Paving		
32 17 00 Paving Specialties		

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.

The Contractor is to work within in the requirements set forth in the Caltrans Encroachment Permit for the traffic devices, detour signage, and CMS boards placed within the Caltrans ROW.

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 flag persons 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 for such.

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

Detours shall comply with conditions issued with the Encroachment Permit.

E. TRAFFIC CONTROL PLAN SUBMITTAL

A conceptual Traffic Control Plan has been included in the Project Plans.

The Final Traffic Control Plan shall be consistent with the conceptual Traffic Control Plan shown on the Project Plans, Standard Plans and the "Manual of Traffic Controls for the Construction and Maintenance in Work Zones". The plan shall show the details of, and designate, all signs, barricades, marking and other traffic control devices the Contractor will use to maintain the passage of public traffic (including pedestrians) through, around and within the project site during construction. The plan shall demonstrate how access to all properties will be maintained at all times during construction. The plan shall describe any detours to be created, streets to be closed, lane closures, and the anticipated maximum traffic delays due to temporary road or lane closures. The City will approve, conditionally approve, or reject the submitted plan within five (5) business days.

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.

By noon each Monday, the Contractor shall submit a written schedule of planned closures for the following week period, defined as Friday noon through the following Friday noon. The closure schedule shall show the locations and times when the proposed closures are to be in effect. The Contractor will be notified of disapproved closures or closures that require coordination with other parties as a condition of approval, by Wednesday noon. Traffic closure information shall be included in the weekly Public Information notices required by Section 01 00 00, "General Requirements".

The Traffic Control Plan shall describe short term traffic control measures for the work along Front Street, K Street, and Play Street. Attention is directed to Section 7-1.03, "Public Convenience," and Section 7-1.04 "Public Safety" of the Caltrans Standard Specifications. Nothing in these Special Provisions shall be construed as relieving the Contractor from the responsibilities specified in these sections.

The Traffic Control Plan shall be updated or revised within five (5) working days of the Engineer's written request to do so.

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 01 50 00 "Temporary Facilities and Controls" for temporary site fencing.
 - 2. Section 31 10 00 "Site Clearing" for removing existing trees and shrubs.
 - 3. Section 31 20 00 "Earth Moving"

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 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.
 - 2. Detail fabrication and assembly of protection-zone fencing and signage.
 - 3. Indicate extent of trenching by hand or with air spade within protection zones.
- C. Samples: For each type of the following:
 - 1. Wood Chip Mulch: 1-quart volume of wood chip mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
 - 2. Organic Mulch: 1-quart volume of wood chip mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
 - 3. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.

4. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.
- D. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
 1. Species and size of tree.
 2. Location on site plan. Include unique identifier for each.
 3. Reason for pruning.
 4. Description of pruning to be performed.
 5. Description of maintenance following pruning.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For arborist and tree service firm.
- B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
- D. 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.
- E. Quality-control program.

1.6 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist as certified by ISA.
- B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.7 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. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and wood chip mulch.
 - D. 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.
- C. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:
 1. Size: As shown on Drawings
 2. Lettering: 3-inch-high minimum, black characters on white background.

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.

- B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

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.
- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.
 - 1. Apply 4-inch uniform thickness of wood chip mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

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. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Owner's Representative. Install one sign spaced approximately every 20 feet on protection-zone fencing, but no fewer than four signs with each facing a different direction.
- C. 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.

3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.

- B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.
- C. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

- A. Prune tree roots that are affected by temporary and permanent construction if unavoidable. Prune as follows:
 - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - 2. Cut Ends: Do not paint cut root ends
 - 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 - 4. Cover exposed roots with burlap and water regularly.
 - 5. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."
- B. Root Pruning at Edge of Protection Zone: Prune tree roots 12 inches outside of the protection zone by cleanly cutting all roots to the depth of the required excavation.

3.6 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.
 - 1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
 - 2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
 - 3. Pruning Standards: Prune trees according to ANSI A300 (Part 1)
- B. Unless otherwise directed by arborist and acceptable to Owner's Representative, do not cut tree leaders.
- C. Cut branches with sharp pruning instruments; do not break or chop.
- D. Do not paint or apply sealants to wounds.
- E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.
- F. Chip removed branches and spread over areas identified by Owner's Representative.

3.7 FIELD QUALITY CONTROL

- A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.8 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated 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 according to arborist's written instructions.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Owner's Representative.
- B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Owner's Representative determines are incapable of restoring to normal growth pattern.
 - 1. Small Trees: Provide new trees of same size and species as those being replaced for each tree.
 - 2. Large Trees: Provide new tree(s) in quantity and caliper size for each tree being replaced that measures more than 4 inches in caliper size. Total DBH replaced must equal DBH of tree damaged.
 - a. Species: As selected by Owner's Representative
 - b. Plant replacement trees in location as directed by Owner's Representative.
 - 3. Plant and maintain new trees as specified in Section 329300 "Plants."

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

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

The City requires a Storm Water Pollution Prevention Plan (SWPPP) for this Project by a qualified QSD per the statewide General Storm Water Permit requirements. All reporting and inspections of the SWPPP will be performed by the Contractor. The attached and enclosed SWPPP are for suggestion purposes only. 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.

END OF SECTION

SECTION 01 71 33

PROTECTION OF PROPERTY

PART 1 – GENERAL

The work to be done under this section shall include the furnishing of all materials, labor, tools, equipment, and necessary incidentals as required to protect public and private property during construction and, if necessary, restore same if damaged.

PART 2 – PRODUCTS

Contractor must submit a Building Protection Plan for any building within a horizontal distance of double the depth of any excavation. (For example, for an excavation of 12 feet, a building 24 feet or less from the excavation must have a Building Protection Plan). The plan will describe how the excavation will be made and backfilled to prevent any horizontal or vertical movement that could potentially damage the building, and must include, at a minimum the following:

1. method and equipment to excavate,
2. detailed plans of shoring method,
3. detailed plans of any specific support, bracing or underpinning of the building,
4. description of method of backfilling,
5. description of shoring removal,
6. description of method of monitoring movement of the building.

The City will approve, conditionally approve, or reject the submitted plan within five (5) business days of receipt. The City's approval of the plan will not relieve the Contractor of his or her full responsibility for any damage done as a result of the project.

No Building Protection Plan or Foundation Monitoring is required where the depth of excavation does not exceed 6 feet below grade. This does not relieve the Contractor from his responsibility to protect property or make repairs to damaged property.

PART 3 – EXECUTION

3.01 BUILDINGS

- A. No excavation may proceed within 100 feet of a building requiring a Building Protection Plan until said plan has been approved. Neither may any excavation proceed until all monitoring benchmarks have been set and pre-excavation lines and/or grades determined.
- B. Buildings must be monitored daily while excavation, backfilling and compaction work is taking place within 50 feet of the building. After

completion of compaction, monitoring must continue on a monthly basis for one year after project completion. Monitoring must be performed by a licensed Land Surveyor or Registered Civil Engineer. Written field notes must be kept of the monitoring and copies provided the City upon request.

- C. The Contractor will be liable for any damage to any building and must hold the City harmless from any liability or expense for injury, damage, or repair to same.
- D. Contractor will be responsible for repairing any damage to existing buildings caused by his operations. The Engineer will determine the extent of the damage and the method of repair.

3.02 MISCELLANEOUS

All dewatering, excavation, shoring, bracing, backfilling, compaction, and removal of dewatering system must proceed in accordance with the approved plan.

END OF SECTION

SECTION 01 74 23

FINAL CLEANING

PART 1 - 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 the 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.

B. 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.

C. 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.

D. SITE CLEANUP

1. 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.
2. The Contractor's use of private property for whatever use regarding this project, such as access, materials and equipment storage, waste disposal, etc., will require a written agreement between the property owner and the Contractor, submitted to the City for approval prior to use of the private property. The agreement shall specifically hold the City harmless, free of any responsibility, resulting from use of the private property.
3. 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 existing storm drains that will remain in service in the project must also be cleaned.
4. All temporary utility drops, fencing, and water supply outlets shall be removed.
5. All plant gate identification signs, barricades, tools, rubbish collection receptacles and other such items shall be removed by the Contractor.
6. All dust, mud, excavated spoils, and construction debris shall be removed from all roadways, ditches, shoulders and private property. The Contractor's

operations shall not cause any increase in the turbidity of runoff waters as defined and controlled by the California Regional Water Quality Control Board, North Coast Region.

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. GAS/PROPANE SERVICE

Blue Star Gas is the provider of in-street buried gas lines. Blue Star Gas can be reached at 541 251-8912.

H. 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 05 00

DEMOLITION AND REMOVAL

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Demolition consists of furnishing transportation, labor, tools, equipment, and incidentals necessary to demolish items as described in this Specification as well as items as noted on the Drawings.
- B. All materials resulting from the demolition work, unless specified otherwise, shall become the property and responsibility of the Contractor for both demolition and disposal. Title to and ownership of all materials to be removed, except as specified otherwise, is vested in the Contractor upon receipt of notice to proceed. The Owner will not be responsible for the condition, loss of, or damage to, such material after notice to proceed is issued.
- C. The work includes, but is not strictly limited to:
 - 1. Removal of existing asphalt paving where shown on plans or otherwise required for project completion.
 - 2. Removal of existing concrete sidewalk, curbs, gutters, and similar structures where shown on plans or otherwise required for project completion.
 - 3. Removal of existing buried debris and unsuitable material as shown on plans or otherwise required for project completion.
 - 4. Removal of existing underground utilities where shown on plans or otherwise required for project completion.
 - 5. Locating existing underground utilities not located by USA North 811 or others.

1.02 QUALITY ASSURANCE

A. GENERAL

- 1. All work shall be performed in accordance with local codes and regulations, applicable state industrial safety provisions, and the requirements of the Occupational Safety and Health Act (OSHA).
- 2. In addition to complying with all pertinent codes and regulations, comply with the requirements of those

insurance carriers providing coverage for this work.

3. The Contractor shall alter or rework existing concrete structures as shown and as specified. Generally, when items of equipment and piping are removed, the areas and surfaces from which items were removed shall be left with a neat appearance and finish compatible with surrounding areas, colors, and surfaces. The Contractor shall perform all painting, sanding, grouting, sacking, resurfacing, and other work as necessary to comply with the above requirements. Prior to structural modifications, all surfaces shall be subject to inspection by the Owner.
4. Miscellaneous cutting, patching, and painting necessitated as a result of visual conditions, and the reworking of abutting surfaces as required to make new work join and match existing surfaces to remain, shall be part of the work under this contract.
5. Prospective Contractors shall visit the job site to ascertain the work required to meet the requirements as shown on the plans and specified herein.

B. OPERATING REQUIREMENTS

1. Demolition shall be performed in such a manner as to not harm adjacent structures, existing landscaping, or natural vegetation. The Contractor shall assume full responsibility for such disturbance. All costs of any such repair, rehabilitation, or modifications shall be borne by the Contractor.
2. When removing materials or portions of existing structures, the Contractor shall take all precautions and use all necessary barriers and other protective devices so as not to damage the structures beyond the limits necessary for the new work, nor to damage the structures or contents by falling or flying debris.
3. Contractor shall contain, remove, and transport debris and rubbish in a manner that will prevent spillage into adjacent areas. Clean up any spillage into adjacent areas as necessary.

1.03 SUBMITTALS

- A. Submittals shall be provided in accordance with Section 01 33 00 and shall include the following information:
 1. A copy of this specification section, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. A check mark (✓) 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. Equipment to be used.
3. Methods of removal and staging.
4. Environmental measures planned to prevent contamination of groundwater, stormwater, or the Owner's property during the course of work.
5. Maintenance, fueling, trucking, barging and disposal routes.
6. Anticipated governmental agency coordination and permits.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 GENERAL

- A. Prior to any demolition work, Contractor shall carefully inspect the site and determine the extent of work involved. Report any discrepancy to the Engineer immediately.
- B. All work of altering existing structures shall be done at such time and in such manner as will comply with the approved time schedule. So far as possible before any part of the work is started, all tools, equipment, and materials shall be assembled and made ready so that the work can be completed without delay.
- C. The Contractor shall cut, repair, reuse, excavate, demolish, or otherwise revise parts of the existing structures, piping, or appurtenances, as indicated on the drawings, herein specified, or necessary to permit completion of the work under this contract.

- D. Where necessary or required for the purpose of making connections, the Contractor shall cut existing pipelines in a manner to provide an approved joint. Where required, weld beads, flanges or couplings shall be provided, as required. The Contractor shall provide suitable plugs, bulkheads, or other means to hold back the flow of water or other liquids, all as required in the performance of the work under this contract.

3.02 DUST AND DEBRIS CONTROL

- A. Dust resulting from demolition and removal work shall be controlled to prevent the spread of dust and to avoid creation of a nuisance or hazard in the surrounding area. Refer to Section 01 41 00 for regulatory requirements.

3.03 PROTECTION

- A. The Contractor shall protect all electrical and fire protection facilities and utilities where removal of existing materials is necessary to accomplish the work. The Contractor shall provide all necessary labor and material to build barricades and temporary services or connections for electrical, mechanical, and plumbing utilities.
- B. The Contractor shall protect all existing utility lines from damage that are made known to the Contractor prior to demolition work and that are not explicitly included in the demolition work. The Contractor shall initiate a "Underground Service Alert" survey to identify all existing utilities.
- C. The Contractor shall repair any damage to utility lines caused by the Contractor, as directed by the Construction Manager, at no additional cost to the Owner.
- D. Where the public safety is endangered in the area of removal work, barricades for traffic shall be used and advance notice shall be given to the Construction Manager prior to beginning any such work.
- E. The Contractor shall protect trees, plant growth, and features designated to remain as final landscaping.
- F. The Contractor shall protect survey monuments, elevation benchmarks, and similar existing structures from damage or displacement unless otherwise directed by the Owner.

3.04 USE OF EXPLOSIVES:

The use of explosives of any kind is strictly prohibited.

3.05 SAW CUTTING

When portions of asphalt pavements and concrete pads are to be removed and later construction is to be connected, edges shall be saw cut, on a neat line at right angles to the curb face.

3.06 COLD PLANE ASPHALT CONCRETE SURFACE

A. GENERAL

Cold Planing shall include all work necessary to remove existing asphalt and/or concrete pavement to a predetermined depth as indicated on the drawings. Planing asphalt concrete pavement shall be performed by the cold planning method. Planing of the asphalt concrete pavement shall not be done with the heater planing method.

B. EQUIPMENT

The machine used for planing shall have performed satisfactory on similar work and shall meet the following requirements herein

1. The planing machine shall be specifically designed and built for the planing of bituminous pavements without the addition of heat. Cold planing machines shall be equipped with a cutter head not less than 30 inches in width and shall be operated so that no fumes or smoke will be produced.
2. The machine shall be operated in a way so that no fumes or smoke will be produced. The machine shall be capable of removing the paving material next to curbs or gutters and be designed such that the operator thereof can at all times observe the planing operation without leaving the controls.

C. CONSTRUCTION

1. Pavement Removal: Prior to cold planing, on streets to have a uniform depth of the existing surface removed, all utility covers shall be lowered such that the cutting teeth of the planing machine passes over the adjusted lid or frame. Contractor will be responsible for maintaining any temporary asphalt fill material over these facilities until the final paving surface is installed.
2. Temporary Marking: The Contractor shall clearly mark or reference lowered sanitary sewer and water valves in case emergency access is required by the agency responsible for operation of the sewer and water system.

3. Spatial and Geometric Requirements: The depth, width, and shape of the cut shall be as shown on the typical cross sections or as designated by the Engineer. The final cut shall result in a uniform surface conforming to the typical cross sections. The outside lines of the planed area shall be neat and uniform. Planing asphalt concrete pavement operations shall be performed without damage to the surfacing to remain in place. Where transverse joints are planed in the pavement at conform lines, no drop-off shall remain between the existing pavement and the planed area when the pavement is opened to public traffic. If asphalt concrete has not been placed to the level of existing pavement before the pavement is to be opened to public traffic a temporary asphalt concrete taper shall be constructed. Asphalt concrete for temporary tapers shall be placed to the level of the existing pavement and tapered on a slope of 1:200 (Vertical:Horizontal) or flatter to the level of the planed area.
4. Air Pollution Control: The Contractor shall take all necessary measures to avoid the dispersion of dust. Attention is directed to Section 7 of the Standard Specifications.

3.07 EXISTING MATERIALS TO BE REMOVED

- A. No on-site sale of salvage will be allowed. No removals shall be made from the site by any person other than the Contractor or employees of the Contractor.
- B. The Contractor shall not interfere with the use of or access to adjacent facilities.
- C. The Contractor shall provide and place bracing and shoring to prevent movement or damage to structures and improvements which are to remain. Contractor shall locate lines shown on plans that are not marked by "USA". The Contractor shall cease operation and notify the Construction Manager immediately if the safety of any facility appears to be endangered. The Contractor shall not resume operations until safe conditions have been restored.
- D. Removal work shall be performed in accordance with applicable requirements of authorities having jurisdiction and under the Engineer's inspection. The Contractor shall have on the work site, copies of applicable extracts of: Construction Safety Orders and General Industrial Safety Orders issued by the State Division of Industrial Safety. The Contractor shall comply with provisions of these and other applicable laws, ordinances, and regulations.
- E. Burning of material on site shall not be permitted.

3.08 SALVAGED ITEMS

The Owner has the right to salvage any items scheduled for removal. The Contractor shall notify the Construction Manager 5 days prior to any salvage or demolition work to determine the disposition of items to be removed. Items the Owner wishes to keep shall be placed at a location specified by the Owner.

The stockpile location is:

Crescent City Corporation Yard
900 10th Street,
Crescent City, CA 95531

3.09 DISPOSITION OF MATERIAL

- A. Unless otherwise noted, all materials and equipment to be removed, except for equipment or material listed for salvage, shall become the property of the Contractor, and shall be promptly removed from the property. Under no circumstances shall the Contractor use the Owner's or adjacent property's trash receptacles, or dumpsters located at or near the work site for any purpose.
- B. If required, materials to be reused or relocated shall be carefully removed and stored to prevent damage and reinstalled as the work progresses.

3.10 CLEAN-UP

- A. Debris and rubbish shall be removed and transported in a manner that will prevent spillage onto existing streets or adjacent areas. All debris shall be removed off site at the Contractor's expense.
- B. All applicable federal, state, and local regulations regarding handling and disposal shall be strictly complied with.

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 3/4-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:

<u>SIEVE SIZE</u>	<u>PERCENT PASSING</u>
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 ¾-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 $\frac{3}{4}$ 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

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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 $\frac{3}{4}$ " 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.

1.02 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.

1.03 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

1.04 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

3.01 REPARATION:

- 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 and 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 in order 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 to be 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.
 - a. Clear & grub
 - b. Asphalt paving
 - c. Walls & steps
 - d. Curbs
2. Salvage of existing items to be reused or recycled.
 - a. Concrete bench
 - b. Discovery Center Signage
 - c. Existing monuments
 - d. Artwork
 - e. Signage
3. Existing to remain.
 - a. Seawall

B. Related Requirements:

1. Section 01 10 00 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 01 56 39 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
3. Section 01 73 00 "Execution" for cutting and patching procedures.
4. Section 01 35 16 "Alteration Project Procedures" for general protection and work procedures for alteration projects.

5. Section 31 10 00 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.
6. Section 31 20 00 "Earth Moving" for soil material fills.

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. Predemolition 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 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

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: Henry Souse Jr. Monument.
 - 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 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

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. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional

for use indicated.

- D. 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 $\frac{3}{4}$ ", 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 REINFORCEMENT

PART 1 – GENERAL

1.1 SCOPE

The work includes the furnishing and installing of reinforcing steel for all cast-in-place concrete. Contractor shall check project or drawings for anchors, inserts, conduits, sleeves, and any other items which are required to be cast in concrete and shall make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

1.2 CODES AND STANDARDS

A. Except as modified by the requirements specified herein and/or the details on the drawings, all work included in this section shall conform to the applicable provisions of the following codes and standards:

1. "Uniform Building Code": Latest Edition, Chapter 26, Concrete.
2. Concrete Reinforcing Steel Institute (CRSI): "Recommended Practice for Placing Reinforcing Bars", latest edition.
3. American Concrete Institute (ACI): "Manual of Standard Practice for Detailing Reinforced Concrete Structures", ACI 315, latest edition.
4. American Society for Testing and Materials (ASTM): The Specifications and standards hereinafter referred to, latest edition.

1.3 RELATED WORK

- A. Section 01 11 00: SUMMARY OF WORK
- B. Section 03 10 00: CONCRETE FORMWORK
- C. Section 03 30 00: CAST-IN-PLACE CONCRETE

1.4 SUBMITTALS

A. Mill affidavits, stating the grades and physical and chemical properties of the reinforcing steel, and conformance with ASTM Specifications, shall be submitted to the Engineer for review and approval by Owner before delivery of the steel to the job site.

B. Shop bending diagrams, placing lists and drawings of reinforcing steel shall be submitted to the Engineer, including actual bar lengths to nearest inch measured to intersection of tangent extensions of the outside bar surface. Bar placement diagrams shall clearly show dimensions of each bar splice.

C. 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

D. Engineer's review shall be general, and approval will not relieve Contractor of responsibility for accuracy.

1.5 STORAGE

A. Reinforcing steel shall be transported to the building site, stored, and covered in a manner which will ensure that no damage shall occur to it from moisture, dirt, grease, or any other cause that might impair bond to concrete.

B. A sufficient supply of approved reinforcing steel shall be stored on the building site at all times to ensure that there will be no delay of the work. Identification of steel shall be maintained after bundles are broken.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing Bars: New, deformed, billet steel bars conforming to ASTM A615-82(S1) Grade 60 unless otherwise indicated. Deliver bars new and free from rust and mill scale in original bundles with mill tags intact.

B. Accessories: Reinforcement accessories, consisting of spacers, chairs, ties, and similar items shall be provided as required for spacing, assembling, and supporting reinforcement in place. Use no aluminum, galvanized steel, plastic or stainless-steel supports or accessories. Supports shall conform to the applicable requirements of the CRSI Standards Chapter 3 specified herein. Use precast concrete block supports with embedded wire ties or dowels for placement on grade or on membranes.

C. Tie Wire: Tie wire for reinforcement shall be 16-gauge or heavier, where indicated or specified, black or galvanized steel wire, conforming to ASTM A82-79.

PART 3 - EXECUTION

3.1 FABRICATION

A. Fabrication of steel reinforcement shall be in accordance with the details shown on the plans. Where specific details are not shown or noted, comply with the applicable requirements of the "Codes and Standards" here in before specified.

B. Bars shall be accurately bent, cut, and placed as indicated on the drawings. Bars shall be bent cold; heating of bars will not be permitted. Bars shall not be bent or

straightened in any manner that will injure the material. Bars with kinks or bends not scheduled will be rejected.

3.2 PLACING

A. General: Place reinforcing steel as indicated and in accordance with the applicable requirements of referenced specified. Install reinforcement accurately and secure against movement, particularly under the weight of workmen and placement of concrete.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials which may reduce or destroy bond with concrete.

B. Reinforcing Supports: Support reinforcing bars above earth and on forms by concrete blocks or other approved noncorrodible supports. Support legs of accessories in forms without embedding in form surface. Space chairs and accessories to conform with CRSI's "Recommended Practice for Placing Bar Supports". No wood will be permitted inside forms.

C. Placing and Tying: Set reinforcing in place, and rigidly and securely tie or wire with 16-gauge steel tie wire in the position indicated, or as directed. Point ends of wire away from forms.

D. The reinforcement shall be so secured in position that it will not be displaced during the placement of concrete.

E. Spacing: Minimum center to center distance between parallel bars shall be in accordance with the details on the plans or, where not shown, the clear spacing shall be 2 times the bar diameter but in no case less than 1½" nor less than 1-1/3" times the maximum size aggregate.

F. Splices: Laps of splices, where shown or noted on plans, shall be adequate to transfer stress by bond. Splicing shall meet requirements of ACI 318 and applicable building codes unless noted otherwise on drawings. Splices of adjacent bars shall be staggered with no more than 50% of the laps at any given joint. Reinforcing bars marked continuous shall be spliced with a minimum lap of (40) bar diameters in masonry and (30) bar diameters in concrete. Approved mechanical coupling may be used for horizontal steel.

G. Dowels: Dowels shall be tied securely in place before concrete is deposited. In the event there are no bars in position to which dowels may be tied, No. 3 minimum shall be added to provide proper support and anchorage. Bending of dowels after placement of concrete will not be permitted.

H. Welding of reinforcing bars is not permitted.

I. All bars shall be free from rust, scale, oil, or any other coating that would reduce or destroy the bond between concrete and steel.

J. Cleaning: Reinforcement, at time of pour, shall be free of all coatings that would impair bond to concrete.

K. Additional Reinforcing: Provide additional reinforcing bars at sleeves and openings as indicated or required. Where additional bars are not shown for such location, obtain Engineer instructions and provide additional bars as directed at no extra cost to the Owner.

3.3 INSPECTION

A. Contractor shall notify Engineer at least 48 hours ahead of each concrete pour, and no concrete shall be placed until all reinforcing steel has been installed, inspected, and approved by the Inspector.

B. The following reinforcing steel work will be considered defective and shall be removed and replaced at no additional cost to the Owner.

1. Bars with kinks or bends not shown on drawings
2. Bars injured due to bending or straightening
3. Bars heated for bending
4. Reinforcement not placed in accordance with the plans and/or specifications

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 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.

1.02 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.

1.03 SUBMITTALS

Refer to Section 01 33 00 – Submittals for the requirements for submittals.

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 shall be air entrained (2% +/-1%).

<u>Location</u>	<u>Minimum psi @ 28 days</u>	<u>Maximum Size Aggregate</u>	<u>Minimum Sacks of Cement/C.Y.</u>	<u>Slump Range</u>
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. Conform to State Standard Specification, Section 51. 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.**
- 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 03 48 00
PRE-CAST CONCRETE SPECIALTIES

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.
- B. Prestressed Concrete Institute MNL 117 "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products" - 3rd Edition, primarily Appendix J.
- C. Prestressed Concrete Institute's "Architectural Precast Concrete Design Manual, 2nd Edition".
- D. ASTM standards as stated herein.

1.02 SUMMARY

- A. This Section includes site pre-cast concrete, complete, as shown and as specified for fence posts and rails.

1.03 REFERENCES

- A. ASTM - American Society for Testing and Materials.
- B. ACI - American Concrete Institute, Manual of Concrete Practice.
- C. STANDARD SPECIFICATIONS:
2018 Standard Specifications of the State of California, Department of Transportation.

1.04 PROJECT/SITE CONDITIONS

- A. FIELD MEASUREMENTS:
Verify field measurements and dimensions where required and show on shop drawings.

1.05 QUALITY ASSURANCE

- A. QUALIFICATIONS:
Show successful experience in precast concrete work, including not less than 5 years of experience in design, engineering, fabrication, and installation of precast concrete systems similar to the work required for this project.

1.06 SUBMITTALS

A. PRODUCT DATA:

Manufacturer's current catalog cuts and specifications for the following:

B. SHOP DRAWINGS:

Shop and erection drawings, including profiles, finish, edges, color, dimensions, joints, details of inserts, reinforcing and connections to all adjoining work. Drawings requiring licensed civil or structural engineers shall include registered stamp in the State where the project is located.

C. SAMPLES:

One each full-sized piece of each type of pre-cast concrete material including finishes, colors, and joints. Verify desired colors by owner prior to submitting samples.

D. CERTIFICATES:

Three (3) certified copies of concrete mix design for each batch used.

1.07 DELIVERY, STORAGE, AND HANDLING

A. DELIVERY:

Transport and deliver all pre-cast concrete units on pallets, packaged in such a manner so that no damage occurs to the product. Catalog items shall be delivered in their original containers, with seals unbroken and labels intact until their installation. Wrapped or bundled materials shall clearly show their manufacturer's name and trademark.

B. STORAGE:

Cover with non-staining, waterproof paper when necessary to protect them from weather.

C. DAMAGED MATERIALS:

Be responsible for all damage or disfiguration of pre-cast work until Final Acceptance. Remove off site and replace at no additional cost to Owner all damaged or rejected pre-cast materials.

1.08 SEQUENCING AND SCHEDULING

A. COORDINATION:

Coordinate with the work of all other sections to insure the following:

1. All such portions of work as are all or in part imbedded, built-in, attached to, supported by, or covered over by the pre-cast

concrete work are executed in ample time that progress of work is not delayed.

2. Sequence work to avoid cutting or patching pre-cast concrete.
3. Coordinate proper installation of all accessories imbedded in the pre-cast concrete for the provision of holes, openings, etc., necessary to the execution of the work of other trades.

- B. Scheduling: Insure that accepted precast concrete units are delivered to the site in ample time so as not to delay the progress of the work.

1.09 WARRANTY

Manufacturer to warrant fabrications to be free from defects due to materials and workmanship for a minimum of five years.

PART 2 – PRODUCTS

2.01 MATERIALS

A. PORTLAND CEMENT:

1. Type: ASTM C150, Type I or II. Use only one brand and type for entire job.
2. Minimum Compressive Strength at 28 Days: 5000 psi.
3. Maximum Absorption Rate:
 - a. Regular Weight Concrete: Five (5) percent.
 - b. Lightweight Concrete: Twelve (12) percent.

B. AGGREGATES:

1. Regular Weight Concrete:

ASTM C33, with maximum 3/4 in. size or to maximum 1/5 width of minimum precast section.
2. Lightweight Concrete:

ASTM C330, with maximum 5/8 in. size or to maximum 1/5 width of minimum precast section.

2.02 ACCESSORIES

A. REINFORCEMENTS:

1. Reinforcing Bars: ASTM A615 Grade 40 deformed billet-steel bars, clean and free from rust, scale, or coating that will reduce bond.

2. Welded Wire Fabric: ASTM A185. Leave tags designating wire size and spacing on each roll until ready for use.

B. WATER:

Clean, potable, free from injurious amounts of oils, alkalis, organic materials, and other deleterious materials. As available from Owner. Transport as required.

C. AIR ENTRAINMENT:

ASTM C260

D. MORTAR:

1:6 Portland Cement/sand

E. GROUT:

Portland Cement Grout Mix: 1,800 psi min. compressive strength at 28 days.

Joints up to 1/2 in.: 1:2:1/4 Portland Cement/sand/lime

Joints 1/2 in. or more: 1:3:1/4 Portland Cement/sand/lime

2.03 MIXES

A. PORTLAND CEMENT:

Riverside white cement.

B. AGGREGATE:

Olympia #1 sand, 200 lbs. per sack of cement.

C. COLORING AGENT:

L.M. Scofield Co., No. 1266 Cool Grey, 6 oz. per sack of cement. Confirm colors with owner in submittal.

D. SHOP ASSEMBLY:

Tolerances:

1. Dimensions: + 1/16 in. per 10 ft. or + 1/8 in. per unit, whichever is greater.
2. Thickness: 1/8 in.

PART 3 – EXECUTION

3.01 EXAMINATION

A. EXISTING CONDITIONS:

Examine surfaces to receive pre-cast concrete work. Report to Owners Representative conditions found to be in conflict or detrimental to installation of pre-cast concrete work.

3.02 PREPARATION

A. FIELD MEASUREMENT:

Verify field measurements prior to installation precast work. Do not install precast work where conditions differ from those shown on Drawings or in Specifications.

B. CLEANING:

Remove dirt and setting materials on finish surfaces prior to application of mortar, pre-cast concrete materials or signs.

3.03 INSTALLATION

- A. Do not install any precast units that have any defects that exceed the acceptable PCI MNL-117 tolerances for dimensions and color if installation would result in unsatisfactory performance or appearance in the opinion of the Owners Representative.
- B. Install precast concrete members plumb, level, and in alignment in accordance with PCI MNL- 117 erection tolerances and the contract documents. Provide temporary supports and bracing as required to maintain position, stability, and alignment as members are being permanently connected.
- C. Protect the precast units from discoloration and staining when washing down the surrounding masonry by covering the precast units with plastic sheeting and/or by thoroughly soaking them with clear water to prevent dirty washdown water from being absorbed into them. If dirty washdown water gets on the precast, hose it off immediately with clear water.
- D. Patching or repair of damaged precast units is not allowed. Damaged units shall be replaced with new units. when viewed with the unaided eye under good typical day lighting at a 20 foot distance.
- E. Sealing: Only exterior stair treads and other units that may come in contact with salt or other deicing compounds must be sealed with a penetrating sealer approved by the Owners representative. The sealer is to be applied in accordance with the sealer manufacturer's instructions

after the units have been installed, cured, patched, and cleaned. Do not apply sealer before installation since it may prevent mortar, joint sealant, and patches from adhering. After application of the sealer the finish must be free of air pockets, pock marks, chipped edges, or honeycomb effects.

3.04 CLEANING

- A. After completion of pre-cast concrete installation, clean surfaces of excess or spilled mortar or concrete materials. No acids or prepared cleaners shall be used without the approval of the precast Fabricator.
- B. Use mild soap, fiber brushes and clean water. Avoid contamination of adjacent work.

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, and site concrete.

Related work specified elsewhere:

03 48 00 Site Precast Concrete Specialties

10 14 53 Traffic Signage

26 00 00 Electrical

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:
1. Aluminum piles
 2. Aluminum bolt clips
 3. Bolts and nuts for clips
 4. Crossbrace bolts and nuts
 5. End caps
 6. Rivets for end caps
 7. Aluminum Signs
 8. All other necessary miscellaneous parts and materials.
 9. The above-mentioned items shall be either:
 - a. Dant Alum-A-Stand, available through Ross Recreation Equipment, P.O. Box 785, Novato, CA 94947 (415) 892-0717.
 - b. Aluminum planking, available through Playground Products, Inc., 1761 Smith Avenue, San Jose, CA 95112 (408) 998-4090.
 - c. Approved equal.

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 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 AWP4 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: Alupalite 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 Alupalite 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 sign 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 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 “water tight” meeting the requirements of ASTM D3212. Storm drain pipe 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.

Storm drainage inlets (drop inlets) shall be Type GO per Caltrans Standard Plans (Drawing D74B). Drainage inlets maybe either cast-in-place or precast units. Inlet grates shall be Type 24-12 per Caltrans Standard Plans (Drawing D77A).

Junction boxes shall be as specified in Section 03 30 00.

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:

<u>Sieve Size</u>	<u>Percent Passing</u>
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 3/4 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 $\frac{3}{4}$ 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 26 00 00

ELECTRICAL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. WORK INCLUDED:

1. Provide all required labor, project equipment, materials, tools, construction equipment, safety equipment, transportation, test equipment, and satisfactorily complete all electrical work shown on the Drawings, included in these Specifications, or required for a complete and fully operating facility. In addition, provide wiring for the equipment that will be provided under other Divisions of these Specifications.
2. Provide conduit and wire for streetlights and bollards. Contractor shall be responsible for conduit and wire to these devices even if not specifically shown on the Drawings or specified herein.
3. Provide metered service equipment and service disconnect switches. All enclosures for this project shall be NEMA 3R or 4X depending on actual locations.
4. Salvaged Materials – At least 2 business days before hauling the material to the salvaged material stockpile location, notify the Director.

The stockpile location is:
[Crescent City Corporation Yard](#)
[900 10th Street,](#)
[Crescent City, CA 95531](#)

B. SAFETY:

Conduct operations in accordance with NFPA 70E, Standard for Electrical Safety Requirements for Employee Workspaces.

1.02 SUBMITTALS

A. SHOP DRAWINGS:

1. GENERAL: Submit Product Review or Product information shop drawings for materials and equipment as required under each Specification Section.

2. For Product Review submittals, submit a single, complete submittal package for all items specified in a particular Specification Section. Submittal packages shall be organized by equipment type. Include separators and tabs or other means of identifying each Specification paragraph (e.g., 2.01, 2.02, etc.) of the submittals or other means of identifying each section of the submittal.

B. AS-BUILT SHOP DRAWINGS:

The Contractor shall submit redlined drawings that provide current factual information including deviations from, and amendments to the drawings and changes in the work, concealed and visible, shall be provided as instructed. The as-built drawings shall show all new installations with respect to fixed installations not associated with the systems specified herein. Cable and wire shall be accurately identified and shall locate the connection and routing to and away from bases, housings, and boxes. Prior to Final Acceptance, deliver one complete set to the Engineer for review. After such review, provide copies of all CAD produced drawings on storage media satisfactory to the Engineer in AutoCAD DWG format.

C. MANUALS:

1. Furnish manual for equipment where Manuals are specified in the equipment Specifications. Electrical manual shall be consolidated and submitted as a single manual.
2. Include equipment descriptions, record shop drawings, operation and maintenance instructions, parts ordering data, and ratings for the equipment furnished for this project.

D. SPARE PARTS:

For each piece of equipment, submit a list of recommended spare parts. Include part numbers and the name, address, and telephone number of the supplier.

E. The following shall be submitted in accordance with Section 01 33 00, Submittal Procedures:

1. SHOP DRAWINGS
 - a. Metered service equipment
 - b. Wiring and circuit diagrams
2. PRODUCT DATA
 - a. Enclosed circuit breakers

- b. Disconnect switches
- c. All dry utility products based on respective Utility Designs

1.03 QUALITY ASSURANCE

A. CODES:

All electrical equipment and materials, including installation and testing, shall conform to the following applicable codes:

1. National Electrical Code (NEC), current edition in force at the Project site
2. National Electrical Safety Code (NESC), current edition
3. Occupational Safety and Health Act (OSHA) standards
4. Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, International Electrical Testing Association (NETA).

B. STANDARDS:

Equipment shall conform to applicable standards of American National Standards Institute (ANSI), Electronics Industries Association (EIA), Institute of Electrical and Electronics Engineers (IEEE), and National Electrical Manufacturers Association (NEMA). The revisions of these standards in effect on the date of issuance of the Contract Documents shall apply.

C. LABELING:

Underwriters Laboratories (UL) listing is required for all equipment and materials where such listing is offered by the Underwriters Laboratories. Safety labeling and listing by other organizations, such as ETL Testing Laboratories, may be substituted for UL labeling and listing if acceptable to the authority having code enforcement jurisdiction. Provide service entrance labels for all equipment required by the NEC to have such labels.

D. CONTRACTOR'S EXPENSE:

Obtain and pay for all required bonds, insurance, licenses, permits and inspections, and pay all taxes, fees, and utility charges that will be required for the electrical construction work.

1.04 DRAWINGS

A. DRAWINGS:

The Electrical Drawings are diagrammatic; exact locations of electrical products shall be verified in the field with the Engineer. Except where special details are used to illustrate the method of installation of a particular piece or type of equipment or material, the requirements or descriptions in this Specification shall take precedence in the event of conflict.

1. Locations of equipment, panelboards, pull boxes, conduits, stub-ups, power pedestals, and lighting fixtures are approximate unless dimensioned; verify locations with the Engineer prior to installation.
2. Field verify scaled dimensions on Drawings.
3. Review the Drawings and Specification Divisions of other trades and perform the electrical work that will be required for the installations.
4. Should there be a need to deviate from the Electrical Drawings and Specifications, submit written details and reasons for all changes to the Engineer for review.
5. Seismic Certification: Design Calculations and attachment drawings as required by elsewhere.

B. AS-BUILT DRAWINGS:

1. Maintain a complete and accurate record set of Drawings for the electrical construction work.
2. Record all work that is installed differently than shown on the Drawings.
3. Upon completion of the work, transfer all marked changes to a clean set of full-size Drawings with red ink. Mark the Drawings "RECORD DRAWINGS" and submit them to the Engineer when the electrical work is completed.
4. Locate all underground conduits using an Engineer or Surveyor qualified to perform topographic surveying.

1.05 FACTORY TESTS

- A. Submit reports of factory tests and adjustments performed by equipment manufacturers to the Engineer prior to field testing and adjustment of the

equipment. These reports shall identify the equipment and show dates, results of tests, measured values, and final adjustment settings. Provide factory tests and adjustments for equipment where factory tests are specified in the equipment Specifications.

1.06 INSPECTIONS

- A. The Engineer may inspect the fabricated equipment at the factory before shipment to job site. Provide the Engineer with sufficient prior notice so that an inspection can be arranged at the factory.
- B. Inspection of the equipment at the factory by the Engineer will be made after the manufacturer has performed satisfactory checks, adjustments, tests, and operations.
- C. Review of the equipment at the factory shall not relieve the Contractor of responsibility for the proper installation and satisfactory startup operation of the equipment to the satisfaction of the manufacturer and the Engineer.

1.07 COORDINATION

- A. Coordinate the electrical work with the other trades, code authorities, utilities, and the Owner.
- B. Where connections must be made to existing installations, properly schedule all the required work, including the power and control system shutdown periods. Schedule and carry out shutdowns so as to cause the least disruption to operation of the Owner's facilities and privately owned facilities.
- C. When two trades join together in an area, make certain that no electrical work is omitted.

1.08 JOB CONDITIONS

- A. OPERATIONS:
 - 1. Keep all power shutdown periods to a minimum.
 - 2. Carry out shutdowns only after the schedule has been reviewed and accepted by the Engineer.
- B. CONSTRUCTION POWER:
 - 1. Make all arrangements for the required construction power.
 - 2. When required, provide all equipment, materials, and wiring in accordance with the applicable codes and regulations.

3. Upon completion of the project, remove all temporary construction power equipment, material, and wiring from the site as the property of the Contractor.

C. STORAGE:

Provide adequate storage for all equipment and materials which will become part of the completed facility so that it is protected from weather, dust, water, or construction operations. All equipment shall be stored in accordance with manufacturer's recommendations. Provide this information upon request by Engineer.

1.09 DAMAGED PRODUCTS

- A. Notify the Engineer in writing in the event that any equipment or material is damaged.
- B. Obtain prior review by the Engineer before making repairs to damaged products.

1.10 OPTIONAL EQUIPMENT

- A. For optional or substituted equipment, refer to Division 1.

1.11 LOCATIONS

- A. GENERAL: Use equipment, materials, and wiring methods suitable for the types of locations in which they are located, as defined in Paragraph 1.11 B herein.
- B. DEFINITIONS OF TYPES OF LOCATIONS:
 1. Dry Locations: All those indoor areas which do not fall within the definition below for Wet Locations and which are not otherwise designated on the Drawings.
 2. Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings.

PART 2 - PRODUCTS

2.01 STANDARD OF QUALITY

- A. Products that are specified by manufacturer, trade name, or catalog number establish a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are approved by the Engineer prior to installation.

- B. It is the intent of these Specifications and Drawings to secure high quality materials and equipment in order to facilitate operation and maintenance of the facility. All equipment and materials shall be new and the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses that may occur during fabrication, transportation, erection, and continuous or intermittent operation. All equipment shall be adequately stayed, braced, and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility, shall be given consideration in the design of details.
- C. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, and shall be of sturdy and durable construction suitable for long, trouble-free service.

2.02 NAMEPLATES

- A. For each piece of electrical equipment, provide a manufacturer's nameplate showing manufacturer's name, location, the pertinent ratings, and the model designation.
- B. Identify each piece of equipment and related controls with a rigid laminated engraved phenolic nameplate. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using two stainless steel screws or, where approved by the Engineer, with epoxy cement. Where no inscription is indicated on the Drawings, furnish nameplates with an appropriate inscription furnished by the Engineer upon prior request by the Contractor.

2.03 FASTENERS

- A. Fasteners for securing equipment to walls, floors, and the like shall be stainless steel. When fastening to existing walls, floors, and the like, provide wedge anchors. Provide capsule anchors for bolts 3/8-inch and larger. Size anchors to meet load requirements.

2.04 PAINTING

- A. Equipment: Repair any final paint finish that has been damaged or is otherwise unsatisfactory, to the satisfaction of the Engineer.

2.05 ENCLOSURES

- A. Unless otherwise noted, provide enclosures as follows:
 - 1. Dry Locations: NEMA Type 1.
 - 2. Wet Locations: NEMA Type 3R or 4X, as noted on the Drawings.

2.06 PRE-CAST CONCRETE BOXES AND COVERS

- A. Pre-cast concrete boxes and covers shall conform to California Standard Specifications. Lids shall be traffic rated. Provide submittals in accordance with Section 01 33 00 "Submittal Procedures."

PART 3 - EXECUTION

3.01 REQUIREMENTS

- A. All electrical installations shall conform to the codes and standards outlined in this Section.

3.02 WORKMANSHIP

- A. Assign a qualified representative who shall supervise the electrical construction work from beginning to completion and final acceptance.
- B. Perform all labor using qualified craftsmen, who have had experience on similar projects. Provide first-class workmanship for all installations.
- C. Ensure that all equipment and materials fit properly in their installations. The installation shall comply with the requirements and recommendations of NFPA 70 and IEEE C2, and local codes where required.
 - 1. Metallic Materials: Metallic materials shall be protected against corrosion as specified. Aluminum shall not be used in contact with concrete. Where aluminum conductors are connected to dissimilar metal, suitable dielectric fittings shall be used.
 - 2. Ferrous Metal Hardware: Ferrous metal hardware shall be hot dip galvanized in accordance with ASTM A 123/A 123M and ASTM A 153/A 153M.
- D. Perform any required work to correct improperly fit installations at no additional expense to the Owner. The Contractor shall become familiar with details of the work, verify dimensions in the field, and advise the Owner of any discrepancy before performing any work.

3.03 EXCAVATION AND BACKFILL

- A. Provide the excavations for electrical equipment foundations and trenches for conduits as shown on the Drawings.
- B. Exercise caution during all excavation work and avoid damage to existing underground pipes. Exercise extreme caution when working near existing electrical conduits and facilities. Field verify the location of all electrical facilities before proceeding with any nearby work.
- C. Refer to Division 31 Earthwork of these Specifications for all excavation and backfilling work.

3.04 CONCRETE

- A. Where shown on the Drawings or specified, provide the required concrete installations for conduit encasement and equipment foundations.
- B. Refer to Division 3 Concrete of these Specifications for all concrete work.

3.05 CONDUCTOR IDENTIFICATION

- A. Identify all wires and cables in conformance with the requirements of Section 26 10 00. This requirement applies to all equipment provided under this contract, regardless of Division, as well as to all conductors provided or worked on during this contract.

3.06 INSTALLING EQUIPMENT

- A. Provide the required inserts, bolts, anchors, and securely attach all equipment and materials to their supports.
- B. Install all floor mounted equipment on 3-inch high reinforced concrete pads. The Contractor, suppliers, and fabricators shall take this requirement into consideration when designing, fabricating, and installing panels and other enclosures so that height above the floor of the operating handles of electrical devices meets the requirements of these Specifications and applicable codes.

3.07 CUTTING, DRILLING, AND WELDING

- A. Provide any cutting, drilling, and welding that is required for the electrical construction work.
- B. Structural members shall not be cut or drilled, except when favorably reviewed by the Engineer. Use a core drill wherever it is necessary to drill through concrete or masonry.

- C. Provide the required welding for equipment supports. Conduits and fittings shall not be welded to structural steel.
- D. Perform patch work with the same materials as the surrounding area and finish to match, as specified in Division 3 of these Specifications.

3.08 PROTECTIVE DEVICE COORDINATION

- A. Provide the services of a coordination analysis consultant for the proper system coordination of the protective devices furnished on this project. Submit the name and the qualifications of the consultant for review by the Engineer; qualifications must include professional registration of proposed personnel as electrical engineers.
- B. The protective device on the line side closest to the fault or abnormal conditions shall isolate the problem portion of the system and minimize damage in that portion. The rest of the system shall be maintained in normal service. The coordination shall be in conformance with the recommendations of latest IEEE Standard 242.
- C. Submit the analysis that shall include impedance and short circuit calculations, list of any assumptions made in the analysis, the recommended settings of the protective devices, and the system time/current characteristic curves. The submittal shall be made so as to allow time for review and resubmittal, if necessary, before the implementation of final settings and adjustments by the testing laboratory.
- D. This section may be waved at the discretion of the Engineer.

3.09 FIELD TESTS

- A. Perform tests in accordance with applicable procedures as described in NETA Acceptance Testing Specifications.
- B. Give at least 7 working days notice to the Engineer prior to any test to permit witnessing the test.
- C. Provide all materials, equipment, labor, and technical supervision required to perform such tests and inspections. It is the intent of these tests to ensure that all electrical equipment is operational within industry and manufacturer's tolerances and is installed in accordance with the Contract Documents and manufacturer's instructions. The tests and inspections shall determine the suitability for energization.
- D. The Contractor shall have a calibration program which maintains all applicable test instrumentation within rated accuracy.

1. The accuracy shall be traceable to the National Bureau of Standards in an unbroken chain. Instruments shall be calibrated in accordance with the following frequency schedule:
 - a. Field instruments: 6 months maximum
 - b. Laboratory instruments: 12 months
 - c. Leased specialty equipment: 12 months
 2. Date calibration labels shall be visible on all test equipment.
- E. Where testing pursuant to NETA requirements is required in these specifications, submit a test report that includes the following:
1. Name of project, name of person performing test, and date of test
 2. Description of equipment tested
 3. Description of test
 4. List of test equipment used and calibration date
 5. Test results
 6. Conclusions and recommendations
 7. Appendix, including appropriate test forms
 8. The test report shall be bound, and its contents certified. Submit the completed report directly to the Engineer no later than thirty (30) days after completion of the test unless directed otherwise. Number of reports to be submitted for review shall be the same as the number required for shop drawing submittals.
- F. Safety practices shall include, but are not limited to, the following requirements:
1. Occupational Safety and Health Act of 1970, OSHA.
 2. Accident Prevention Manual for Industrial Operations, Seventh Edition, National Safety Council, Chapter 4.
 3. Applicable state and local safety operating procedures.
- G. All field tests shall be performed with apparatus deenergized except where otherwise specifically required by the latest Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems published by NETA. The Contractor shall have a designated safety representative who shall be present on the project and supervise operations with respect to safety. In all cases, work shall not proceed until

the safety representative has determined that it is safe to do so. The Contractor shall have available sufficient protective barriers and warning signs to conduct the specified test safely.

- H. Electrical equipment and materials furnished and installed by the Contractor, and the testing equipment listed below, shall be tested in accordance with the "Inspection and Test Procedures" and "System Function Tests" (Section 8) of the latest Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems published by NETA. Tests shall not include any tests listed as optional in the aforementioned NETA Specifications unless specifically noted in respective equipment specifications for this project.
- I. Retesting will be required for all unsatisfactory tests after the equipment or system has been repaired. Retest all related equipment and systems if required by the Engineer. Repair and retest equipment and systems that have been satisfactorily tested but later fail, until satisfactory performance is obtained.
- J. Putting Equipment and Cables into Service: Submittal and favorable review of the specified factory and field tests shall occur before the Contractor is permitted to place the respective equipment or cable into service.
- K. MISCELLANEOUS TESTS
 - 1. Insulation Resistance, Continuity: Perform routine insulation resistance, continuity, and rotation tests for all distribution and utilization equipment. Supply a suitable and stable source of test power at each test site. Notify the Engineer when equipment becomes available for acceptance tests. Work shall be coordinated to expedite project scheduling. All testing shall be performed in the presence of the Engineer. The Contractor shall be responsible for implementing all final settings and adjustments on protective devices and tap changes. Any system material or workmanship that is found defective on the basis of acceptance tests shall be reported directly to the Engineer. The Contractor shall maintain a written record of all tests and upon completion of project, assemble and certify a final test report.
 - 2. Operational Tests: Operationally test all circuits to demonstrate that the circuits and equipment have been properly installed, adjusted, and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation, including alarm conditions, and demonstrate satisfactory interfacing with the data acquisition and alarm systems.

3.10 EQUIPMENT PROTECTION

- A. Exercise care at all times after installation of equipment, motor control centers, etc., to keep out foreign matter, dust, dirt, debris, or moisture. Use protective sheet metal covers, canvas, heat lamps, etc., as needed to ensure equipment protection.

3.11 CLEANING EQUIPMENT

- A. Thoroughly clean all soiled surfaces of installed equipment and materials.
- B. Clean out and vacuum all construction debris from all areas of all equipment.
- C. Provide and touch-up to original condition any factory painting that has been marred or scratched during shipment or installation, using paint furnished by the equipment manufacturer.

3.12 CLEANUP

- A. Upon completion of the electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean, and acceptable to the Engineer.

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 as 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 10 00

ELECTRICAL – BASIC MATERIALS AND METHODS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

Work of this section is bound by the General Conditions, Supplementary General Conditions and Division 1 in addition to this Specification and the accompanying Drawings.

1.02 GENERAL REQUIREMENTS

This section covers the Work necessary to furnish, install and complete the materials specified hereinafter.

This project is wired in raceway.

PART 2 – PRODUCTS

2.01 CONDUIT

A. Rigid Steel Conduit:

Standard pipe with screwed joints for electrical raceway use.

Zinc coated by hot dip galvanizing or sherardizing.

Manufacturer: Allied Tube and Conduit, Carlon, Wheatland, Republic Steel, Anaconda, Triangle PWC.

B. Intermediate Metallic Conduit (IMC):

Standard pipe with screwed joints for electrical raceway use.

Zinc coated by hot dip galvanizing or sherardizing.

Manufacturer: Allied Tube and Conduit, Robroy Industries, Wheatland Tube Co., or approved.

C. Electric Metal Tubing (EMT):

Zinc coated by hot dip galvanizing or sherardizing.

Manufacturer: Allied Tube and Conduit, Cole-Flex Corp., Robroy Industries, V.A.W. of America,

Wheatland Tube Co. or approved.

D. Flexible Conduit

Galvanized steel or aluminum, abrasion resistant.

Manufacturer: AFC, Carol Cable Co., Hubbell Inc., Triangle PWC or approved.

E. Flexible Conduit, Liquid Tight

Hot dipped galvanized steel core with thermoplastic overcoat.

Manufacturer: AFC, Carol Cable Co., Carlon, Cole-Flex Corp., Hubbell Inc., Raco or approved.

2.02 WIRE

A. GENERAL:

All building wire shall be copper (unless otherwise noted) of not less than 98% conductivity, color coded, marked with gauge type and manufacturer on 24" centers, bear underwriter's label and be delivered to job in original unbroken packages. All wire #8 AWG size and larger shall be stranded.

B. MANUFACTURERS:

General Cable Company, Okonite, Triangle Cable Co., Anaconda, or approved.

2.03 CONDUCTOR INSULATION

A. IN CONDUIT:

1. For No. 10 and smaller use stranded Type XHHW.
2. For No. 8 and larger use stranded type XHHW.

B. ALUMINUM WIRE:

Use of aluminum wire is limited to service entrance conductors.

2.04 CABLE

A. MC CABLE:

High Strength galvanized steel flexible armor. Full length No. 12 AWG Wire minimum ground conductor THHN 90°C conductors full length tape marker. Overall PVC or nylon cable tape. Short circuit throat insulators, mechanical compression termination. May be used on branch circuits not exceeding 50 amps.

2.05 CONDUCTOR SPLICES AND CONNECTORS

A. FOR NO. 8 AND LARGER CONDUCTOR:

Use solderless Lugs and Connectors by Burndy, T&B, Blackburn, or approved.

B. FOR ALL OTHER CONDUCTORS:

Use pressure type and solderless by Scotchlock, Ideal "Wingnut", T&B, or approved.

2.06 DUPLEX RECEPTACLES (GFI WHERE REQUIRED)

A. TYPE

Duplex type, 20 amperes at 125 volts, grounded with Composite Base and slots to accommodate parallel Plug Caps. Two blade grounding type, side wire Leviton 5242, Bryant, Hubble, or Sierra. Receptacle must be TAYMAC MX320 GFCI duplex type.

Receptacle enclosure must be outdoor rated and lockable while-in-use.

B. COLOR

Color shall be Stainless Steel.

2.07 WEATHERPROOF RECEPTACLES

Each receptacle is to consist of corrosion resistant duplex grounding type with gasket and hinged cover plate to provide cover when plug and cord or inserted, 20 AMP, 125V mounted in cast metal box. Match receptacle series.

2.08 480 VOLT RECEPTACLES

Pin and Sleeve – North American Ratings, Size 20 to 125 Amp as required. Provide Back Box and Matching Plug.

2.09 WALL COVER PLATES

A. SURFACE BOX, RECEPTACLE, AND COVER:

Steel "Industrial Raised" to match Receptacle type.

B. FLUSH BOX:

Material-stainless steel: Manufacturer-Leviton or approved.

2.10 OUTLET BOXES

One piece, pressed, galvanized, or sherardized steel; or plastic, sized and shaped to accommodate conductors, fixture, or indicated device.

A. AT 1" AND LARGER CONDUIT:

Use Deep Type Boxes.

B. FIXTURE BOXES:

Use 4" minimum, octagon shape.

C. SWITCH BOXES:

Use rectangular or square, 1½" deep minimum and with switch plaster ring and gang cover.

D. BOXES INSTALLED IN WET OR DAMP LOCATIONS:

Use FS or FD type, cast metal. Manufactured by Bell, Slater or approved.

PART 3 – EXECUTION

3.01 CONDUIT – FLEXIBLE CONDUIT

A. GENERAL

1. Run concealed in finished areas, exposed in unfinished areas. Securely support all conduit runs at 8' intervals or less. Provide pipe clamps and metal inserts for support on concrete or masonry; trapeze type supports using Kindorf, Unistrut, or approved steel channels and clamps where conduit runs are grouped. Bends shall conform to code requirements on radii and shall be carefully made to avoid injury or flattening.

2. Bends in conduit 1¼" size and larger shall be factory made ells or be made with manufactured mechanical bender, as required by code requirements.
3. Run through, floors, or foundation shall be sleeved, and sleeves furnished and installed by the Electrical Contractor.
4. Cap during construction by means of manufactured seals. Swab out before pulling wires.
5. Keep free from contact with all other pipe runs of different systems or of dissimilar metals.
6. Provide grounding connections per code requirements.

B. MATERIALS

1. Rigid Galvanized Steel: Use where run in ground below floor slabs, in masonry, or in contact with the ground. Make up joints with white lead or other approved joint compound, and where underground paint with asphaltic compound 12" each side of coupling.
2. Electrical Metallic Tubing (EMT): Use in dry locations in areas not subject to damage, in sizes of up to and including 3" only. Larger sizes are not acceptable.
3. Fittings: Steel gripping ring-type with insulated throat. Indenter type, set screw or Steel.
4. Flexible Metal Conduit: Shall be used for connection of all motors or other moveable or vibrating equipment connections.
5. Liquid tight flexible metallic conduit shall be used for similar connections in all wet or damp locations.

3.02 WIRE

A. GENERAL

1. Conform to code requirements as to number of wires and conduit sizes. Provide J boxes and pull boxes as required by code and as shown.
2. Exercise care to avoid injury to wire or insulation during pull-in. Powdered soap or flax soap are the only lubricants to be used.

3. Wires in conduit installation only: Not to be pulled in until all construction is completed which might damage insulation or fill conduit with foreign materials.
4. Wire splices and joints: Pressure-type, solderless connectors Scotchlock, Ideal "Wingnut", T&B, or approved equal.
5. Joints and connections in heavy cables: Burndy, T&B, or approved equal solderless lugs and connectors.
6. Aluminum connections shall be made with Burndy "Hypress" or approved equal solderless lugs and connectors. Provide ample application of "Penetrox" at all aluminum connections.

B. MATERIALS

1. Size: No. 12 AWG Wire shall be the minimum size wire used for lighting and power circuits. Motor control circuits may be No. 14 AWG wire, provided this size is adequate for the voltage and current involved.

3.03 OUTLET BOXES

A. GENERAL

1. Installation: Place accurately for finish. Support independently and securely with appropriate mounting device and align to present a neat and finished appearance.
2. Mounting Locations: Locate at the following heights above grade or floor, unless otherwise noted on the drawings:
3. Convenience Outlets in General: Height 18" A.F.F. (unless indicated otherwise).
4. Local Switches: Height 46" A.F.F. (unless otherwise noted on plans).
5. Other Outlets: As noted on plans.
6. Where the above heights do not suit the building construction or finish, consult Architect.

END OF SECTION

SECTION 26 40 00
ELECTRICAL – SERVICE AND DISTRIBUTION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 GENERAL REQUIREMENTS

Refer to General Provisions, Section 26 01 00 of specifications.

System of Distribution: 120/208V., 277/480V, 3-phase, 4 wire. 120/240V, 1 Phase

PART 2 – PRODUCTS

2.01 GENERAL

Refer to Basic Materials & Methods, Section 26 10 00 of specifications.

2.02 PRODUCTS

A. METERING

Provide metering as required by serving utility, loads, equipment, and appliances shown.

B. GROUNDING

Provide service and equipment grounds per code requirements.

C. MAIN ELECTRICAL SERVICE

Underground service from service point indicated by serving utility. Electrical Contractor to provide for service to building with serving utility. Provide service entrance conductors as shown in Riser Diagram.

D. PANEL BOARDS

Panel Boards to be flush or surface mounted as indicated with flush lift latches with typewritten protected circuit schedules listing each

circuit. Panel Boards to be circuit breaker type, bolt to buss, copper bus only, and equipped with ground bars.

E. CIRCUIT BREAKER

Minimum width of circuit breakers shall be $\frac{3}{4}$ ", no twins. Minimum interrupting capacity shall be 10,000 amperes.

F. MANUFACTURER

ITE, Siemens, Square "D", Cutler-Hammer (Eaton), G.E., Westinghouse, or approved equal.

G. DRY TYPE TRANSFORMERS

1. Minimum Standard:

ANSI C89.2, NEMA ST1-4, Dry Type Transformers, 600 Volts and below.

2. Acceptable Manufactures:

600 Volt Class – GE, Sorgel, Westinghouse, Cutler-Hammer (Eaton), Square D, ACME

3. Taps:

Through 25 KVA: Two 5% full capacity taps below normal rated primary voltage.

30 KVA and Larger: Two 2½% full capacity taps above and four 2½ taps below primary voltage.

4. Insulation:

NEMA Class

0.050 through 2 KVA: Class B

3 KVA and above: Class H

5. Temperatures:

Average rise by resistance: 115°C Maximum

Hot spot rise: 145°C Maximum

Maximum ambient 40°C

6. Continuous Overload Capacity: 10% minimum @ nominal voltage.

2.03 POWER SYSTEM

Furnish and install required or necessary disconnecting means to comply with code requirements whether specifically shown or not.

Disconnecting switches for 480 volt equipment: ITE, Westinghouse, General Electric, Square "D", or approved. Exterior switches shall have NEMA 3 raintight enclosures.

PART 3 – EXECUTION

3.01 GENERAL

Install Panel Boards and fasten them to structure independently of the conduits and conductors that enter them. Provide non-vibrating supports.

Install circuit breakers and conductors as indicated on the plans.

3.02 METERING

As shown on drawings and required by serving utility.

3.03 GROUNDING

All conduit systems, supports, cabinets, equipment cases, motor frames and system neutral conductors shall be permanently and effectively grounded. Continuity of equipment ground shall be maintained throughout the system. Ground clamps shall be approved types specifically designated for grounding.

Where the grounding conductor is enclosed in conduit, ground clamp shall be of type which grounds both the conductor and conduit. Copper-clad strap metal is not acceptable for grounding or bonding purposes.

Grounding shall meet all code requirements. Where other approved grounding means are not available, ground rods shall be used. All ground rods shall be $\frac{3}{4}$ " x 10'-0" copper clad steel. Two ground rods shall be installed (if required) to obtain proper grounding per code requirements. Space a minimum of 6'-0" apart where two rods are used.

3.04 POWER SYSTEM

Provide including service to each power unit and line voltage control wiring.

Connect equipment requiring electrical connections.

After connecting, test for proper operation.

3.05 PANEL BOARDS

Panel Boards shall be mounted as shown on drawings. Mount per Code requirements.

Balance electrical loads to all panel boards. Check rotation of all motors and, if necessary, correct after final service connections are made.

3.06 UNDERGROUND WORK

Electrical Contractor shall be responsible for coordination of all excavating, concrete work, and backfilling (unless otherwise noted) with General Contractor. Trenching, backfilling, shoring, and compacting shall be in accordance with Section 26 01 00 of this Specification. Electrical Contractor shall furnish and install all conduit, fitting, and grounding, unless otherwise noted.

END OF SECTION

SECTION 26 50 00

LIGHTING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 GENERAL REQUIREMENTS

Contractor responsible for correct fixture mounting trim to be compatible with ceiling system being provided.

PART 2 – PRODUCTS

2.01 GENERAL

Refer to Electrical Basic Materials and Methods, Section 26 10 00 of these specifications and material specified on electrical drawings.

2.02 LIGHTING FIXTURES

Fixture Types: See Fixture Schedule.

The streetlights must be 240V/90w Lumec Domus 50 series as shown on the plans.

See list of provided materials listed in the Specifications elsewhere.

2.03 LAMPS

A. FLUORESCENT LAMPS:

As per schedule, unless otherwise indicated.

B. INCANDESCENT LAMPS:

Extended service type 130 volts. Provide number, size and type as required by fixture as indicated on drawings, as manufactured by General Electric, Westinghouse, Sylvania, or approved.

C. BALLASTS:

As per schedule, ETL and UL approved. All ballasts guaranteed by manufacturer for two years after installation.

D. LED DRIVERS:

As per schedule, ETL and UL approved. All Drivers guaranteed by manufacturer for five years after installation.

E. FIXTURE ACCESSORIES:

Provide all necessary hanging or mounting devices for all fixtures and be responsible for checking the type needed for various ceiling conditions. Plaster rings shall be provided where required.

PART 3 – EXECUTION

3.01 LIGHTING FIXTURES

Provide lighting fixtures at the outlets as shown on the drawings according to the symbol at the outlets and as listed in the fixture schedule. Fixtures shall be installed complete with lamps.

3.02 LIGHTING CIRCUITS

Balance loads at panel. Branch circuits to be laid out for a maximum of 1800 watts on a 20-ampere circuit at 120 volts and wired with #12 wire (or larger), per code requirements.

3.03 OUTLETS SHOWN

On the drawings for lighting, fixtures are located for symmetrical patterns and to suit structural conditions.

Major changes in location of outlets shall be approved by the Owner. Consult Drawings for fixture locations in areas receiving special ceiling or other treatment.

3.04 FIXTURE SUPPORT

A. STREET LIGHTING LAMP POSTS

Construct bases as shown on the drawings. Install anchor bolts per manufacturers recommendations.

END OF SECTION

SECTION 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.

1.03 SUBMITTALS

- A. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.04 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.

1.05 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.

1.06 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 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. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to CM.

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 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. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.
 - 1. Arrange with utility companies to shut off indicated utilities.
- C. Interrupting Existing Utilities: Do not interrupt utilities serving occupied facilities unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
- D. Excavate for and remove underground utilities indicated to be removed.

3.04 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation not designated for protection to permit installation of new construction.
 - 1. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
- 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.

3.05 TOPSOIL STRIPPING

- A. Review Geotechnical Report prior to performing work.
- B. Remove sod and grass before stripping topsoil.
- C. Strip topsoil in a manner to prevent intermingling with underlying sub-soil or other waste materials.
 - 1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- D. 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. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity required for reuse.
 - 3. Stockpile remaining topsoil to allow for resspreading.

3.06 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.

3.07 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.

3.08 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: Geotechnical Report have been provided for this project. Please reference Appendices A-D. 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.

1.03 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)

1.04 ACTION SUBMITTALS

- A. No action submittals are necessary.

1.05 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. Laboratory compaction curve according to CTM 216.
- 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.

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 1½ 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 1½ inch sieve and 0 to 5% passing a No. 8 sieve, or as specified by manufacturer.

PART 3 - EXECUTION

3.01 EARTHWORK

- A. Protect and maintain erosion and sedimentation controls during earthwork operations.
- B. Protect sub-grades and foundation soils from softening and damage by water, freezing temperatures, or frost.
- C. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- D. Excavation (General): Shall be to the contours and dimensions required. Keep excavations free from water and debris while construction is in progress. Unless otherwise required, concrete placed below grade will be formed, and excavations shall allow for placement and removal of forms.

Side cuts shall be cribbed and shored as required to protect the stability of adjacent streets to the recommendations of the Engineer, the City Engineering Manual, and the California Department of Transportation Standard Specifications.

- E. Excavation for Structures: Shall be to a tolerance of plus or minus 0.10 foot and shall extend at least five feet laterally beyond the building limits at the excavation level. The excavation side slopes shall not exceed a slope ratio of 1 to 1, horizontal to vertical, unless they are positively retained by shoring or other approved methods.
- F. Excavate for structures, building slabs, pavements, and walkways. Trim sub-grades to required lines and grades.
- G. Utility Trenches: Excavate trenches to indicate slopes, lines, depths, and invert elevations. Maintain 12 inches of working clearance on each side of pipe or conduit unless otherwise noted on the Plans.
- H. Under pavements and walkways, place sub-base course material on prepared sub-grades and compact at optimum moisture content to required grades, lines, cross sections, and thicknesses.
- I. Under slabs on grade, place drainage course on prepared sub-grade and compact to required cross section and thickness per Structural Engineer recommendation(s).

3.02 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 City.

3.03 SUBGRADE INSPECTIONS

- A. Notify the Engineer, the State, and the City's Inspection Representative when excavations have reached required sub-grade.
- B. If the Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or material as directed.

3.04 BACKFILL

- A. Place and compact backfill in excavations promptly.
- B. Place backfill on sub-grades that are free of mud, frost, snow, or ice.

3.05 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.

3.06 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.

- 1) 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.
- 2) 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.
- 3) 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.

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 22 13

EARTHWORK

PART 1 – GENERAL

1.1 DESCRIPTION

Earthwork describes the work including loosening, removing, loading, transporting, depositing, and compacting in its final location of all materials, wet and dry, as required for purposes of construction of all Work shown; the furnishing, placing, and removing of all sheeting and bracing necessary to safely support the sides of the excavations; all pumping, ditching, draining, and other required measures for the removal or exclusion of water; the supporting of structures above and below the ground; all backfilling around structures and all backfilling of trenches and pits; the disposal of excess excavated materials, and all other incidental earthwork as shown.

1.2 RELATED SECTIONS

- A. Section 01 11 00: SUMMARY OF WORK
- B. Section 31 23 33: TRENCHING, BACKFILLING, AND COMPACTING

1.3 REFERENCES

- A. ASTM C136 Sieve Analysis of Fine and Coarse Aggregates
- B. ASTM D1556 Density and Unit Weight of Soil in Place by the Sand Cone Method
- C. ASTM D1557 Laboratory Compaction Characteristics of Soil Using Modified Effort
- D. ASTM D2922 Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)
- E. ASTM D4253 Maximum Index Density and Unit Weight of Soils Using Vibratory Table
- F. ASTM D4254 Maximum Index Density and Unit Weight of Soils and Calculation of Relative Density
- G. Caltrans Test Method 216
- H. Caltrans Test Method 217 Sand Equivalence

1.4 SUBMITTALS

- A. The Contractor shall submit a copy of the excavation permit issued by the California Department of Industrial Safety.
- B. A detailed plan for design of shoring, bracing, sloping or other excavation shall be submitted a minimum of 5 days before Contractor begins excavation.
- C. The Contractor shall submit samples of all materials proposed to be used in the work.
- D. 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

2.1 MATERIALS

- A. GENERAL: Fill, backfill, and embankment materials shall be selected or processed clean, fine earth, rock, or sand, free from grass, roots, brush, other vegetation or miscellaneous inorganic debris and inert rubble.
- B. Fill and backfill materials shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 3 inches.
- C. Fill material shall have an Expansion Index (EI) less than 20.
- D. Suitable Materials: Materials not defined as unsuitable below are defined as suitable materials and may be used in fills, backfilling, and embankment construction subject to the indicated limitations. In addition, when acceptable to the Engineer, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a stable composite.
- E. Suitable materials may be obtained from on-site excavations, may be processed on-site materials, or may be imported. If imported materials are required by this Section or to meet the quantity requirements of the project, the Contractor shall provide the imported materials at no additional expense to the City, unless a unit price item is included for imported materials in the bidding schedule.
- F. The following soil and backfill materials shall be defined and specified:
 - 1. Pipe Zone Material – Material from below pipe to less than 12 inches above top of pipe shall be sand or gravel in compliance with ASTM D1557 minimum sand equivalence of 30 material free from shale, sod, stones, and clods over 2 inches in diameter, roots, trash, organic material and other debris.
 - 2. Trench Zone Material – Material in pipe trench above pipe zone and below street zone shall be suitable soil material in compliance with ASTM D1557.
 - 3. Surface Zone Material – Material in upper 12 inches of trench to finish surface in unimproved or landscaped areas shall be suitable topsoil in compliance with ASTM D1557.
 - 4. No material greater than two inches in any dimension shall be placed within one foot of any pipe, valve, or structure.
 - 5. All backfill within 24 inches of ductile iron fittings or valves shall be clean, washed sand.

2.2 UNSUITABLE MATERIAL

- A. Soils which cannot be compacted sufficiently to achieve the density specified for the intended use.
- B. Rocks larger than three (3) inches in the largest dimension shall not be placed within the fill. Rocks larger than one (1) inch shall not be placed within the upper 12 inches of subgrade soils.
- C. Materials that contain hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.
- D. Soils that contain greater concentrations of chloride or sulfate ions or have a soil resistivity or pH less than the existing on-site soils.

- E. When material for the excavation is unsuitable for use in backfill, it shall be disposed of off-site and suitable material that is capable of being compacted to the required relative density shall be arranged for and furnished by the Contractor at their expense.

PART 3 - EXECUTION

3.1 EXCAVATION – GENERAL

- A. The existence and location of existing underground facilities shown on the plans were obtained by a search of the available records. To the best of our knowledge, no other facilities exist except as shown on the plans. The possibility exists of pipe and other underground improvements which may or may not be shown on the plans. Preserve and protect any such improvements whether shown or not. Where necessary to remove and replace or to relocate such improvements in order to prosecute the Work, they shall be removed, maintained, and permanently replaced by the Contractor at his expense, except as otherwise provided in the Contract documents.
- B. Control grading to prevent water running into excavations. Do not obstruct surface drainage. Provide swales, gutters temporary drains or other means of channeling flow without interruption around excavation.
- C. Preserve existing drainage patterns except as otherwise shown. Where construction methods cause temporary obstruction of drainage patterns, provide temporary facilities adequate for expected flows and a means of emergency removal of the obstruction.
- D. Provide and maintain ample means and devices and promptly remove and properly dispose of all water from any source entering the excavation or other parts of work. Dewatering methods shall ensure preservation of final lines and grades of bottoms of excavations. Said methods may include well points, sump points, suitable rock, or gravel placed below required bedding for drainage and pumping purposes, temporary pipelines and other means that will not be detrimental to the proposed construction. Contractor is responsible for obtaining all water discharge permits required.
- E. Do not place concrete footings or floors in water. Do not allow water to rise over Work until concrete or mortar has set at least eight hours.
- F. During excavation, place the excavated material only within the working area. Do not obstruct any roadways or access ways.

3.2 SITE EXCAVATION

- A. Stripping: Strip all vegetation such as roots, brush, heavy sods, heavy growth, or grass and all decayed vegetable matter, rubbish, and other unsuitable materials within area of Work prior to starting excavation or embankment. Trees and other natural growths outside the actual lines of construction operations shall not be destroyed and such measures as are necessary shall be taken by the Contractor, at his own expense, for the protection thereof.
- B. After stripping, excavation of whatever substances are encountered within grading limits of the Work shall be carried to lines and grades shown. All suitable excavated material shall be used to meet embankment and backfill requirements of Work.

Material in excess or not suitable for embankment or backfill shall be disposed of as specified herein.

- C. Areas to receive embankment or fill shall be benched, if sloping, and scarified to a depth of 12 inches, then compacted to at least 90 percent of the laboratory maximum dry density. All fill should be compacted at moisture content within three (3) percent of optimum moisture content. Do not deposit unsuitable material in fill areas where compaction is required.
- D. Finish: All areas covered by the Work, including excavated and filled sections and transition areas, shall be uniformly graded to elevations shown. Finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. Round edges of spoil and borrow areas to blend into natural contours. The degree of finish ordinarily obtainable from a blade grader will be satisfactory for open areas, but hand grading and raking will be required around structures and walkways. Finished surface shall be not more than 0.1 foot above or below established grade and sloped to prevent ponding.

3.3 TRENCH EXCAVATION

- A. Alignment and Grades: Alignment and grade for pipe shall be as shown. When flow line is shown, it shall be the invert or interior bottom of pipe. When top of pipe is shown, it shall be the exterior of pipe barrel. In absence of such profile grade, pipe shall be laid on a straight grade to permit complete drainage and to provide a minimum of 36 inches of cover to finish ground or street subgrade unless otherwise shown.
- B. The Contractor shall excavate and expose buried points of connection to existing utilities where indicated on the Drawings for connections and before fabrication of pipe and the data obtained shall be used in preparing shop drawings.
- C. In accordance with California Department of Industrial Safety requirements and Green Book, the Contractor is required to obtain a permit for the excavation of trench which is five feet or more in depth and into which a person is required to descend. The Contractor shall furnish all labor, equipment and materials required to design, construct, and remove all sheeting, shoring, and bracing or other equivalent method of support for the walls of open excavations required for the construction of this project.
- D. Trench Width: Overall trench width measured at a level of one foot above the top of pipe shall not exceed the limits listed as follows:
 - 1. Nominal Inside Pipe Diameter of 4" to 12" – Minimum width equal to OD plus 12" and Maximum width equal to OD plus 16".
 - 2. Nominal Inside Pipe Diameter of 14" to 48" – Minimum width equals OD plus 16" and Maximum width equal to OD plus 24".
 - 3. Excavation and trenching shall be true to line so that the pipe is centered in the trench.
- E. Grade Trench Bottom: Provide smooth, firm, and stable foundation such that each pipe section will be continually in contact with the bedding along the extreme bottom of the pipe. Excavation for pipe bells and welding shall be made as required. If excessively wet, soft, spongy, unstable, or similarly unsuitable material is encountered at subgrade, it shall be removed and replaced by gravel of sufficient thickness to form an unyielding foundation. The Contractor shall maintain adequate

dewatering procedures to ensure that an otherwise stable foundation will not be rendered unfit due to accumulation of water in trench.

1. Should large gravel, cobbles or rock be encountered at the trench bottom or pipe subgrade, they shall be removed from beneath the pipe and replaced with granular material which shall be compacted to provide uniform support and a firm foundation.

3.4 VAULT AND CATCH BASIN EXCAVATION

- A. Vault excavation shall have a flat bottom conforming to the grade at which the existing pipe is laid. Vault bottom shall be laid upon firm soil cut true and even, so that bottom of the vault will have a bearing for its full length. Any part of the excavation cut below the needed grade by the Contractor shall be corrected with approved material and thoroughly compacted.
- B. When the bottom material uncovered is soft and in the opinion of the Engineer cannot support the vault, excavate a further depth and/or width and refill to needed elevation. Remove boulders and large stones and refill to grade with a material approved by Engineer, then thoroughly compacted.
- C. Excavation for construction shall be carried out to lines and grades shown and as required to provide working clearance and safe construction slopes and to emplace shoring, sheeting, bracing, and other Work required.

3.5 EXCAVATION IN VICINITY OF TREES

Except where trees are indicated to be removed, trees shall be protected from injury during construction operations. No tree roots over 1 inch in diameter shall be cut without express permission of the Engineer. Trees shall be supported during excavation by any means previously reviewed by the Engineer.

3.6 BACKFILL GENERAL

- A. The fill material placed on the scarified and compacted soil should be compacted to 95% of laboratory maximum dry density, and the top 12 inches of the fill underlying the tank and the concrete ring foundation should be compacted to 95% of the laboratory maximum dry density.
- B. All fill should be compacted at moisture condition to within three (3) % of optimum for fine-grained soils.
- C. Flooding, ponding or jetting shall not be used for fill around tank foundation.
- D. Equipment weighing more than 10,000 pounds shall not be used closer to foundation than a horizontal distance equal to the depth of the fill at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.
- E. Material for mechanical compacted backfill shall be placed in lifts which shall not exceed the following depth:
 1. Impact, free fall, or stomping equipment – maximum lift depth of 3 feet. Not permitted over rigid or cement mortar lined pipe.
 2. Vibratory equipment with smooth contact surface – maximum lift depth of 2 feet.

3. Rolling equipment, including vibratory interrupted surface equipment – maximum 1 foot.
4. Hand directed mechanical tampers – maximum lift depth of 6 inches.

3.7 STRUCTURAL BACKFILL

Do not place backfill until structure footings or other portions of structure of facility have been inspected by the City's representative and approved for backfilling. Do not deposit backfill material against back of concrete retaining walls, foundations or reinforced concrete structures until concrete has developed strength of not less than 75% of full strength using specified test procedures. Place backfill in horizontal layers, moistened and thoroughly tamped, rolled or otherwise compacted. Water settling will not be permitted. Place backfill such that no additional unbalanced loading may occur during placement.

3.8 TRENCH BACKFILL

- A. The pipe bedding is defined as the portion of the trench between the trench subgrade and the bottom of the pipe. After compacting the bedding, the Contractor shall perform a final trim using a string line for establishing grade, such that each pipe section when first laid shall be continually in contact with the bedding along the extreme bottom of the pipe. Excavation for pipe bells and welding shall be made as required.
- B. After pipe has been properly laid, exterior joints grouted and inspected, backfilling shall be commenced. Compaction method or methods used shall result in obtaining the compaction of the backfill in the various specified zones and within the maximum lifts specified. Compaction methods used shall not damage pipe, adjacent ground, existing improvements, or improvements installed as part of Work.
- C. If a moveable trench shield is used during excavation, pipe installation, and backfill operations, the shield shall be moved by lifting the shield free of the trench bottom or backfill and then moving the shield horizontally. The Contractor shall not drag trench shields along the trench causing damage or displacement to the trench sidewalls, the pipe or the bedding and backfill.
- D. Water settling may be used in pipe zone and trench zone in lieu of mechanical compaction, only where material being backfilled is sufficiently sandy and permeable so that specified compaction is achieved. Compaction by saturation shall be accomplished by inserting a pipe, through which water is being supplied under pressure, to the bottom of the lift of material to be consolidated and applying to each square yard or lesser surface area in this manner sufficient water to completely saturate the backfill, there over and cause obvious settlement.
 1. Vibrating compacting equipment may be necessary to supplement water saturation process where required densities cannot be attained by saturation alone.
 2. If water does not readily drain from trench, it shall be removed by sump pump.
- E. Trench Backfill by Zones: Backfill shall be constructed by zones, regardless of compaction method used. The compaction requirements for each zone shall be as follows, unless otherwise specified.
 1. Pipe Zone Backfill: Backfill from below pipe to less than 12 inches above top of pipe. The pipe shall be backfilled with the specified material per Section 2.1 F. to 90% compaction. The Contractor shall exercise care to prevent damage to the pipeline coating, cathodic bonds, and the pipe itself during the installation and backfill

operations. Backfill shall be placed in layers simultaneously on each side of the pipe for full trench width. In placing and compacting backfill give particular attention to underside of pipe and fittings to provide firm support along full pipe length.

2. Trench Zone Backfill: Backfill in pipe trench above pipe zone and below Surface Zone. The zone shall be backfilled with the specified material per Section 2.1 F to 90% compaction. Backfill may be either mechanical compaction or water settling, based on characteristics of material.
3. Surface Zone Backfill: Upper 12 inches of trench to finish surface. Zone shall be backfilled with the specified material per Section 2.1 F. If finish surface is in unimproved or landscape area, 80% compaction is sufficient. If finish surface is within travel way compaction shall be 90%. If finish surface is to be paved, compaction shall be 95%.

3.9 FIELD TESTING

Compaction testing method for pipelines shall be per the Standard Specifications. Compaction testing method for structural foundation shall be per the five (5) layer test ASTM Standard D-557 of the latest edition. Compaction test will be performed by the Water Company as required. The Contractor shall pay all costs for any retesting of work not conforming to the Specifications and the Contract Drawings.

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.

<u>Reference</u>	<u>Title</u>
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 than 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.

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 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. Division 00 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 tests 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 01 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, Road Base

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 $PI = 15 - (S \times 100)$ 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, $\frac{3}{4}$ " 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 $\frac{3}{4}$ " to $\frac{3}{8}$ " 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: $PI = 15 - (S \times 100)$ 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:
1. 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
- G. 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:

- 1. 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.

B. Sand Bedding:

- 1. Sand bedding material, conforming to Paragraph 2.01-A herein shall be placed in 12" maximum loose lifts and compacted to 90% maximum density per ASTM D1557.

C. 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 (per Specification 31 20 00) to final sub-grade elevation.
- 5. Place backfill on sub-grades that are, or have been made to be, free of mud, frost, snow or ice.
- 6. Public Rights-of-Way: Trenches in established streets, highways, or private paved areas subject to vehicular traffic, shall be backfilled per the requirements of the local utility agency.

D. Compaction

- 1. All compaction work shall be performed per Specification 31 20 00.

E. Trench Dewatering

1. Where groundwater is encountered, the Contractor shall dewater the trench per Specification 31 23 19 and sufficiently to meet the bedding and backfill requirements of Paragraph 3.02-C and 3.02-D herein.
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.

F. Finish Operations

1. Fine Grading: 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: 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: 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 31 40 00
SHORING AND UNDERPINNING

PART 1 GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies requirements for sheeting, shoring, and bracing of trenches greater than 5 feet in depth. Nothing in this section shall be deemed to allow the use of a shoring, sloping, or protective system less effective than that required by the Construction Safety Orders. Nothing in this section shall be construed to impose tort liability on the Owner, Owner's employees, or the Construction Manager.

B. DESIGN REQUIREMENTS:

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. Horizontal strutting below the barrel of a pipe and the use of pipe as support are not acceptable.

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
CAL/OSHA --	State of California Construction Safety Orders California State Labor Code

1.03 SUBMITTALS

- A. Submittals shall be provided in accordance with Section 01 33 00 and shall include the following information:
1. A copy of this specification section, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. A check mark (✓) 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. The Contractor shall submit information required by Section 6705 of the California State Labor Code.
 3. A detailed plan shall be submitted before excavation 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 shoring system standards, the plan shall be prepared by a registered civil or structural engineer registered in the State of California.

1.04 CONTRACTOR'S RESPONSIBILITIES FOR SAFETY

- A. The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons (including employees), and property during performance of the work. These requirements shall apply continuously and not be limited to normal working hours.
- B. Safety provisions shall conform to U.S. Department of Labor (OSHA), the

California Occupational Safety and Health Act, and all other applicable federal, state and county, laws, ordinances, codes, the requirements set forth below, and any regulations that may be detailed in other parts of these Specifications.

- C. Where any of these are in conflict, the more stringent requirement shall be followed.

1.03 PERMIT

For trenches or excavations of depths of 5 feet or more, the Contractor shall obtain from the State Division of Industrial Safety a permit for such excavation and submit a copy of the permit to the Construction Manager, prior to initiating any work requiring said permit.

1.04 SAFETY ORDERS

- A. The Contractor shall have copies or suitable extracts of the Construction Safety Orders of Cal-OSHA at the work site.
- B. All work shall comply with the provisions of these and all other applicable laws, ordinances, and regulations.

1.05 SHORING AND TRENCH SAFETY PLAN

- A. For trenches and excavations 5 feet or more in depth, the Contractor shall submit to the Construction Manager a detailed plan design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazards of caving ground.
- B. Such the work shall be submitted at least 10 days before the Contractor intends to begin trenching or excavation work.
- C. If such the work varies from the shoring system standards established by the Construction Safety Orders, the work shall be prepared, sealed, and signed by a Civil or Structural Engineer currently registered in California and experienced in shoring design. Signed and sealed copies of calculations necessary to qualify the system shall be submitted also.
- D. Nothing herein shall be deemed to allow the use of shoring, sloping, or protective systems less effective than that required by the Construction Safety Orders of the Division of Industrial Safety.

1.06 ENGINEER'S REVIEW

- A. The duty of the Engineer to conduct construction review of the Contractor's performance is not intended to include a review or approval

of the adequacy of the Contractor's safety supervisor, the safety program, or any safety measures taken in, on, or near the construction site.

- B. The Engineer will review the submittal of the Contractor's proposed shoring system to verify the general scope of the work, to determine that qualified professional engineering services are used, and to determine that appropriate construction techniques are proposed for use. This review shall not in any way be construed to relieve the Contractor from sole responsibility for the design and safety of such shoring.

1.07 CONTRACTOR'S SUPERVISOR

- A. The Contractor shall appoint a qualified supervisor, who shall be responsible for determining the shoring system which shall be used depending on local soil type, water table, etc.
- B. This supervisor shall have experience in the direction of such excavation and shoring work.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 GENERAL

The construction of sheeting, shoring, and bracing shall not disturb the state of soil adjacent to the trench and below the excavation bottom. Trench sheeting below the top of a pipe shall be left in place.

3.02 SEQUENCE

Trench excavation shall not be started until the design for trench support has been accepted by the Owner.

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.

1.02 QUALITY ASSURANCE

A. 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 D1557-78	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 D2922	Test Method for Density of Soil in Place by the Nuclear Methods
ASTM D994	Preformed Expansion Joint Filler for Concrete (Bituminous Type)
CTM 216	Method of Test for Relative Compaction of Untreated and Treated Soils and Aggregates

CTM 231	Method of Test for Relative Compaction of Untreated and Treated Soils and Aggregates Using Nuclear Gage
Caltrans 2018 Standard Specifications	State of California, Department of Transportation, Standard Specifications, latest edition (2018)

B. TESTING:

Testing will be conducted by an independent laboratory acceptable to the Engineer and paid for by the Contractor to determine compliance with the specified degree of compaction and moisture content prior to placement of aggregate base course.

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 ¾-in HMA Type A and B, as specified in Section 39-2.02A(4)(b)(ii), “Aggregates,” of the Caltrans 2018 Standard Specifications.

D. CONCRETE AND REINFORCING STEEL:

Concrete and reinforcing steel for concrete curbs and sidewalks shall be as specified in Section 73, "Concrete Curbs and Sidewalks," of the Caltrans 2018 Standard Specifications.

E. EXPANSION JOINT FILLER:

Expansion joint filler shall be pre-molded, composed of asphalt fiber and mineral filler with asphalt impregnated liners on both sides, and shall conform to ASTM D994.

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 CONCRETE CURBS AND SIDEWALKS

A. GENERAL:

Concrete work shall be performed in accordance with Section 73, "Concrete Curbs and Sidewalks," of the Caltrans 2018 Standard Specifications.

B. EXPANSION JOINT INSTALLATION:

Unless otherwise specified, expansion joints shall be provided in concrete work at intervals not to exceed 20 feet and against structures abutting sidewalks.

3.05 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. Division 00 Contracting Requirements and Division 01 General Requirements apply to the Work of this Section.

1.02 REFERENCES

- A. Section 26 of the Caltrans 2018 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.
- D. California Department of Transportation
 - 1. CTM 202, Method of Test for Sieve Analysis of Fine and Coarse Aggregates
 - 2. CTM 204, Method of Tests for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 - 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

1.03 SUBMITTALS

- A. Submit under provisions of Specification 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 CTM 202.

- C. Determine Liquid Limit and Plasticity Index in accordance with CTM 204.
- D. Maximum Wet Density in accordance with CTM 216.
- E. CTM 231, 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, reestablish 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
3/4"	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 1 inch 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 loaded 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 Caltrans 2018 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 CTM 216 and CTM 231. 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 1/2 inch of specified thickness the section shall be considered as conforming.

END OF SECTION

SECTION 32 12 00

FLEXIBLE PAVING

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 place asphalt concrete paving including prime coat, tack coat, and seal coat.
- B. Division 00 Contracting Requirements and Division 01 General Requirements apply to the Work of this Section.

1.02 REFERENCES

- A. Section 37 and 39 of the Caltrans 2018 Standard Specifications.
- B. Section 92, 93 and 94 of the Caltrans 2018 Standard Specifications.
- C. California Department of Transportation:
 - 1. CTM 304, Preparation of Bituminous Mixtures for Testing.
 - 2. CTM 308, Method of Test for Determining Bulk Specific Gravity and Density of Compacted Hot Mix Asphalt.
 - 3. CTM 375, Determining the In-Place Density and Relative Compaction of Hot Mix Asphalt Paving Using Nuclear Gages
- D. American Society of Testing and Materials:
 - 1. ASTM D946, Penetration Graded Asphalt Cement for use in Pavement Construction.
 - 2. ASTM D2950, Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
 - 3. ASTM D2041, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.

1.03 ACTION SUBMITTALS

- A. Submit under provisions of Specification 01 33 00 Submittal Procedures.
- B. Mix design for each class of mix.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with the Caltrans 2018 Standard Specifications.
- B. Mixing Plant: Conform to the requirements of the Caltrans 2018 Standard Specifications.
- C. Obtain materials from same source throughout.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Asphalt Binder: The grade of the asphalt binder to be mixed with aggregate for asphalt concrete shall be Grade PG 64-16 conforming to the provisions in Section 92 of the Caltrans 2018 Standard Specifications. The minimum asphalt binder must be 6.0 percent for ½" gradation.
- B. Aggregate: Aggregate shall meet the full requirements of Section 39-2.02 of the Standard Specifications for Type B (½" maximum medium grading). The amount of asphalt binder to be mixed with aggregate shall be such that the air void content of the resulting asphalt concrete shall be not less than 4% +/- 2%. Stabilometer value as determined by CTM 304 shall be 35 at minimum.
- C. Prime Coat: Primer shall be MC-70 or SC-70 grade liquid asphalt conforming to the provisions of Section 93 of the Caltrans 2018 Standard Specifications applied at a rate of 0.25 gallons per square yard.
- D. Tack Coat: Tack coat shall be RS-1 type asphalt emulsion conforming to the provisions of Section 94 of the Caltrans 2018 Standard Specifications.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that compacted aggregate base is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 SPREADING and COMPACTING EQUIPMENT

- A. Spreading and Compacting Equipment shall conform to Section 39 of the Caltrans 2018 Standard Specifications.
- B. Furnish a minimum of one steel-tired roller weighing not less than 12 tons, and one vibratory steel-tired roller weighing not less than 8 tons. Vibratory rollers shall be double steel drum, have adjustable frequency and amplitude settings directly available to the operator during operation. Each roller shall have a separate operator.

3.03 PREPARATION: PRIMER

- A. Apply primer in accordance with the Caltrans 2018 Standard Specifications.
- B. Use clean sand to blot excess primer.

3.04 PREPARATION – TACK COAT

- A. Apply tack coat in accordance with the Caltrans 2018 Standard Specifications.
- B. Apply tack coat to vertical contact surfaces of curbs and gutters.

- C. Coat manhole and catch basin frame surfaces.

3.05 PLACING ASPHALT PAVEMENT

- A. Install work in accordance with the Section 39 of the Caltrans 2018 Standard Specifications.
- B. Place asphalt within 24 hours of applying primer or tack coat.
- C. Place to compacted thickness per Section 39-6.01 of the Caltrans 2018 Standard Specifications.
- D. Install gutter drainage grilles and frames, manhole frames, etc., in correct position and elevation.
- E. Compact pavement in accordance to Section 39-6.03 of the Caltrans 2018 Standard Specifications. Do not displace or extrude pavement from position. Hand compact any areas inaccessible to rolling equipment.
- F. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.
- G. Spread all mixtures at a temperature of not less than 260°F, and not greater than 300°F. Perform initial rolling immediately after placement. No asphalt concrete is to be placed when the atmospheric temperature is below 50°F.
- H. Compact asphalt concrete to a minimum relative density of 95% of the maximum theoretical density (CTM 308 prior to mat cooling below 250°F).

3.06 TOLERANCES

- A. Flatness: The finish surface shall be uniform to a degree such that no depressions greater than 0.02 feet are present when tested with a straightedge 12 feet long.
- B. Scheduled Compacted Thickness: Within 0.01 feet.
- C. Variation from True Elevation: Within 0.02 feet.
- D. Density shall be tested in conformance with CTM 375 and shall average 95% of the laboratory compacted unit weight (CTM 304).

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The work includes, but is not limited to, the following:

- 1. Vehicular Paving
- 2. Pedestrian Paving

- B. RELATED SECTIONS

- 1. Section 03 30 00: Cast-in-Place Concrete
- 2. Section 31 20 00: Earth Moving
- 3. Section 32 13 16: Decorative Concrete Paving
- 4. Section 32 17 26: Tactile Warning Surfacing
- 5. Section 32 17 23: Concrete Paving Joint Sealants

1.3 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.

1.4 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.

1.5 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.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 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.

2.2 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.

2.3 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.

2.4 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.

2.5 FIBER REINFORCEMENT

- A. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.
 - 1. Available Products:
 - a. Monofilament Fibers:
 - 1) Axim Concrete Technologies; Fibrasol IIP.

- 2) Euclid Chemical Company (The); Fiberstrand 100.
 - 3) FORTA Corporation; Forta Mono.
 - 4) Grace, W. R. & Co.--Conn.; Grace MicroFiber.
 - 5) Metalcrete Industries; Polystrand 1000.
 - 6) SI Concrete Systems; Fibermix Stealth.
 - 7) Or approved equal
- b. Fibrillated Fibers:
- 1) Axim Concrete Technologies; Fibrasol F.
 - 2) FORTA Corporation; Forta.
 - 3) Euclid Chemical Company (The); Fiberstrand F.
 - 4) Grace, W. R. & Co.--Conn.; Grace Fibers.
 - 5) SI Concrete Systems; Fibermesh.
 - 6) Or approved equal.

2.6 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.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

1. Available Products:

- a. Axim Concrete Technologies; Cimfilm.
- b. Burke by Edeco; BurkeFilm.
- c. ChemMasters; Spray-Film.
- d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
- e. Dayton Superior Corporation; Sure Film.
- f. Euclid Chemical Company (The); Eucobar.
- g. Kaufman Products, Inc.; Vapor Aid.
- h. Lambert Corporation; Lambco Skin.
- i. L&M Construction Chemicals, Inc.; E-Con.
- j. MBT Protection and Repair, ChemRex Inc.; Confilm.
- k. Meadows, W. R., Inc.; Sealtight Evapre.
- l. Metalcrete Industries; Waterhold.
- m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
- n. Sika Corporation, Inc.; SikaFilm.
- o. Symons Corporation; Finishing Aid.
- p. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

1. Available Products:

- a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
- b. Burke by Edoko; Aqua Resin Cure.
- c. ChemMasters; Safe-Cure Clear.
- d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
- e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
- f. Euclid Chemical Company (The); Kurez DR VOX.
- g. Kaufman Products, Inc.; Thinfil 420.
- h. Lambert Corporation; Aqua Kure-Clear.
- i. L&M Construction Chemicals, Inc.; L&M Cure R.
- j. Meadows, W. R., Inc.; 1100 Clear.
- k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
- l. Symons Corporation; Resi-Chem Clear.
- m. Tamms Industries Inc.; Horncure WB 30.
- n. Unitex; Hydro Cure 309.
- o. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

1. Available Products:

- a. Anti-Hydro International, Inc.; AH Curing Compound #2 WP WB.
- b. Burke by Edoco; Resin Emulsion White.
- c. ChemMasters; Safe-Cure 2000.
- d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
- e. Dayton Superior Corporation; Day-Chem White Pigmented Cure (J-10-W).
- f. Euclid Chemical Company (The); Kurez VOX White Pigmented.
- g. Kaufman Products, Inc.; Thinfil 450.
- h. Lambert Corporation; Aqua Kure-White.
- i. L&M Construction Chemicals, Inc.; L&M Cure R-2.
- j. Meadows, W. R., Inc.; 1200-White.
- k. Symons Corporation; Resi-Chem White.
- l. Tamms Industries, Inc.; Horncure 200-W.
- m. Unitex; Hydro White.
- n. Vexcon Chemicals, Inc.; Certi-Vex Enviocure White 100.

2.7 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; Surfard.
 - 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.
- G. Pigmented Mineral Dry-Shake Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
 - 1. Available Products:
 - a. Conspec Marketing & Manufacturing Co., Inc.; Conshake 600 Colortone.
 - b. Dayton Superior Corporation; Quartz Tuff.
 - c. Euclid Chemical Company (The); Surflex.
 - d. Lambert Corporation; Colorhard.
 - e. L&M Construction Chemicals, Inc.; Quartz Plate FF.
 - f. MBT Protection and Repair, ChemRex Inc.; Mastercron.
 - g. Metalcrete Industries; Floor Quartz.
 - h. Scofield, L. M. Company; Lithochrome Color Hardener.
 - i. Symons Corporation; Hard Top.
 - 2. Color: As selected by Owner's Representative from manufacturer's full range.
- H. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch sieve and 85 percent retained on a No. 8 sieve.

2.8 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. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals. as follows:
 1. Fly Ash or Pozzolan: 25 percent.
 2. Ground Granulated Blast-Furnace Slag: 50 percent.
 3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- G. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.
- H. 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.

2.9 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.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd...
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 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.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 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.

3.4 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.

3.5 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.

3.6 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 F at 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.

3.7 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.

3.8 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.

3.9 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 321316

DECORATIVE CONCRETE PAVING

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:

- a. Sandblasted pattern 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.

1.3 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.

1.4 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.

1.5 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.

1.6 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, 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 4'x4' standalone mockups of full-thickness sections of decorative concrete paving to demonstrate typical joints (including portion along typical concrete); surface color, sandblasted 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. Approval of mockups does not constitute approval of deviations from the Contract Documents unless Landscape Architect specifically approves such deviations in writing.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on decorative concrete paving mixtures.

1.8 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

- C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in 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.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. Concrete shall comply with Caltrans Minor Concrete Standards.
- B. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
1. Use flexible or uniformly curved forms for curves of a radius of 100 feet or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 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.

2.4 FIBER REINFORCEMENT

- A. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.
 - 1. Available Products:
 - a. Monofilament Fibers:
 - 1) Axim Concrete Technologies; Fibrasol IIP.
 - 2) Euclid Chemical Company (The); Fiberstrand 100.
 - 3) FORTA Corporation; Forta Mono.
 - 4) Grace, W. R. & Co.--Conn.; Grace MicroFiber.
 - 5) Metalcrete Industries; Polystrand 1000.

6) SI Concrete Systems; Fibermix Stealth.

7) Or approved equal

b. Fibrillated Fibers:

1) Axim Concrete Technologies; Fibrasol F.

2) FORTA Corporation; Forta.

3) Euclid Chemical Company (The); Fiberstrand F.

4) Grace, W. R. & Co.--Conn.; Grace Fibers.

5) SI Concrete Systems; Fibermesh.

6) Or approved equal.

2.5 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, nondissipating, 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.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber. Bonding agent in "Bonding Agent" Paragraph below may be used directly from container or as an admixture in cement or sand-cement slurry.

B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy-Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for

application temperature, of grade complying with requirements, and of the following types:

1. Types I and II, nonload bearing for bonding hardened or freshly mixed concrete to hardened concrete.

D. Polyethylene Film: ASTM D4397, 1 mil thick, clear.

2.7 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. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals. as follows:

1. Fly Ash or Pozzolan: 25 percent.
 2. Ground Granulated Blast-Furnace Slag: 50 percent.
 3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- G. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd..
- H. 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.

2.8 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.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd...
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 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.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 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.

3.4 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.
- 3.5 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 Fahrenheit at 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.

3.6 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. Finish surfaces to true planes. 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.

3.7 SANDBLASTED CONCRETE FINISH

- A. Sandblasted Concrete Finish: After final floating, apply the following finish:
 1. Sand blast: Apply a medium sandblast finish. Landscape architect to review mockup before proceeding.

3.8 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.

3.9 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:

ACI 117 establishes few pavement tolerances; those in subparagraphs below are based on ACI 330.1.

- 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 TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

ACI 117 establishes few pavement tolerances; those in subparagraphs below are based on ACI 330.1.

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.

END OF SECTION

SECTION 32 13 16.15-7

LITHO MOSAIC® (LITHOMOSAIC®) SPECIFICATION SYSTEM 7

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. Requirements of "General Conditions of the Contract" and of Division 1, "General Requirements," apply to work in this Section with same force and effect as though repeated in full herein.

1.2 SCOPE OF WORK

- A. Furnish materials, labor, transportation, services, and equipment necessary to furnish and install Lithomosaic® architectural concrete paving incorporating the patented Lithocrete® process as indicated on Drawings and as specified herein.
- B. Work included in this Section:
- Lithocrete® architectural concrete products and concrete installations are covered by one or more of the following United States Letters Patents: 5,794,401; 5,887,339; 5,950,394; 6,016,635; 6,033,146; 6,082,074; 6,112,487; 7,322,772; 7,493,732; 7,607,859; 7,614,820; 7,670,081; 7,781,019. Other patents pending. Lithocrete, Lithocrete Thin Tech, Lithocrete Presto, Presto Pneumatic Spray, and LQS are registered trademarks of Lithocrete Inc.
 - Only experienced Architectural Cast-in-place Concrete installers, certified to install Lithomosaic® are acceptable for this project. Acceptance of certification will be based on proof of certification & experience to be provided within 30 days after Notice to proceed. If timeframe is exceeded, or suitable certification/experience is not provided – installer will not be eligible to install project. For certified Lithomosaic® installers contact Lithocrete® at 800-899-9921.
 - Approved sample #25-013a-sd for this project are available at (location), as prepared by T.B. Penick & Sons, Inc. Contact T.B. Penick & Sons, Inc., *Frank Klemaske*, 858.558.1800.
- C. Work related in other Sections:
- Section 02750 - Portland Cement Concrete Paving: Adjacent concrete paving.
 - Section 02810 - Irrigation System: Coordination of irrigation sleeve installation.

- Section 02900 - Landscape Planting: Coordination of plant material placement.
- Section 07900 – Joint Sealers: Installation of caulking.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

- A. Federal, State and local laws and regulations governing this Work are hereby incorporated into and made part of this Section. When this Section calls for certain materials, workmanship, or a level of construction that exceeds the level of Federal, State, or local requirements, provisions of this Section take precedence.

1.4 APPLICABLE STANDARDS

- A. Specifications and recommended practices of American Concrete Institute (ACI), American Society for Testing and Materials (ASTM), The Uniform Building Code, and under one or more U.S. Patents 5,794,401; 5,887,339; 5,950,394; 6,016,635; 6,033,146; 6,082,074; 6,112,487; 7,322,772; 7,493,732; 7,607,859; 7,614,820; 7,670,081; 7,781,019 and U.S. Trademarks #1,879,329, # 2,358,183 # 2,358,054 referred to in this Specification with their individual designations are to be considered part of this Specification.
- B. Design and Control of Concrete Mixtures – Thirteenth Edition; Portland cement Association.

1.5 QUALITY CONTROL

- A. Quality control to be maintained by licensed installers of LithoMosaic® throughout duration of project.
- B. Paving Subcontractor Qualifications: provide evidence to indicate successful experience in providing Lithocrete® similar to that specified herein and demonstrate successful experience.
- C. As part of the bid submittal the General Contractor shall submit background information/qualifications on his Architectural Cast-in-place Contractor certified for Lithomosaic® installation. This information shall provide evidence to indicate successful experience in providing concrete work identical to that specified herein. A listing of projects shall be provided and shall be reviewed and approved as comparable projects to the specified work by the Owner or Architect prior to award of bid. Failure to provide this information or the submittal of incomplete or inaccurate information shall give cause to reject the entire bid as non responsive and incomplete. The submittal shall provide the Owner and Architect with evidence of successful experience in Lithocrete® similar to that

specified herein and can demonstrate successful experience through past project documentation and references.

- D. Demonstration of experience: provide a minimum of three (3) projects of installed Lithomosaic® totaling at least 5,000 square feet with a reference list of each containing address of installation, contact person and phone number of project's architect or owner's representation. Minimum size of each individual installation shall be 200 square feet. Provide two (2) color photos, 8" x 10" size, of each installation listed above representing the installation. Photo #1 shall show the approximate size of the installation. Photo #2 shall be taken approximately 2 to 3 feet from the paving surface. See submittals portion of this section for additional information.
- E. Supervision: On site superintendent must have a minimum of 10 years experience installing Architectural Cast-in-place concrete. See submittals portion of this section for additional information.
- F. Slip Resistance: provide a finish with a slip resistance of equal or greater than 0.65 when tested by the owner in accordance with ASTM F 489

1.6 SITE INSPECTION

- A. Verify conditions at site that affect work of this Section.
- B. Take field measurements as required.
- C. Report major discrepancies between Drawings and field dimensions to Owner's Authorized Representative prior to commencing work.

1.7 SUBMITTALS

- A. Product Data: Submit no later than 10 days after contract award a typed list of products specified in this Section.
- B. Submit evidence of installer qualifications, demonstration of square footage installed, number of projects, and contact information to verify experience; evidence of supervisor experience as indicated in Quality Control Section of this specification.
- C. Shop Drawings:
 - 1. Paving Jointing and Pour Sequence Plan - submit six blueprints indicating the following:
 - a) Proposed layout of contraction, construction and isolation joints. Clearly delineate the three different joint types.

- b) Layout of paving types as indicated on Drawing Paving Schedule.
Give overall dimensions of each paving type.

D. Statement of Mix Design: Submit (1) copy of Statement of Mix Design prepared by batch plant servicing Project for each load delivered to Project. Statement of Mix Design to contain following information:

1. Name, address, and telephone number of batch plant preparing statement of mix design.
2. Date of mix design.
3. Project location.
4. Contractor requesting load delivery.
5. Mix design number.
6. Integral color used.
7. Gradation for sand and aggregate.
8. Material weights, specific gravity, and absolute volumes.
9. Basis of testing, i.e. UBC 2605 D4 and Title 24 2604 D4.
10. Water/cement ratio.
11. PSI rating.

1.8 SUBSTITUTIONS

- A. None allowed unless approved in writing by Owner's Authorized Representative.

1.9 TESTING

- A. A testing agency may be designated by Owner or Owner's Authorized Representative. Testing personnel to meet ASTM E329 requirements.

1.10 PROJECT CONDITIONS

- A. Keep Work area clean, and in a safe and workmanlike condition so that rubbish, waste and debris do not interfere with work of other trades.

1.11 PRODUCT HANDLING

- A. Store materials in a dry and protected location. Protect reinforcing steel and dowels from rusting, deformation, staining, and moisture damage.

- B. Keep Lithocrete® aggregate dry at all times prior to installation.

1.12 COORDINATION

- A. Notify Owner's Authorized Representative and contractors performing work related to installation of Contractor's Work in ample time, so as to allow sufficient time for them to perform their portion of work.
- B. Concrete pour sequence plan to be generated during preconstruction phase.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT

- A. Type I, IA, IL, II, IIA, III, IIIA, IV, and V cements, to conform to ASTM C150.
- B. Use same brand of cement from single source throughout entire project.

2.2 WASHED CONCRETE SAND

- A. Clean, hard, and durable washed concrete sand, conforming to ASTM C33.
- B. Use same sand from single source throughout entire project.

2.3 COARSE AGGREGATE

- A. Clean, hard, and durable coarse aggregate, conforming to ASTM C33.
- B. Use same aggregate from single source throughout entire project.

2.4 WATER

- A. Free from deleterious materials such as oils, acids, and organic matter.

2.6 ADMIXTURES

- A. Integral Concrete Coloring Admixture: Refer to Drawings for color type and manufacturer.
 - 1. Acceptable Manufacturers:
 - a. L.M. Scofield; (800) 800-9900.
 - b. Colorfull by Admixtures, Inc.; (626) 357-3263.
 - c. Davis Color (323) 269-7311
 - d. Solomon Colors (800) 624-0261
 - e. Increte/The Euclid Chemical Company (800)752-4626
- B. Air Entrainment Admixtures: Conforming to ASTM C260.

1. Acceptable Manufacturers:
 - a. Grace Construction Products; Daravair[®], (800) 433-0020 or www.graceconstruction.com/concrete/air_entraining.html#daravair.
 - b. Master Builders, Inc.; Micro-Air[®], (800) 628-9990 or www.masterbuilders.com/MB/pub/Product.asp?TypeCat=2&ParentID=78&ProductID=22.
 - c. The Euclid Chemical Company; AEA or Airmix Series (800) 752-4626 www.euclidchemical.com
 - d. or approved equal

C. Water Reducing Admixtures: Conforming to ASTM C494, Type A.

1. Acceptable Manufacturers:
 - a. Grace Construction Products; WRDA[®] (800) 433-0020 www.graceconstruction.com/concrete/water_reducers.html#wrda.
 - b. The Euclid Chemical Company; Eucon Series (800) 752-4626 www.euclidchemical.com
 - c. or approved equal

D. Shrinkage Reducing Admixtures: Conforming to ASTM C157.

1. Acceptable Manufacturers:
 - a. Grace Construction Products; Eclipse[®] (800) 433-0020 or www.graceconstruction.com/concrete/shrinkage_reducers.html#eclipse.
 - b. BASF; Tetraguard (800) 228-3318 or http://www.basf-admixtures.com/en/products/shrinkage_reducing/tetraguard_as20/Pages/default.aspx
 - c. The Euclid Chemical Company; Eucon SRA (800) 321-7628 www.euclidchemical.com
 - d. or approved equal

2.7 READY MIXED CONCRETE

- A. Batched, mixed and transported in accordance with ASTM C94 - "Specifications for Ready Mixed Concrete."

2.8 REINFORCING

- A. Reinforcing Steel: Conforming to ASTM A615, clean and free of rust, dirt, grease or oils.
- B. Tie Wire: 16-gauge plain cold-drawn steel conforming to ASTM A82, clean and free of rust, dirt, grease or oils.

C. Supports for Reinforcement:

1. Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars in place.

D. Polypropylene Fiber Reinforcement: 100% virgin multifilament polypropylene fibers, complying with ASTM C 1116 - Type III.

1. Acceptable Manufacturers:

- a. Fibermesh; Fibermix Stealth® – 1/4" long (423)892-8080 or www.fibermesh.com/family/stealth.htm.
- b. Grace Construction Products; MicroFiber™ (800)433-0020 or www.graceconstruction.com/concrete/fibers.html

2. Application Rate: 1/2 lb. /cy of mix.

2.9 ISOLATION JOINT MATERIALS

- A. Refer to Section 07900 – Joint Sealers for isolation joint construction.

2.10 CONSTRUCTION JOINT DOWELS

- A. Construct Diamond Dowel Construction joints at modules no larger than 20'-0" x 20'-0".
- B. Dowel schedule to match rebar schedule at a minimum spacing of 24-30"o.c.
- C. 1/4-inch-thick diamond shaped load plate, free of dirt, grease, and oils. Contact PNA Construction Technologies at (800) 542-0214 or http://www.pna-inc.com/products/square_dowel_basket/ or contact local suppliers such as White Cap.

2.11 FLY ASH

- A. ASTM C618 - Type F.

2.12 CURING COMPOUND

- A. Concrete Curing Compound

1. Acceptable Manufacturers

- a. Admixtures Inc.; Colorful Clear Curing Compound – (626) 357-3263 or <http://admixtures.home.att.net/>
- b. Cure & Sealer Lithocrete® Sealer or HLQ 125.

PART 3 - EXECUTIONS

3.1 SUBGRADE

- A. Subgrade to meet requirements of project's soil report.
- B. Ensure that a minimum 4-inch layer of FREE DRAINING graded washed aggregate or clean washed and graded concrete sand compacted to 95 percent relative compaction is placed over subgrade prior to placing concrete.
- C. Place all aggregate base material to a smooth plane ensuring proper slab design thickness to a tolerance plus or minus $\frac{1}{2}$ ".
- D. Ensure that utilities, including irrigation lines are buried and compacted below bottom of sand layer.
- E. Keep sand damp prior to placing concrete.

3.2 FORMING

- A. Be responsible for design and engineering of formwork as well as its construction.
- B. Ensure that Work conforms to recommended practice for concrete formwork (ACI 347), latest edition.
- C. Do not exceed 20-feet by 20-feet in a formed construction area.
- D. Ensure that form lumber is new #2 or better grade wood. Do not use used form lumber.
- E. Perform form layout with a digital electronic transit for line layout accuracy.
- F. Allow forms to remain in place long enough to allow concrete to set properly. Remove forms when appropriate.

3.3 DESIGN OF MIXES AND PROPORTIONING

- A. Proportion and mix of cement, aggregate, admixture and water to attain required plasticity and strength in accordance with current edition of ACI Manual of Concrete Practice and PCA "Design and Control of Concrete Mixtures."
- B. Concrete mixtures to be designed by an approved commercial testing laboratory, using approved materials to obtain specified minimum compressive strength.

C. Concrete Mix Criteria:

1. Slump: 5-inch, with a 1/2-inch slump differential between successive batches. Obtain approval from Owner's Authorized Representative if slump is outside these parameters.
2. Minimum PSI Rating at 28 days: 4,000 or per soils report.
3. Sand: 50-55% of total mix.
4. Blended Gravel: 45-50% of total mix
5. Admixtures:
6. Air entrainment: Per local standards
7. Shrinkage Reducing: Do not exceed 2% by weight of cement.
8. Fly ash: Use only when seeding reactive Lithocrete™ aggregates such as glass and seashells or per item 2.11 above. If fly ash is not available, utilize approved equal to mitigate alkali silica reaction.
9. Non-Chloride Accelerators: Do not use corrosive accelerators such as calcium chloride.
10. Concrete Delivery: Use of concrete loads exceeding 90 minutes from time of batch plant must be approved by Owner's Authorized Representative.
11. Ensure that batch plant guarantees single source supply for cement, sand, and aggregate for the entire project.
12. Final mix designs shall be based on criteria above and meet critical minimum points stipulated in items 2,4, and 7 above. Other items may vary by geographical region and required certain modifications shall in no way compromise the strength and integrity of the mix design stipulated.

D. Architectural Cast-in-Place Concrete mixes are based on Architect's design intent. The mix designs involve different Architectural Cast-in-place Lithocrete finishes as indicated in Drawings.

3.4 LITHOMOSAIC INSTALLATION

- A. LithoMosaic® is a patented paving process. Installation of LithoMosaic® must be performed by a licensed LithoMosaic® installer only.
- B. Contact Lithocrete® at 800-899-9921 for a licensed LithoMosaic® installer in project area.

C. Lithocrete® is to be installed in accordance under one or more U.S. Patents 5,794,401; 5,887,339; 5,950,394; 6,016,635; 6,033,146; 6,082,074; 6,112,487; 7,322,772; 7,493,732; 7,607,859; 7,614,820; 7,670,081; 7,781,019 and U.S. Trademarks #1,879,329, # 2,358,183 # 2,358,054.

- LithoMosaic finish as provided by T.B. Penick & Sons, Inc. Contact T.B. Penick & Sons, Inc., *Frank Klemaske*, 858.558.1800.

D. LithoMosaic® process incorporates use of following patented products:

1. Lithocrete® Conditioner™.
2. Lithocrete® Etch Retarder®.
3. Lithoseal™ paving sealer.
4. Lithocrete® vibrating float process – use patent # 6,016,635
5. Lithocrete® power trowel process – use patent # 6,016,635

3.5 JOINTING

A. Refer to ACI 302 “Guide for Concrete Floor and Slab Construction” for work under this section.

B. Construction and Contraction Joints:

1. Saw-cut construction and contraction joints in locations indicated on Drawings.
2. Perform jointing with a new diamond tip circular saw.
3. Joint Width: Per Drawings. Do not exceed 3/16-inch in width.
4. Depth of sawcuts: 1/4th depth of slab.
5. Decorative Saw-cut Joints: Per Drawing.
6. Saw-cut joints in a straight line with no over-cutting.
7. Use a hand tool to saw-cut up to vertical edges such as walls, steps, curbs and columns. No cutting into vertical surfaces will be allowed nor shall saw-cuts be allowed to stop short of vertical surfaces and allowed to crack at the end.
8. All saw-cuts shall be further treated with a Soft-Cut beveled blade or sealed with structural silicone joint sealant to be determined by Architect.

9. CONSTRUCTION JOINT DOWELS

10. Construct Diamond Dowel Construction Joints and Dowel Basket Joints at modules no larger than 20'-0" x 20'-0".
11. Dowel schedule to match rebar schedule at a minimum spacing of 24-30"o.c.
12. 1/4-inch-thick diamond shaped load plate, free of dirt, grease, and oils. Contact PNA Construction Technologies at (800)542-0214 or http://www.pna-inc.com/products/square_dowel_basket/ or contact local suppliers such as White Cap.

C. Isolation Joint Caulking:

1. Install isolation joint caulking to be installed under Section 07900 – Joint Sealers.

3.6 CURING

- A. After LithoMosaic® exposure, cure concrete for a minimum of seven (7) days without foot traffic and a minimum thirty (30) days without vehicular traffic. If a curing compound is required, refer to Section 2.12 of this specification for acceptable curing compounds for use with Lithocrete or install a moisture retaining, non-staining, non-woven, curing cover and maintain sufficient moisture under cover to provide for 100% humidity conditions at Lithocrete® surface for a minimum of 7 days. Cover shall be reflective in nature to prevent excessive heat build up under cover and allow for optimal curing conditions.

3.7 SEALING

- A. Seal surface of paving using Lithocrete® Sealer also apply Semco X-Crete 500, Semco Satin Stone, or Spec Chem sealers.
- B. Final cleaning, staining, caulking, and sealing operations shall not commence until Lithocrete® surfaces have been completely and properly cured or 28 days whichever is later.
- C. Follow Lithocrete® Sealer directions when applying.

END OF SECTION

(Name of Project)

**REQUIRED ARCHITECTECTURAL CAST-IN-PLACE CONCRETE SUB-CONSULTANT
INFORMATION**

The proper installation of specialty concrete finishes such as LithoMosaic is critical to the success of the project. The bidder, **or the bidder's subcontractor**, shall have at least three (3) or more LithoMosaic® projects installed.

I. LITHOMOSAIC INSTALLER

- Contractor: _____
- Project Manager/Foreman: _____
- Phone Number: _____

II. COMPARABLE PROJECT LIST (PROVIDE MINIMUM OF 3)

1. Project Name: _____
Address: _____
Name of Contact: _____
Phone Number: _____
2. Project Name: _____
Address: _____
Name of Contact: _____
Phone Number: _____

3. Project Name: _____
Address: _____
Name of Contact: _____
Phone Number: _____

Provide two (2) color photos, 8"x10" in size, of each installation listed above. Photo #1 shall show the approximate size of the installation. **Photo #2 shall be taken approximately 2 to 3 feet from the respective paving surface.** Photos shall clearly show the detail associated with the Lithocrete® finish or the photo(s) will be rejected. The bidder must submit the above information along with the color photos with the bid. Failure to submit the information and photos shall be considered a non-responsive bid and therefore the bidder shall be considered non-responsive.

Signature of Bidder

Date

SECTION 32 13 73

CONCRETE PAVING JOINT SEALANTS

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. Expansion and contraction joints within cement concrete pavement and adjacent vertical features.
 - 2. Joints between cement concrete and asphalt pavement.

1.3 RELATED REQUIREMENTS

- A. Section 03 30 00 Cast-in-Place Concrete
- B. Section 32 13 13 Concrete Paving

1.4 SUBMITTALS

- A. Product Data:
 - 1. For each joint-sealant product indicated.
- B. Samples for Verification:
 - 1. For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Product Certificates:
 - 1. For each type of joint sealant and accessory, signed by product manufacturer.
- D. Qualification Data:
 - 1. For Installer.

E. Compatibility and Adhesion Test Reports:

1. From sealant manufacturer, indicating the following:
 - a. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - b. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
 - c. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sealants.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. An employer of workers trained and approved by manufacturer.

B. Source Limitations:

1. Obtain each type of joint sealant through one source from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing:

1. Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - a. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - b. Submit not fewer than four pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - c. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - d. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 - e. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

D. Product Testing:

1. Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing of current sealant

products within a 36-month period preceding the Notice to Proceed with the Work.

a. Testing Agency Qualifications:

- 1) An independent testing agency qualified according to ASTM C 1021 for testing indicated, as documented according to ASTM E 548.

1.6 DELIVERY STORAGE AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
 2. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 degrees F.
 3. When joint substrates are wet or covered with frost.
 4. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 5. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products:
 1. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

B. Products:

1. Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 MATERIALS

A. Compatibility:

1. Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants:

1. As selected by Owner's Representative from manufacturer's full range.

2.3 COLD-APPLIED JOINT SEALANTS

A. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

1. Products:
 - a. Crafcro Inc.; RoadSaver Silicone SL.
 - b. Dow Corning Corporation; 890-SL.
 - c. Or approved equal

2.4 JOINT-SEALANT BACKER MATERIALS

A. General:

1. Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Sealants:

1. ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Sealants:

1. ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

D. Round Backer Rods for Cold-Applied Sealants:

1. ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.5 PRIMERS

A. Primers:

1. Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints:

1. Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming:

1. Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General:

1. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

- B. Sealant Installation Standard:
1. Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of backer materials.
 2. Do not stretch, twist, puncture, or tear backer materials.
 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses provided for each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants:
1. Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - a. Remove excess sealants from surfaces adjacent to joint.
 - b. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.
- G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

END OF SECTION

SECTION 32 17 00
PAVING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Traffic Stripes and Pavement markings.
 - 2. Detectable warning surface.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's printed product data for each product specified.
- B. Detectible Warning Surface Warranty per Caltrans 2018 Standard Specifications Section 73-3.01C.

1.3 QUALITY ASSURANCE

- A. Americans with Disabilities Act (ADA): Title III Regulations, 28 CFR Part 36 ADA Standards For Accessible Design, Appendix A, Section 4.29.2 Detectable Warnings On Walking Surfaces, supplemented by Caltrans Standard Plans and Specifications.

1.4 CALTRANS REFERENCE SPECIFICATIONS

- A. Section 84 Markings.
- B. Section 73 Concrete Curbs and Sidewalks.

PART 2 - PRODUCTS

2.1 PAVEMENT MARKING

- A. Products for Traffic Stripes and Pavement Markings to comply with Caltrans 2018 Standard Specifications Section 84-2.02 Materials.
 - 1. Thermoplastic Traffic Stripes and Pavement Markings: Thermoplastic traffic stripes and pavement markings shall conform to the provisions of Section 84-2, "Thermoplastic Traffic Stripes and Pavement Markings," of the Caltrans Standard Specifications.
 - 2. Thermoplastic Material: Thermoplastic material shall conform to either Caltrans Standard Specification PTH-02ALKYD, PTH-02SPRAY or PTH-02HYDRO. Glass beads to be applied to the surface of molten thermoplastic material shall conform to the requirements of State Specification 8010-004.

2.2 DETECTABLE WARNING SURFACE

- A. Refer to Caltrans 2018 Standard Specifications Section 73-1.02B.

PART 3 - PART 3 – EXECUTION

3.1 PAVEMENT MARKING

- A. Conform to Construction Requirements in Caltrans 2018 Standard Specifications Sections 84 and 73.

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.
- B. Shop Drawings:
 - 1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
 - 2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Standard Specifications (2023) of California DOT, Section 84 Markings, for pavement-marking work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyd materials, and 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Aexcel Inc.
 - 2. Colorado Paint Company; a subsidiary of Swarco Industries Inc.
 - 3. Columbia Paint & Coatings, Inc.; a subsidiary of Sherwin-Williams Company (The).
 - 4. Conco Paints.
 - 5. Diamond Vogel Paints.
 - 6. Dow Chemical Company (The).
 - 7. Dunn-Edwards Corporation (a Nippon Paint Holdings Co. Ltd. company).
 - 8. Ennis-Flint.
 - 9. Farrell-Calhoun.
 - 10. General Paint.
 - 11. Insl-X Products; Benjamin Moore & Co.
 - 12. Kelly-Moore Paint Company Inc.
 - 13. McCormick Paints.
 - 14. PPG Paints.
 - 15. Rodda Paint Co.
 - 16. Rust-Oleum Corporation; a subsidiary of RPM International, Inc.
 - 17. Scott Paint.
 - 18. Sherwin-Williams Company (The).
 - 19. Transpo Industries, Inc.
 - 20. Approved equal.
- B. Source Limitations: Obtain pavement-marking paints from single source from single manufacturer.

2.2 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

2.3 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.
- B. Glass Beads:
 - 1. Each lot of glass beads must comply with EPA Test Method 3052 and 6010B or 6010C. Glass beads must contain less than 200 PPM each of arsenic and lead.
 - 2. AASHTO M 247, Type 1. Roundness: Minimum **75** percent true spheres by weight.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 THERMOPLASTIC MARKING

- A. Apply thickness and install and according to Standard Specifications (2023) of California DOT, Section 84 Markings

3.4 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.
- C. Samples for Verification: For each type of tactile warning surface, in manufacturer's standard sizes unless otherwise indicated, showing edge condition, truncated-dome pattern, texture, color, and cross section; with fasteners and anchors.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For tactile warning surfacing, to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of tactile warning surfaces that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

- a. Deterioration of finishes beyond normal weathering and wear.
- b. Defects in dome shape, color fastness, sound-on-cane acoustic quality, resilience, and attachment.

2. Warranty Period: Five years from date of Contract acceptance.

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.

- B. Source Limitations: Obtain each type of tactile warning surfacing, **joint material, setting material** from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

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. Permanently embedded detectable warning tile wet-set into freshly poured concrete.
- b. Replaceable detectable warning tile wet-set into freshly poured concrete and surface-fastened to permanently embedded anchors.

2.3 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of tactile warning surfaces, noncorrosive and compatible with each material joined, and complying with the following:
 1. Furnish **Type 316** stainless-steel fasteners for exterior use.
 2. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant heads, colored to match tile.
- B. Sealant: As recommended by manufacturer for sealing perimeter of tactile warning surfacing unit.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

3.3 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.

B. Removable 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 removable tile.
2. Set each detectable warning tile accurately and firmly in place with embedding anchors and fasteners attached, and firmly seat tile back 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.

3.4 CLEANING AND PROTECTION

- A. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Owner's Representative. Replace

using tactile warning surfacing installation methods acceptable to Owner's Representative.

- B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

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. Recessed Lighting
- 3. Accessible Drinking Fountain
- 4. Skate Deterrent Type 1
- 5. Skate Deterrent Type 2
- 6. Bollard light
- 7. Removable Bollard

- B. Related Requirements:

- 1. Section 32 13 13 "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. Shop Drawings:

1. Include plans, elevations, sections, and mounting attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Full-Size Samples for Verification:

1. Bicycle Racks
2. Recessed Lighting
3. Accessible Drinking Fountain
4. Skate Deterrent Type 1
5. Skate Deterrent Type 2
6. Bollard light
7. Removable Bollard

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Manufacturer.

B. Product Certificates: For each type of Product.

1. Bicycle Racks
2. Recessed Lighting
3. Accessible Drinking Fountain
4. Skate Deterrent Type 1
5. Skate Deterrent Type 2
6. Bollard light
7. Removable Bollard

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 year(s) 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: five years from date of Substantial Completion for defects in materials or workmanship.
- 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.

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. Recessed light

1. Product:

- a. Manufacturer: BEGA
- b. Model: 24880
- c. Material: Aluminum alloy, aluminum, and stainless steel
- d. Color: Graphite or silver
- e. Mounting: Recessed in concrete
- f. Dark Sky: For installation with light emission downwards. No light is emitted into the upper half space of the luminaire.

C. Accessible 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

D. 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

E. 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

F. Bollard Light

1. Products:

- a. Manufacturer: Ligman
- b. Model: # LH-10665, Lightsoft 1 Bollard Light
- c. Color: Concrete Urban
- d. Mounting: Surface

G. Removable Bollard

1. Products:

- a. Manufacturer: Columbia Cascade Company
- b. Model: No. 2190 Metal Bollard
- c. Color: Selected by Owner's Representative
- d. Mounting: Concrete footing with removable bollard insert
- e. To include removable bollard hole cover

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.
 - 1. 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 22 11 13 "Facility Water Distribution Piping" and 33 14 15 "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 22 05 53 "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 31 20 00 "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 31 10 00 "Site Clearing" for topsoil stripping and stockpiling.
 - 2. Section 32 92 00 "Turf and Grasses" for placing planting soil for turf and grasses.
 - 3. Section 32 93 00 "Plants" for placing planting soil for plantings, fertilizers, including biochar and mycorrhizae in backfill soil.

1.3 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.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 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.

1.6 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.

1.7 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.

1.8 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.

1.9 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.

1.10 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.

1.11 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.

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 01 40 00 "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 32 91 13 "Soil Preparation." and Section 32 91 15 "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 32 93 10 "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 32 91 13 "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, galls, 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 H₂O.
 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 32 91 13 "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 **to 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** 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 32 93 10 "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 32 93 00 "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 32 93 00 "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 32 92 00 "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 11 13

PIPELINES AND APPURTENANCES

PART 1 - GENERAL

1.1 DESCRIPTION AND SCOPE

- A. Contractor shall furnish all pipe, fittings, thrust blocks, materials, equipment, and labor and perform all operations necessary to construct pipelines and appurtenances as specified by the City as shown by the Drawings. Drawings shall consist of construction drawings, standard drawings, and detailed drawings.
- B. The Work shall consist of all utility location and verification (excavating, exposing, and verifying locations, depths, and dimensions of utility facilities); all pavement removal and disposal; all earthwork (including trenching, shoring, dewatering if required, blasting if required, bedding, backfilling, and compacting); furnishing and installing all pipe, fittings, appurtenances, and making all related connections; protecting in place or removing and replacing all existing utilities and public and private improvements; removing and replacing all asphalt and disinfecting and testing all pipelines; disposing of excess soil and rock material; and restoring all areas and improvements to pre-construction conditions.
- C. Contractor shall, upon completion of pipeline construction and appurtenances required herein, initially operate all components of the Work installed or furnished and installed by him, and make any additional adjustments, corrections, repairs, replacements, and reconstructions necessary to provide the City with complete, correctly operating pipelines and appurtenances.

1.2 SUBMITTALS

- A. Complete fabrication, assembly, and installation drawings, together with details and data governing materials used and other accessories furnished, shall be submitted for approval. Data shall include, but not be limited to, the following:
- B. Welded Steel Pipe - Contractor shall furnish an Affidavit of Compliance in accordance with Section 1.12, AWWA C200, latest, and Section 1.7 AWWA C205, latest. Contractor shall also furnish certifications of the following:
 - 1. Material Certification
 - a. Steel Skelp
 - b. Flanges
 - c. Nuts and Bolts
 - d. Flange Gaskets
 - e. Rubber Gaskets
 - 2. Manufacturing Certification
 - a. Pipe Mill Reports
 - b. Production Weld Test Reports
 - c. Hydrostatic Test Reports
 - d. Outlet Reinforcement Calculations

e. Pipe Wall Thickness Calculations

3. Unless specified otherwise, Contractor shall furnish detailed layout and shop or fabrication drawings showing pipe, lining, coating, reinforcement, joints, fittings, appurtenances, and station and elevation for each fitting and outlet and for each pipe joint at each change in pipe class, alignment, or slope. Contractor shall submit detailed layout and shop or fabrication drawings to the City for acceptance in all cases in time sufficient to allow review and acceptance, and to accommodate the Contractor's construction schedule.

C. Ductile Iron Pipe

1. Ductile iron pipe shall conform to ANSI A21.51 (AWWA C151) class to thickness designed per ANSI 21.50 (AWWA C150), Tar (Seal) coated, and cement mortar lined per ANSI A21.4 (AWWA C104) unless otherwise specified, with bolted mechanical joints as indicated on the plans or special provisions. The minimum laying lengths for DIP shall be 18 feet. Cut sections of pipe (pups) shall not be less than 2 feet in length for pipe diameters 16 inches and smaller and not less than 3 feet for pipe diameters 18 inches and larger. Delivered pipe to include $\pm 5\%$ short joints.
2. Ductile iron pipe shall be minimum pressure class 350 for pipe diameters 16-inch and smaller, Class 250 for 18-inch and larger unless indicated differently on the plans.
3. Fittings shall be ductile iron and shall conform to ANSI A21.10 (AWWA C110) or A21.53 (AWWA C153), and ANSI A21.11 (AWWA C111). Fittings shall be bolted mechanical joints. All bends shall use mechanical joints for 12-inch and above. Fittings shall be tar (seal) coated and cement mortar lined per ANSI A21.4 (AWWA C104). Above grade fittings shall be flanged and from the Approved Materials List.

D. Polyvinyl Chloride Pipe

1. Contractor shall furnish an Affidavit of Compliance in accordance with Section 6.3, AWWA C900 and C90S (latest). Contractor shall also furnish certified copies of test reports containing results of all physical and chemical tests on pipe and coupling showing compliance with AWWA C900 and AWWA C90S (latest) as modified herein.
2. Unless specified otherwise, Contractor shall prepare detailed installation or laying drawings showing pipe, fittings, appurtenances, station and elevation for each fitting, and each change in alignment or slope. Contractor shall submit the detailed installation or laying drawings to City for approval in all cases in time sufficient to allow review and approval, and to accommodate the construction schedule.
3. Revisions shown on the shop drawings shall be considered changes necessary to meet the requirements of these Specifications and shall not be taken as the basis of claims for extra charges. Contractor shall accept such revisions or submit others for acceptance. When delays are caused by resubmissions of shop drawings, Contractor shall not be entitled to any damages or extensions of time for delays.
4. The City's acceptance of detailed layout and shop or fabrication drawings shall apply only to general arrangement and general compliance and not to specific details and dimensions and their correctness and compatibility. Contractor shall correct any misfits due to any errors in the detailed shop or fabrication drawings. Any fabrication in advance of receipt of detailed layout and shop or fabrication drawings marked "Accepted" or "Furnish as Corrected" shall be at Contractor's risk. Contractor shall furnish the City six sets of all accepted layout and shop or fabrication drawings.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Contractor shall furnish only approved materials as listed in the specifications. All materials shall be new and of the best quality for their intended use. All like materials shall be of one manufacturer for any particular project.
- B. Contractor shall, in addition to furnishing other data herein required, submit three signed and dated copies of the list of materials to be used in pipeline and appurtenance construction including but not limited to pipeline installations, pipeline valve installations, air valve installations, blowoff installations, manway installations, service installations, fire hydrant installations, and related appurtenances.

2.2 WELDED STEEL PIPE (CEMENT MORTAR LINED AND COATED)

- A. All welded steel pipe shall conform with applicable provisions of AWWA C200, C205, C206, C207, and C208, latest, and applicable portions of M11 "Steel Pipe Manual", latest, as modified herein, by the Drawings, or by the City.
- B. All welded steel pipe shall be manufactured by organizations with at least ten years successful experience in manufacturing, fabricating, lining, and coating the type of pipe specified. City shall approve manufacturer's methods, equipment, facilities, and operations before performance of and work and manufacturer's completed product before its use.
- C. Standard or special pipe sections and standard or special connections, outlets, and fittings may be manufactured at a single plant, or they may be manufactured at two separate plants (Plant 1: manufacturing of standard sections of lined, coated, and cured steel pipe consisting of steel pipe cylinder formation and lining, coating, and curing; Plant 2: fabricating special pipe sections and standard or special connections, outlets, and fittings using standard sections of manufactured lined, coated, and cured steel pipe). Special pipe sections and standard or special connections, outlets, and fittings fabricated at a separate manufacturing plant shall be comprised of standard pipe cylinders that have been formed, lined, coated, and cured at a single manufacturing plant. The separate manufacturing plant shall use facilities and methods for lining and coating repair and curing equal to the facilities and methods of the manufacturer of the standard sections of lined, coated, and cured steel pipe.
- D. Pipe and Fitting: All pipe and fittings furnished shall conform with applicable provisions of AWWA C200, C205, C206, C207, and C208, latest, and applicable portions of AWWA M11, "Steel Pipe Manual", latest, as modified herein, by the Drawings, or by the City.
 - 1. Pipe and fittings shall be Class 150 minimum. Minimum steel cylinder thickness shall be as noted by the construction drawings or specified by the City; it shall not be less than 10 gauge or as noted by the standard drawings. All pipe and fittings shall be machine cement mortar lined and machine cement mortar coated.
 - 2. Curved alignment by use of pulled joints will be permitted. Maximum pull permitted from normal closure on one side of joint shall not exceed $\frac{1}{2}$ inch for 8-inch pipe or smaller,

$\frac{3}{4}$ inch for 10-inch through 21-inch pipe, and 1 inch for 24-inch pipe and larger. Maximum joint deflections shall not exceed manufacturer's recommendation or 3 degrees; the more restrictive or lesser deflection shall apply.

3. Where greater curvature is required, Contractor may use fabricated bends as specified by the construction drawings or ordered by the City. For the purpose of reducing angular deflections at pipe joints, Contractor may use pipe sections of less than standard length. Closing courses and short sections of pipe shall be fabricated and installed by Contractor as found necessary in the field.
 4. All fittings shall be shop fabricated unless the construction drawings indicate that fittings may be field fabricated, Contractor describes methods of fabrication, and the City specifically approves field fabrication. All fittings shall be fabricated from individual pipe sections, welded together, and lined and coated as described hereafter.
 5. Lining of Fittings
 - a. The application of cement mortar lining to miters, angles, bends, reducers, and other special sections, the shape of which precludes application by the machine spinning process, shall be accomplished by mechanical placement, pneumatic placement, or hand application, and finished to produce a smooth, dense surface.
 - b. If the interior of the fitting has not been previously machine lined, wire-fabric reinforcement or ribbon-mesh reinforcement shall be applied to the interior of fittings larger than 24 inches and shall be secured at frequent intervals by tack welding to pipe, by dips or by wire. Repaired areas of machine applied linings at miters, pipe ends, outlets, and other cuts made in the lining for fabrication of the fittings need not be reinforced if the width of the repair area does not exceed 12 inches. Repairs for widths exceeding 6 inches shall be bonded to the steel and adjacent faces of the lining with an approved bonding agent.
 - c. Immediately after lining has been completed, pipe and fittings shall be water cured without being disturbed for at least one day before applying the exterior coating, if such a coating is specified. If cement mortar coating is not specified, the lining shall be kept moist for four days before shipment. In either case, the lining shall be cured for at least four days before shipment. To prevent moisture loss during the curing period, ends of the pipe sections shall be kept closed with plastic end caps or covers which will remain in place until time of installation. The date of lining and class of pipe shall be plainly marked on the inside of each fitting.
 6. Coatings of Fittings: Mortar coating for pipe bends and other special sections not adaptable to the application of spiral-wire coating reinforcement shall be reinforced with wire fabric or ribbon mesh. The wire fabric or ribbon mesh shall be applied over the surface of the pipe to be coated and may be held away from the pipe shell with self-furring mesh, furring clips, or an equivalent method. The application of the mortar coating shall be by mechanical or pneumatic means to the specified thickness, except that hand application may be substituted for all specials. After the outside coating has been applied, the pipe and fittings shall be kept continually moist by continuous spraying for at least four days. Provisions shall be made to protect the coating from erosion during sprinkling. The date of coating and class of pipe shall be plainly marked on the inside of each fitting.
- E. Pipe Joints: Unless specified otherwise, joints shall conform to the following types. Joints shall be as specified on the construction drawings or by the City. All joints shall be continuity bonded.

1. All rubber gasket joints shall conform with AWWA C200, latest.
 2. Flanged Joints
 - a. All flanges 4 inches through 12 inches shall conform with AWWA C207, latest, Class E (ring) or ANSI 816.5 Class 150. All flanges larger than 12 inches shall conform with AWWA C207, latest, Class E (ring). All flange bolts shall be standard hex head machine and conform with ASTM A325. All flange nuts shall be heavy hex cold pressed semi-finished steel and conform with ASTM A194-2, 2H.
 - b. All flanges shall be fully welded to pipe on both faces, one pass minimum on the inside, and two passes minimum on the outside. Pipe linings shall extend to mating faces of flanges. Bolt threads shall be lubricated with an approved anti-seize compound. Flanges together with bolts and nuts, shall be, once installed, coated with an approved bitumastic material.
 3. Swedged Lap Welded Joints: Bell ends shall be formed integrally with pipe cylinders, being swedged out by machine. Bell ends shall be designed and fabricated to withstand design pressure of class of pipe specified and to permit spigot ends (plain end) to enter belled ends approximately 1 inch with clearance of approximately 1/32 inch.
 4. Banded Lap Welded Joints: Where lap welded joints are required and swedged lap welded joints cannot be fabricated, belled ends shall be formed by welding steel bands to outside circumferences of plain ends of pipe. Bell ends shall be designed and fabricated to withstand design pressure of class of pipe specified and to permit spigot ends (plain ends) to enter belled ends approximately 1 inch with a clearance of approximately 1/32 inch.
 5. Sleeve Couplings: Where sleeve couplings are required, they shall conform with the construction drawings. Pipe coatings at pipe ends shall be held back 12 inches and pipe shall have weld seams ground flush within 12 inches from pipe ends, unless specified otherwise. For above ground applications, pipe ends, and sleeve couplings shall be painted. For below ground applications, pipe ends, and sleeve couplings shall be coated with an approved bitumastic material. An approved bitumastic coating shall be substituted for mortar coating within 12 inches of pipe ends. After joints have been coupled, sleeve couplings shall be coated with an approved bitumastic material.
 6. Cut-to-Fit Joints: Where cut-to-fit joints are required, they shall conform with the standard drawings and the construction drawings. Pipe coatings at cut-to-fit joints shall be held back as required to permit construction of joints; pipe coatings shall thereafter be added in the field. Field applied pipe coatings shall match manufactured pipe coatings. Contractor shall provide, at his expense, cut-to-fit joints, in addition to those specified, if necessary to accommodate his work and schedule.
 7. Shop Testing of Joints and Joint Ends: Every pipe section, standard, or special, shall be hydrostatically tested after joint ends have been completely shop formed and attached in place by welding, as applicable, or dye check tested provided pipe cylinders had been previously hydrostatically tested.
- F. Cement Mortar Lining and Cement Mortar Coating: Cement mortar lining and cement mortar coating shall conform with AWWA C205, latest.

1. Surface Preparation: Prior to lining and coating, pipe shall be cleaned of all loose mill scale, moisture, rust, sand, dust, oil, grease, and other deleterious or objectionable matter both inside and outside.
2. Cement Mortar Lining
 - a. Mortar shall consist of one part Portland cement to three parts (by weight) clean, sharp sand. Unless specified otherwise, cement used for cement mortar shall conform with ASTM C-150, latest, Type II. Sand shall consist of clean, inert, sharp, durable material, maximum grain size being no more than one-half specified minimum lining thickness. Mortar shall be thoroughly mixed and made workable with clear, potable water. All cement mortar shall develop a minimum compressive strength of 2,600 psi minimum at seven days and 4,500 psi minimum at twenty-eight days.
 - b. Cement mortar shall be applied to interior surfaces of pipe with equipment specifically designed for that purpose. Said equipment shall have a retracting feed line that will provide uniform cement mortar distribution throughout pipe length. Pipe shall be slowly rotated in horizontal position while cement mortar is being applied. Each end shall be provided with suitable end dam during spinning operation to control lining thickness and provide square-finished lining end.
 - c. Following application of mortar, pipe shall be rotated at sufficient speed to compact lining mortar. Said speed shall be maintained until all excess water has been forced to lining surface. During the spinning operation, surplus water shall be expelled from pipe by blower or other suitable means. Peripheral speed and spinning time shall be sufficient to obtain dense, well compacted lining with smooth surface free from defects. Minimum lining thickness shall be as shown by the standard drawings. Immediately after lining has been completed, pipe shall be water cured without being disturbed for at least one day. Moisture loss shall be prevented during the curing period.
3. Cement Mortar Coating
 - a. Mortar shall consist of one part Portland cement to three parts (by weight) clean, sharp sand. Materials for cement mortar coating shall be the same as materials for cement mortar lining. All cement mortar shall develop a minimum compressive strength of 2,600 psi minimum at seven days and 4,500 psi minimum at twenty-eight days.
 - b. After pipe interior has been lined, cement mortar shall be applied to outside of pipe through fixed nozzles to form an even, dense, and tightly adhering coating. During coating operation, pipe shall be rotated and moved beneath said fixed nozzles to obtain uniform coating free from defects. Minimum coating thickness shall be as shown by the standard drawings.
 - c. Cement mortar coating shall be reinforced with spirally wound steel (reinforcing) wire embedded midway within coating. Reinforcing wire shall be bright basic wire comprised of low carbon, open hearth steel, unannealed after the last draw, with an approximate ultimate tensile strength of 80,000 psi. Said wire shall be No. 14 gauge minimum and it shall be placed at a pitch of 1½ inch maximum in the middle third of the coating.
 - d. Immediately after coating has been completed, each end of each section shall be cleansed to bare metal and cement mortar shall be troweled and shaped suitable for joint being used. All exposed bare metal shall be cleaned and coated and

painted for protection against corrosion. Completed pipe shall then be water cured for at least four days without being disturbed.

G. Manufacturing Inspection: The City shall at all times have the right to inspect Work and materials during the course of manufacture. Manufacturer shall furnish the City reasonable facility for obtaining such information as it may desire regarding progress and manner of work and character and quality of materials used.

H. Loading, Transporting, and Unloading Pipe and Fittings

1. After pipe and fittings have been manufactured as set forth above, they shall be braced at the plant with wooden struts of adequate size to protect against excessive deflection. Each set of struts (two struts minimum to a set) shall be nailed together at right angles as a unit. Wooden wedges may be used to accomplish proper tight fit for the struts. Bracing shall be located 1 foot in from each end of each pipe section for pipe 24 inches and smaller, and additionally at mid-point for pipe 30 inches and larger.
2. After the struts have been installed, pipe shall be loaded on rubber-tired vehicles, adequately supported, and choked to prevent damage during transportation, and delivered to Work site. All bracing shall remain in place until each pipe section has been bedded and backfilled to at least 1 foot above the top of the pipe for pipe 24 inches and larger.
3. Plastic end caps or covers shall be placed over the ends of pipe following installation of braces to prevent moisture loss during loading, transporting, unloading, and installing; they shall remain in place until installation. If the plastic and caps or covers are damaged (perforated), they shall be replaced immediately.
4. During loading, unloading, and stringing operations, pipe and fittings shall be moved with care to prevent damage thereto. They shall be moved with nylon chokers or straps of sufficient width, placed at third points (one-third length of pipe from each end), to prevent damage to exterior coating, and they shall be handled in such manner to prevent damage to interior lining. Steel slings shall not be used.
5. Unloading shall be accomplished in a workmanlike manner by Contractor and every precaution shall be taken to prevent damage to pipe and fittings. Under no circumstances are pipe sections to be dropped or bumped in handling. Any pipe section that becomes damaged shall be repaired if possible and, if not possible in the opinion of the City, it shall be replaced with an undamaged pipe section. When strung, pipe shall be adequately supported and choked to avoid movement until it is installed. It shall also be placed to avoid damage during construction.

2.3 DUCTILE IRON PIPE

- A. All ductile iron pipe underground shall be encased with V-BIO polyethylene tubes in accordance with Method A as described in AWWA C105.
- B. Installation of pipeline shall be per the latest edition of the "Standard Specifications for Public Work Construction" (SSPWC) unless supplemented by this specification.
- C. The pipe shall be accurately laid to the alignment and grade shown on the Approved Plans or as established by the City's Representative. Prior to placing the pipe in the

trench, the contractor shall remove any material that may damage the pipe or the pipe polyethylene encasement including sharp rocks, lumber, nails, sheet metal or other sharp objects. The pipe ends shall be covered at the end of each day or when work activity has ceased on a particular section of pipe. The pipe is to remain free and clear of any dirt and foreign objects. The Contractor shall be responsible for protecting the pipeline from mud and trench water during the construction of pipeline.

2.4 POLYVINYL CHLORIDE PIPE

- A. Polyvinyl chloride (PVC) pipe furnished and installed under these Specifications shall conform to applicable AWWA Standards (latest), as modified herein, by the Drawings, or by City.
- B. All pipe furnished shall be manufactured by an organization which has had not less than 10 years successful experience in the manufacture of the type of pipe specified. City shall approve manufacturer's product before its use.
- C. Pipe and Couplings: All pipe and couplings furnished shall conform to AWWA C900 and C905 (latest) and the following additional requirements:
 - 1. Unless otherwise specified or shown on Drawings, AWWA C900 pipe and couplings (4" through 12" diameter) shall be minimum Class 150 (maximum dimension ratio of 18). Polyvinyl chloride pipe shall have same dimensions as ductile iron pipe and pipe bell and pipe spigot shall have same thickness as pipe barrel.
 - a. Standard lengths of pipe shall have nominal length of 20 feet, 0 inches, plus or minus 1 inch. Standard lengths of pipe shall be furnished with integral bells and spigots and with rubber gaskets. Couplings may be used for closures and curved alignments where permitted by City.
 - b. Pipe shall have sufficient strength to withstand an internal hydrostatic pressure of four times rated operating pressure for its class per AWWA C900 (latest).
 - 2. Unless otherwise specified or shown on the Drawings, AWWA C905 pipe and couplings (14" through 36" diameter) shall have maximum dimension ratio of 18 (Class 235). Polyvinyl chloride pipe shall have same dimensions as ductile iron pipe and pipe bell and pipe spigot shall have same thickness as pipe barrel.
 - a. Standard lengths of pipe shall have nominal length of 20 feet, 0 inches, plus or minus 1 inch. Standard lengths of pipe shall be furnished with integral bells and spigots and with rubber gaskets. Couplings may be used for closures and curved alignments where permitted by City.
 - b. Pipe shall have sufficient strength to withstand an internal hydrostatic pressure of two times rated operating pressure for its class per AWWA C905 (latest).
 - 3. Where restrained joints are required (specified or shown on the Drawings), the restraint system shall be a split ring installed on the spigot connected to a solid back-up ring seated behind the bell. Restraint system shall be Series 1350 UniFlange, Star Pipe Products Series 1100, or equal. The solid back and split rings shall apply even pressure around the pipe and provide 360° contact. Restraint device shall be ductile iron with 316 stainless steel rods and nuts. Restraint device shall be rated for full working pressure of the pipe with 2:1 factor of safety.

- D. Fittings: All fittings shall be Class 150 ductile iron unless otherwise specified or shown on the Drawings. Ductile iron fittings shall conform with AWWA C110, C111, and C153 (ANSI A21.10, A 21.11, and A21.53, respectively), latest. Unless specified otherwise, fittings shall be push-on joint and comply with AWWA C111 (ANSI A21.11). Fittings shall have an asphaltic outside coating in accordance with AWWA C110 or C153 (ANSI A21.10 or A21.53), latest, and cement mortar lining in accordance with AWWA C104 (ANSI A21.4), latest. Fittings shall have standard lining thickness and shall be seal coated with asphaltic material or other approved material. The lining process must produce a dense, compacted lining that shall be bonded to the interior of the fitting and have a smooth surface.
1. Where PVC fittings are specified on the Drawings or permitted as an alternative as specified on the Drawings, fittings shall be in compliance with AWWA C907 (4" through 8"). Affidavits and testing results shall be submitted as required for PVC pipe.
 2. Where restrained joints are required (specified or shown on the Drawings), the system shall be suitable for mechanical joint fittings and be of split ring design providing even pressure around the pipe with 360° contact. The rings shall be ductile iron and threaded rods shall be 316 stainless steel. System shall be EBAA Iron MegaLug.
- E. Testing: All pipe and couplings furnished shall be tested in the United States in accordance with Section 4, AWWA C900 and AWWA C905.
- F. Manufacturing Inspection and Certification: City shall at all times have the right to inspect all work and materials in the course of manufacture. Manufacturer shall furnish City reasonable facility for obtaining such information as he may desire regarding the progress and manner of the work and the character and quality of materials used.
- G. Loading, Transporting, and Unloading: After the pipe has been tested in accordance with Section 5 above, it shall be loaded on rubber-tired vehicles, adequately supported and chocked to prevent any damage during transportation and delivered to job site. All pipe and couplings (AWWA C900 and C905) shall be unloaded and stored in accordance with AWWA manual M23 (latest). During the unloading and stringing operations, the pipe shall be moved in such a manner as to prevent damage to the pipe and/or couplings. Unloading shall be accomplished in a workmanlike manner as directed by the manufacturer. Under no circumstances are pipe sections to be dropped or bumped in handling.
- H. Defective or Damaged Material: The pipe and couplings shall be carefully inspected for defects. Any pipe, coupling, sleeve, or rubber ring found to be defective in workmanship or material or so damaged as to make repair and use impossible shall be rejected and removed from the job site. In the event that pipe is damaged, the damaged portion may be removed, as approved by City, and discarded. Remaining sound portions may be used with ductile iron fittings or with couplings. Contractor shall be responsible for any and all damage to material and he shall stand expense of repairing or replacing same. Contractor shall take proper precautions to assure that the rubber gaskets are protected from oxidation or undue deterioration.

2.5 FASTENERS

- A. Hex head bolts and nuts shall be carbon steel conforming to ANSI/ASME B18.2.1 and ANSI/ASME B18.2.2. All thread compound used on bolted connections shall be NSF 61 approved.
- B. Flange insulation kits shall be used at all stainless-steel bolts in contact with carbon steel. Insulating flange kits shall include insulating sleeves, gaskets, and insulating washers for each flange bolt. Sleeves shall be full length and shall cover entire bolt. Insulating gaskets shall be full faced. Insulating flange kit shall be as manufactured by PSI, Pipeline Seal and Insulator, Inc. or approved equal.

2.6 DETECTABLE METALLIC WARNING TAPE

Warning tape shall be 6-inch wide blue detectable metallic utility warning tape. The tape shall be inductively locatable and conductively traceable using a standard pipe and cable locating device. The tape shall be composed of one layer of aluminum foil laminated between two layers of inert plastic film resulting in a minimum thickness of 4.5 mils. The tape shall have the following custom message printed at minimum 36-inch intervals: "Caution Buried Water Line Below". The tape shall have a minimum tensile strength of 15,000 psi. The tape shall be inert and not degrade when exposed to alkalis, acids, and other destructive elements commonly found in soil. The ink used to print the message on the tape shall be permanent and not be removable by normal handling or upon prolonged underground burial. The warning tape shall be "Terra Tape" as manufactured by Reed Industries, Inc., NorthTown Hytech Detectable Tape or approved equal.

PART 3 - EXECUTION

3.1 PIPELINE CONSTRUCTION

- A. Pipelines and Appurtenances: Pipelines and appurtenances shall be constructed in accordance with these Specifications and the Construction Drawings, and as specified by the City.
- B. Valves and Appurtenances
 - 1. Pipeline valves at pipeline intersections shall be connected directly to pipeline intersection fittings (cross or tee).
 - 2. Unless specified otherwise, air valve installations shall be constructed at all pipeline high spots and blowoff installations shall be constructed at all pipeline low spots. Contractor shall construct, at his expense, air valve installations and blowoff installations in addition to those specified, if necessary to accommodate his work and schedule.
- C. Pipeline Length: All pipeline lengths noted by the Construction Drawings or otherwise specified or referenced shall mean net horizontal constructed lengths and said lengths shall extend through all fittings and appurtenances including bends, outlets, tees, flanges, and valves. Contractor shall provide all pipe necessary to accommodate any vertical

alignment of the pipeline and said pipe shall be represented by the net horizontal constructed length.

D. Pipeline Alignment

1. All pipelines shall be constructed with no basic variation in horizontal alignment as shown by the Drawings or as specified by the City. Pipelines may be constructed by the use of pulled joints, short joints, bevels, bends, and elbows, provided pipelines are constructed as specified.
2. In all non-critical areas and subject to the City's approval, pipelines may be constructed at variance with vertical alignment as shown by the construction drawings by the use of pulled joints, short joints, bevels, bends, and elbows provided pipelines are constructed as specified at pipeline connections and underground interferences, and where pipeline cover is limited. The City will not approve any variation in vertical alignment until it has determined that proposed alignment is proper and modifications are in order.

E. Pipeline Tolerances

1. With regard to vertical alignment, pipelines shall be constructed so that actual flow line elevations, measured at pipe joints, are within 0.1 foot of design flow line elevations. Pipelines, when installed, shall have continuous slope upgrade or downgrade, corresponding with design slope, without any high spots.
2. With regard to horizontal alignment, pipelines shall be constructed so that actual pipeline centerlines, measured at pipe joints, are within 0.1 foot of design pipeline centerlines. Pipelines, when installed, shall closely follow specified horizontal alignment.
3. Pipeline construction shall conform with Construction Drawings and layout, shop, fabrication, installation, or laying drawings (design drawings which show flow line elevations and pipeline centerlines) in accordance with the above specified tolerances. Contractor shall make or assist the City in making all necessary measurements, as determined by the City, to confirm or verify compliance with construction tolerances.

F. Pipeline Cover

1. Pipeline cover as shown by the Construction Drawings is hereby defined as design cover over pipeline. If field conditions determined during construction staking show that pipe grade changes are required to provide design cover, Contractor shall, at his expense, make required changes in pipeline grade and construct pipeline accordingly.
2. Pipeline cover from top of pipe to ground surface over pipeline shall not be less than 36 inches. Where future ground surface elevation over pipeline has been established and where actual ground surface is greater, pipeline cover shall be referenced to future (established) ground surface elevation, not actual ground surface elevation.

3.2 SURVEY MONUMENTS AND CONSTRUCTION STAKES

- A.** Contractor shall not disturb or destroy any existing monuments or benchmarks. If any survey monuments or benchmarks need to be removed and replaced, Contractor shall have all necessary services performed by a registered civil engineer or a licensed land surveyor. If Contractor fails to comply, the City will have said services performed at Contractor's expense.

- B. Before removing any monuments in preparation for construction, Contractor shall have a registered civil engineer or licensed land surveyor set at least four ties for each monument to be removed and replaced; after construction Contractor shall have the same registered civil engineer or licensed land surveyor replace each monument using the aforementioned ties and file a corner record for each replaced monument.
- C. Unless specified otherwise, Contractor shall use construction stakes and cut sheets for pipeline construction and the City will use them for construction inspection. All construction stakes shall be set by a registered civil engineer or licensed land surveyor. The City must approve cut sheets before actual construction. Contractor shall protect all construction stakes set for construction and he shall restore any construction stakes destroyed or disturbed. If Contractor fails to comply, the City will have services performed at Contractor's expense.

3.3 UNDERGROUND UTILITIES (SUBSURFACE INSTALLATIONS)

- A. Where underground utility facilities (conductors or conduits for water, gas, sewer, telephone, electric power, cable television, or other utilities) are shown on construction drawings, Contractor shall assume that service facilities (services or laterals for water, gas, sewer, telephone, electric power, cable television, or other utilities) extend from each utility facility to each parcel or property whether or not service facilities are shown.
- B. At least two working days but no more than fourteen calendar days before commencing any excavation on the Work, Contractor shall request Underground Service Alert (1-800-227-2600) and non-member companies or utilities to mark or otherwise indicate the locations of their subsurface facilities including, but not limited to, structures including vaults, main conductors or conduits, and service connections or facilities.
- C. Contractor shall comply with applicable laws pertaining to subsurface installations, especially with respect to excavations and permits. Contractor shall specifically comply with applicable provisions of Sections 4215 through 4216.9 of the Government Code. Contractor shall take all actions necessary to maintain a valid inquiry identification number during the Work.
- D. At least ten days in advance, or 1,000 feet minimum ahead of pipeline trenching, Contractor shall excavate, expose, and determine ("pothole") the exact locations, depths, and dimensions of each and every potential interference, including, but not limited to, all facilities shown specifically (depth and location) on construction drawings, or which have been marked by their respective Owner.
- E. Upon learning of the existence or location of any utility facility omitted from or shown incorrectly on construction drawings, or improperly marked or otherwise indicated, Contractor shall immediately notify the City, providing full details as to depth, location, size, and function. Contractor shall immediately notify utility having jurisdiction over facility.
- F. Contractor shall not interrupt or disturb any utility facility without written permission from the Utility or written order from the City. Where protection is required to ensure integrity of

utility facilities located as shown on construction drawings or visible to Contractor or marked or otherwise indicated as stated herein, Contractor shall, unless otherwise provided, furnish and place all necessary protection at his expense.

- G. Contractor is advised that the City has no knowledge or information about trench backfill conditions of utility facilities adjacent to or parallel with pipeline being constructed pursuant to these Specifications; therefore, Contractor shall protect against adjacent or parallel trench backfill failure. If adjacent or parallel trench fails, Contractor shall, at his expense, remove and replace said backfill material in accordance with trench backfill requirements herein and remove and replace asphalt concrete pavement and any other improvements damaged in connection therewith.

3.4 TRENCH EXCAVATION

- A. Unless specified otherwise, pipelines and appurtenances shall be installed in open trench excavations to the depth and in the direction specified by the construction drawings and the City's Standard Specifications and Drawings. Excavation for trenches shall include removal of all material of any nature as required for installation of pipe, fittings, or appurtenances and shall include blasting, either sloping or shoring, and all necessary dewatering, if any, all at Contractor's expense. Contractor is advised that unsuitable earth may be encountered during trenching operations. Where such material is encountered, Contractor shall, at his expense, remove such material, discard it at legal disposal site(s), and thereafter replace it with approved backfill material.
- B. Excavation Safety Drawings: Before excavating any earth or soil to a depth of five (5) feet or more, Contractor shall, pursuant to Labor Code Section 6705, submit to the City detailed drawings (hereafter referred to as excavation safety drawings) showing design of shoring, bracing, sloping, or other provisions to be made for worker, individual, or property protection. Said excavation safety drawings shall comply with OSHA Construction Safety Orders (Cal/OSHA or Federal OSHA, whichever is applicable at time of construction) and shall be prepared and certified by a registered civil or structural engineer, engaged by Contractor at his expense, who shall affix his signature and seal to each sheet of said excavation safety drawings. Contractor shall not excavate until the City has received and acknowledged properly certified excavation safety drawings. Contractor shall comply with all other applicable requirements of Labor Code Section 6705 and, as therein provided, no requirements of that Section shall be construed to impose tort liability on City or City's representatives, including City's Engineer.
- C. Trench and Bell Hole Sloping or Shoring: Trenches and bell holes shall be adequately sloped or shored so that earth will not slide or settle into trench, so that all existing improvements and utilities (above and below ground) will be fully protected from damage, and so that workers and individuals are protected from injury. At minimum, Contractor shall keep toe of trench spoil at least 5 feet from top of trench. Contractor shall assume full responsibility for all damages caused by inadequate sloping or shoring. Contractor shall make all necessary repairs or perform all reconstruction at his expense, and he shall bear all other expenses resulting from such damages.

- D. Unless specified otherwise, all pipeline trenches within pipe zone shall, wherever possible, have vertical sides and minimum widths as specified on the standard drawings, however, trenches shall be sloped or shored as required for worker, individual, and property protection.
- E. Whenever maximum allowable trench width, as shown by the Drawings, is exceeded for any reason, the City may, at its discretion, require Contractor, at his expense, to cradle pipe (Class B Portland cement concrete) or to provide higher class bedding to support pipe as required to limit load on pipe to allowable supporting strength. The City shall approve method of support prior to its use.
- F. Trenches shall be excavated to depths specified by or shown on construction drawings or as otherwise directed by the City. If trench excavation is carried below grade without direction or permission, Contractor shall, at his expense, refill trench to proper grade with moist clean sand, sand and gravel, or other suitable material as approved by the City, tamped in place to 90% relative compaction minimum. Excess excavated material shall be incorporated in backfill or discarded at legal disposal site(s) by Contractor at his expense.

3.5 WELDED STEEL PIPE INSTALLATION

A. Pipe Installation

1. Pipe manufacturer, fitting manufacturer, and material supplier, in addition to the City and the City's representative, shall have access to the Work during installation. Contractor shall use assistance provided by either manufacturer or supplier where required for proper installation of pipe, fittings, or materials; however, Contractor shall limit role of either manufacturer or supplier to advisory service.
2. Contractor shall not move pipe using dozer blades, backhoe buckets, or the like (sharp metal surfaces). Contractor shall use nylon chokers or straps, not steel slings, in moving, placing, or setting pipe. Nylon chokers or straps shall be placed at third points (one-third length of pipe from each end).
3. All out-of-round pipe shall be rejected and removed from the Work site immediately. Rejected pipe shall be replaced immediately. Contractor shall not use hammers, bars, wrenches, or other tools to modify pipe ends to accommodate installation.
4. All pipe ends shall be secured with plastic covers. Said plastic covers shall be left in place until pipe is prepared for installation. If any plastic covers are damaged or destroyed before pipe has been installed, they shall be immediately replaced.
5. All pipe and fittings shall be laid true to line and grade and at the locations shown by the construction drawings or as specified. Pipe and fittings shall be installed in accordance with applicable sections of AWWA M11, "Steel Pipe Manual". Bell ends shall be placed uphill unless otherwise permitted.
6. All flanges shall be fully welded to pipe on both faces, one pass minimum on the inside and two passes minimum on the outside. Pipe linings shall extend to mating faces of flanges and pipe coatings shall extend to backs of flanges, tapered as necessary for installation of bolts and nuts. All exposed steel shall be field coated with an approved bitumastic material.
7. Special care shall be taken to avoid damaging lining or coating during lowering of pipe into trench and making of field joints. Unless specified otherwise, field joints shall be bell and spigot rubber gasket joints, continuity bonded (two evenly spaced bonding

clips per joint minimum). Flanged joints, welded joints, and mechanical joints may be required for particular applications.

8. After pipe has been set in trench, exterior of spigot and interior of bell shall be thoroughly cleaned. Lubricant as recommended by pipe manufacturer and as approved by the City shall be applied to rubber gasket and said gasket shall then be snapped into place and excess lubricant removed. Lubricant shall be water soluble, nontoxic, shall impart no objectionable taste or odor to water, shall have no deteriorating effects on the rubber gaskets, and shall not support the growth of bacteria.
9. Before inserting spigots into bells, to make joints, bells shall be hand mortared with quick setting non-shrink commercial grout mixed with an approved bonding agent. Once spigots have been inserted into bells, joints shall be gauged to ensure that gaskets have been properly seated.
10. For pipe 24 inches and larger, Contractor shall relieve (equalize) gaskets before laying to prevent gaskets from being tight on one side of pipe and slack on the other side, and adversely affecting seal. Contractor shall lift gaskets with a round blunt tool (like the shaft of a screwdriver) and roll it around the circumference of the spigot end at least once and preferably twice.
11. For pipe less than 24 inches in diameter, sufficient quantities of moist cement mortar shall be placed on interior joining ends of pipe to completely fill space between respective mortar linings. Moist mortar shall be placed only after respective mortar linings have been properly wetted. Moist mortar shall not be placed against dry mortar linings. Excess mortar shall be removed by drawing an approved pipe cleaning tool through the pipe after joints have been made (pipe sections have been joined). For fully welded joints, pipe sections shall be pulled together and restrained with come along devices, or hoists with chains and slings, and mortar shall be allowed to set for twenty minutes before welding joint. Once joint has been pulled closed and cleaning tool has been drawn through pipe sections, pipe alignment shall not be adjusted, nor shall pipe be bounced or hammered. Come along devices, or hoists with chains and slings, shall be removed only after joint has been fully welded.
12. For pipe 24 inches in diameter and larger, cement mortar shall be placed on interior joining ends from inside pipe after it has been set. Moist mortar shall be applied only after mortar linings have been properly wetted. Moist mortar shall not be placed against dry mortar linings. Excess mortar and debris shall be removed by hand or by other means acceptable to and approved by the City.
13. For cement mortar coated pipe, joint exteriors shall be coated with cement mortar utilizing a joint diaper. Said diaper shall be furnished by pipe manufacturer and shall be centered over joint and securely fastened to pipe. Cement mortar joint mix consisting of one part Portland cement to two parts (by weight) clean, sharp sand, shall contain just enough water to allow mix to be poured into diaper and flow around circumference of joint. Said mix shall be allowed to set prior to backfilling around joint.
14. Joints shall be completed to provide continuous interior lining and exterior coating. Field lining and coating must equal or exceed shop lining and coating when completed with respect to strength, uniformity, and density and there shall be no voids between lining or coating and steel cylinder.
15. If cement mortar lining has to be removed, Contractor shall scribe, chisel, and remove the lining using appropriate tools. If cement mortar coating has to be removed, Contractor shall first scribe, then saw cut said coating $\frac{3}{4}$ of its thickness, and then

remove coating using a chisel driven by a hammer, chipping gun, or other suitable tool. Impact shall be applied parallel with pipe barrel, not perpendicular thereto.

16. At the end of each day's work, all openings in the pipeline shall be plugged with watertight, expandable plugs or approved equal. Said plugs shall be secured in place so that they cannot be removed by children or animals.

B. Field Welding

1. Whenever field welding is required, Contractor shall attach welding machine ground to pipe only with clamps or other means acceptable to the City unless an alternative means is specified.
2. Unless specified otherwise, field welded or thrust restrained joints shall consist of flanged joints or fully welded joints. All flanges shall be fully welded to pipe on both faces, one pass minimum on the inside and two passes minimum on the outside. Welded joints shall be made with pipe having ends belled for welding, or alternatively, ends belled for rubber gasket joints, provided pipe manufacturer furnished filler rods of proper diameter, length, and curvature are installed in accordance with pipe manufacturer's recommendations, as approved by City. Belled ends shall not be deformed to accomplish fully welded joints. Full welds for all joints shall be accomplished with two welding passes (beads) minimum.

C. Field Cement Mortar Lining and Cement Mortar Coating: Whenever field cement mortar lining and cement mortar coating is permitted by the City for either repair or fabrication, Contractor shall comply with the following procedures:

1. Cement Mortar Lining
 - a. Contractor shall square the edge of the remaining lining, leaving no feather edge, and shall clean metal surfaces with a stiff wire brush.
 - b. Contractor shall apply approved bonding agent to both steel area and edges of adjacent lining. Cement mortar shall then be applied to the area being patched and worked and finished with a trowel until smooth. Contractor shall brush on approved curing compound over the surface of the patch to prevent rapid evaporation of moisture. Otherwise, Contractor shall keep the patched mortar moist by covering it with wet burlap. The pipe shall not be moved until the cement mortar achieves its initial set, not less than three hours.
 - c. Cement mortar shall consist of not less than one part cement to three parts sand, thoroughly mixed before any water addition. Cement mortar may be approved commercial, packaged dry mortar mix. Cement mortar shall be mixed separately for each area to be patched. Quantity of water shall be just sufficient so that when mortar is firmly compressed into a ball, it will hold its shape without slump.
2. Cement Mortar Coating
 - a. Exterior coating which requires removal around the complete circumference of the pipe shall be repaired by removing the coating by chipping with a hammer or chisel, squaring the edges to accept repair patch. Wrapping the area with 2 x 4 x 14 GA self-furring wire mesh or an approved stucco netting and guniting the area being patched and hand troweling mortar onto the area being patched. Applying an approved curing compound to the patched area. Avoiding movement and protecting the pipe until the cement mortar achieves its initial set, not less than three hours.
 - b. Exterior coating that does not extend around the entire circumference of the pipe shall be repaired by removing the coating by chipping with a hammer and chisel,

- squaring the edges to accept repair patch. Applying by brush an approved bonding agent to both the steel area and the edges of the remaining coating. Applying cement mortar to the area being patched and thoroughly compacting it, with finished patch mounding up above and overlapping (at least 1 inch on all sides) the surrounding coating. Applying an approved curing compound to the patched area. If the repair patch is made on pipe in the ditch, it shall be covered with wet burlap, heavy cloth, or similar material, and dirt shall be placed around and over the patched area by hand before proceeding with placing backfill material.
- c. The cement mortar mix proportions shall be the same as for lining repair.
 - d. If the area to be patched exceeds over half of the pipe circumference, 2 x 4 x 14 GA self-furring wire mesh or an approved stucco netting shall be attached to the pipe prior to the application of the cement mortar.
3. Installation of Repaired Pipe: After the repaired area has achieved initial set, not less than six hours, the pipe section can be installed, providing the patched area of the coating is backfilled with water saturated or wetted soil.

3.6 PVC PIPE INSTALLATION

- A. Pipe manufacturer, fitting manufacturer, and material supplier, in addition to the City and the City's representative, shall have access to the Work during installation. Contractor shall use assistance provided by either manufacturer or supplier where required for proper installation of pipe, fittings, or materials; however, Contractor shall limit role of either manufacturer or supplier to advisory service.
- B. All pipe shall be laid true to line and grade and at the locations as shown by the Construction Drawings or as specified. Pipe shall be installed in accordance with AWWA C605 and Manual M23 (latest) (including AWWA C905 pipe and couplings), applicable provisions of manufacturer's installation guides (latest) and manufacturer's directions. City shall approve manufacturer's product before its use. Contractor shall furnish City with two manufacturer installation guides for use during construction. Bell ends shall be placed uphill unless otherwise specified.
- C. Unless otherwise specified or shown on the Drawings, backfill within the pipe zone shall have a minimum sand equivalent of 50 as determined by ASTM D2419 (latest).
- D. After pipe has been set in trench, exterior of spigot and interior of bell shall be thoroughly cleaned. Lubricant recommended by pipe manufacturer and as approved by the City shall be applied to rubber gasket. Lubricant shall be water soluble, nontoxic, shall impart no objectionable taste or odor to the water, shall have no deteriorating effects on the rubber gaskets, and shall not support growth of bacteria. Excess lubricant shall be removed. Pipe ends shall be aligned, and spigot shall be pulled into bell with come-along devices, or hoists with chains and slings, unless permitted otherwise. If either the pry bar or the backhoe bucket method is permitted, a timber header shall be placed between the pipe and the pry bar or backhoe bucket before the spigot is pushed into bell.
- E. Curved alignment of AWWA C900 pipe shall be accomplished by longitudinal bending of the pipe. Minimum allowable bend radii shall be as specified by the pipe manufacturer. Unless otherwise allowed by the pipe manufacturer and approved by the City, axial

deflection at the pipe joints of AWWA C900 pipe is prohibited. Where closing sections are required, Contractor shall make all necessary measurements to select appropriate pipe lengths and closure couplings for correct installation.

- F. Curved alignment of AWWA C905 pipe by use of longitudinal bending is prohibited; however, curved alignment by use of pulled joints will be permitted. Unless otherwise allowed by the pipe manufacturer and approved by the City, maximum joint deflection shall be one (1) degree. For purposes of reducing angular deflections at pipe joints and for closure sections, Contractor may install pipe sections of less than standard length. Where closing sections are required, Contractor shall make all necessary measurements to select appropriate pipe lengths and closure couplings for correct installation.
- G. Whenever cutting of pipe is required, it shall be done with a special cutting tool specifically made for cutting and machining PVC pipe. Cut ends and rough edges shall be ground smooth and beveled for push-on joints.
- H. Pipe locator wire (No. 14 AWS insulated copper) shall be installed in trench with pipe where shown by the Standard Drawings unless it is specifically deleted by the Construction Drawings or by City. It shall be held in place by looping the pipe at 20-foot intervals maximum, or as specified.
- I. As work progresses, a pipe cleaning tool as approved by City shall be drawn through the pipe to remove dirt, rocks, or other foreign material. At the end of each day's work, all openings in the pipeline shall be plugged with watertight expandable plugs or City approved equal.
- J. Unless specified otherwise, polyvinyl chloride pipe shall not be encased with concrete. If protection is necessary, it shall be accomplished by the use of conductor casing(s) as approved by City.

3.7 FIELD HYDROSTATIC TEST AND LEAKAGE TEST

- A. Hydrostatic and Leakage Test shall be performed in accordance with Section 33 14 00.
- B. Required test pressures shall be applied by pump connected to pipeline sections being tested. The City shall approve pump connections to pipeline before testing begins. As part of the Work, and unless specified otherwise, Contractor shall install, at his expense, top outlets (service taps) required for testing. Contractor shall provide calibrated meters for measurement of leakage, and all pumps, piping, fittings, bulkheads, plugs, valves, gages, power equipment, and manpower necessary for conducting all tests required, all at his expense. Contractor shall furnish the City three copies of all records of all tests performed.
- C. Unless specified otherwise, Contractor shall test against test plates for pipelines 12 inches and smaller. Contractor shall not remove said test plates until pipelines have been tested, disinfected, and accepted by the City.
- D. Contractor, at his expense, shall locate and repair leaks or other defects which may develop or become apparent during test. Contractor shall excavate, including removal of

backfill already placed, and make all repairs necessary for required water tightness, and then replace all excavated material, after which Contractor shall retest repaired pipeline section. Pipeline sections shall be repeatedly repaired and tested until they meet requirements set forth herein.

- E. Pipe manufacturer and fitting manufacturer shall have free access to the Work during testing. Any improper act on the part of Contractor which the pipe and fitting manufacturer may observe shall be reported to the City. Pipe and fitting manufacturer shall be free to observe and verify all tests.
- F. After completed pipeline and appurtenances or test sections have successfully met test requirements to the satisfaction of the City, the entire pipeline or each test section shall be filled or shall remain filled with water until completion of the Work, unless otherwise ordered by the City.

3.8 MISCELLANEOUS REQUIREMENTS

- A. Connections to Existing Water Mains: The Contractor shall make all connections to existing water mains in the presence of City's Inspector. Contractor shall provide all labor, equipment, and materials necessary to perform connection work including, but not limited to, isolation gate valve, fittings, and adapters.
- B. Hydrostatic testing against isolation valves will not be allowed. Adjacent to the isolation valve, Contractor shall install a test plate for the aforementioned test and, after satisfactory test, remove said test plate and replace it with a 1/8 inch thick minimum ring gasket. The use of any other test appurtenances shall be as approved by the City.
- C. Field Painting: Contractor shall field paint all aboveground, bare, or exposed piping and appurtenances in accordance with the applicable specifications and drawings.
- D. Plastic detectable warning tape shall be installed above the piping a maximum of 3 feet below grade.

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:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
Body, Bonnet, Disc	Bronze	ASTM B62
Stem	Bronze or Copper Silicon	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:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
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:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
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:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
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	Stainless Steel	ASTM A276, Type 316

Bolts and Nuts

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:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
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:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
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:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
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:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
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:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
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.

<u>Component</u>	<u>Material</u>	<u>Specification</u>
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 bolt holes 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:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
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, reseal 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 14 00
WATER MAINS

PART 1 – GENERAL

- A. The work to be done under this section shall include the labor, tools, equipment, and necessary incidentals to install water mains, fittings, valves, fire hydrants, precast utility boxes, thrust blocks and related incidentals complete and in place.
- B. Owner shall furnish quantities of pipe, fittings, and accessories as described in Section 01 64 00 of these Specifications. Requirements of Part 2 Products herein shall not be construed to apply to materials furnished by the Owner.
- C. Contractor shall furnish all necessary materials not otherwise provided by the Owner in order to install a complete and functioning system. Materials furnished by the Contractor shall conform to the requirements of Part 2 Products herein.

PART 2 – PRODUCTS

- A. Pipe shall be poly vinyl chloride (PVC) pipe conforming to AWWA C900-16 or Ductile Iron pipe (DIP) conforming to AWWA C151-17 of the size and type as shown on the Plans.
- B. Fittings shall be Ductile Iron conforming to AWWA C110-12 unless noted otherwise on the Plans or by direction of the Owner.
- C. Gate valves shall be Resilient-Seated gate valves as manufactured by Kennedy Valve Company or Mueller Company conforming to AWWA C509-01, or equal.
- D. Double check valves (backflow prevention devices) shall be lead-free bronze for as manufactured by Apollo or Watts, conforming to AWWA C510-17, or equal.
- E. Combination air valve (CAV) shall be single-body valve as manufactured by Val-matic or Apco, conforming to AWWA C512-15, or equal.
- F. Blow-off valve (BOV) shall be 2" threaded brass with adjustable pressure setting as manufactured by Ford or equal.
- G. Fire Hydrants shall be Clow Valve Company Model 860 wet barrel hydrant conforming to AWWA C503-14, with one 4½ inch NST outlet and two 2½ inch NST outlets.
- H. Concrete for thrust blocks shall conform to Specification 03 30 00.
- I. Concrete for precast boxes housing water valves, appurtenances, or accessories shall conform to Specification 03 48 00. The Contractor shall propose sizes for precast boxes following the submittal procedures in Specification 01 33 00.
- F. Restraint joint connectors shall be "Megalug" by EBBA Iron or "GripRing" by

Romac Industries or approved equal.

PART 3 – EXECUTION

- A. The Contractor shall provide all labor, materials, tools, equipment, and necessary incidentals, to install water mains, fittings, valves, fire hydrants, thrust blocks and related incidentals as indicated on the Plans, described herein or as otherwise required for a complete job.
- B. Underground pipe installation shall be in accordance with AWWA C605-13 for PVC pipe and AWWA C600-17 for Ductile Iron pipe. The installed pipe shall be pressure tested to 100 psi and in accordance with AWWA C605-13 as regards procedure and allowable water loss. The testing shall treat Ductile Iron pipe as if it were PVC pipe.
- C. The installed pipe shall be disinfected in accordance with AWWA C651.
- D. All points where change of direction of water flow may occur and end of lines shall be properly restrained with thrust blocks and restraint connectors.
- E. All connections to fittings tees, valves, bends, end of line plugs/caps, shall use restraint connectors (Megalug, Gripring or equal).

END OF SECTION

SECTION 33 30 00
SANITARY SEWERAGE

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 installation of sanitary sewer piping, fittings, and accessories for the following:
 - 1. Sanitary sewer piping, fittings, and accessories for adjustment of covers.
- B. Division 00 Contracting Requirements, and Division 01 General Requirements apply to the Work of this Section.

1.02 REFERENCES

- A. American Society for Testing Materials:
 - 1. ASTM D-1784, Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
 - 2. ASTM D-1785, Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - 3. ASTM D-2464, Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - 4. ASTM D-2467, Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - 5. ASTM D-3034, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 6. ASTM F-477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
 - 1. Product data for pipe fittings, and all products listed below.
 - 2. Field quality control reports.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

- A. Gravity Sewer: Poly Vinyl Chloride (PVC) material with integral wall, bell, and spigot joints. Pipe and fittings shall meet wall and strength minimum of SDR 35, and the requirements of ASTM D3034. Joints shall be equipped with rubber rings. The bell shall consist of an integral wall section with a

solid cross section rubber ring factory assembled, securely locked in place to prevent displacement. Rubber rings shall meet the requirements of ASTM F477. All fittings and accessories shall be manufactured and furnished by the pipe supplier and have bell and/or space configurations identical to that of the pipe.

2.02 MANHOLES

- A. Precast Concrete Manholes: Conforming to ASTM C478. Base and first riser shall be monolithic. Gaskets for joints between manhole sections shall conform to ASTM C443. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C923 or ASTM C990. Traffic rated structures required as noted on drawings.
- B. Manhole Frames and Covers: Frame and cover must be cast gray iron, ASTM A48, Class 35B, cast ductile iron, ASTM A536, Grade 65-45-12, or meeting local requirements. Frames and covers must be circular. Include indented top design with lettering cast into cover. Traffic rated frames and covers required as noted on drawings.

2.03 PIPE ACCESSORIES

- A. Fittings: All fittings and accessories shall be manufactured and furnished by pipe supplier 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.

2.04 EXCAVATION AND BACKFILL

- A. Excavation and backfill for all sewers shall conform to the provisions of Division 31, Section 31 23 33 of these specifications.

PART 3 - EXECUTION

3.01 GENERAL

- A. Verify existing elevations prior to extensive excavating and notify the City of any discrepancies. Contractor shall be liable for any premature construction, which must be modified due to unforeseen existing conditions. Verify location of point of connection (POC).
- 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.
- C. Provide all necessary fittings, fixtures, hardware, plates, fasteners, etc. to provide complete installation.
- D. Use manholes or cleanouts for changes in direction or pipe size.
- E. For sewer main location, alignment, cover, and size: Conform to local requirements.
- F. All installations shall be secure and watertight.

3.02 INSTALLATION

- A. Excavate pipe trench and place pipe zone bedding material 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. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe barrel.
- D. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal joints watertight.
- E. The pipe shall be laid without break upgrade from structure to structure, with bell end upgrade for bell and spigot pipe.
- F. The horizontal alignment of the pipe shall be laid such that any point shall not vary more than 0.10 feet from the design alignment.
- G. Install pipe zone bedding material at sides and over top of pipe in accordance with Section 31 23 33 of these specifications.
- H. Place trench zone backfill in accordance with Section 31 23 33 of these specifications. Do not displace or damage pipe when compacting.

3.03 CONNECTIONS TO EXISTING

- A. No new sewer line shall be connected to an existing sewer system until the new sewer lines are installed, flushed, and satisfactorily tested.

3.04 BRACING AND SHORING

- A. As required by the Trench Construction Safety Orders of the California Construction Safety Orders of the Division of Occupational Safety and Health, bracing and shoring shall be installed in trenches of five feet or greater depth to ensure the safety of workers and to protect and facilitate the work.

3.05 TESTING SEWERS

- A. All sewers, sewer services, and manholes shall be tested and observed for obstructions and leakage in accordance with the provisions of the local jurisdiction and per ASTM D3212.
- B. Final acceptance and testing requirements shall conform to the requirements of this section or local requirements, which ever are more stringent.
- C. Mandrel test of PVC pipe:
 - 1. Following the placement and densification of backfill and prior to placement of permanent pavement, all main line pipe shall be cleaned and mandrelled to measure for obstructions (deflections, joint offsets, and lateral pipe intrusions). A rigid mandrel, approved by the Engineer, with a circular cross section having a diameter of at

least 95% of the specified average inside diameter, shall be pulled through the pipe by hand. Mandrel testing shall be performed 30 days or longer after installation and backfill compaction. In the event permanent pavement is placed prior to that time, mandrel-testing shall be required prior to paving and a second mandrel test 30 days or longer after compaction of backfill. The backfill shall be removed and re-compacted for any section of pipe that fails the mandrel test. Re-rounders shall not be used to correct excessive pipe deformation.

D. Leakage Test:

1. Test lines for leakage by either infiltration or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least the lower half of the pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered for inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory corrections and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.
2. Perform these tests for sewer lines made of the specified materials, not only concrete, in accordance with ASTM C969. Make calculations in accordance with the Appendix to ASTM C969.
3. Test in accordance with UBPPA UNI-B-6. Allowable pressure drop shall be as given in UBPPA UNI-B-6. Make calculations in accordance with the Appendix to UBPPA UNI-B-6.

END OF SECTION

SECTION 33 41 00

STORM 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.
- C. Volume 1 - Contracting Requirements, and Division - 01 General Requirements apply to the Work of this Section.

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. Stormwater Retention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.
- C. Field quality-control reports.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

- A. Conduits shall be designed to have a minimum useful life of 50 years.
- B. Cast-in-Place concrete pipe, Non-reinforced Concrete Pipe, and Reinforced Concrete Pipe conforming to the California Department of Transportation Standard Specifications will be acceptable.

- C. Polyethylene (PE) large diameter profile wall pipe conforming to ASTM F894, or Polyvinylchloride (PVC) large diameter profile wall pipe conforming to ASTM F794 will be acceptable.
- D. The minimum allowable pipe size for privately maintained systems is 12 inches.

2.02 MANHOLES AND DRAIN INLETS

- 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.

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.
- 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.

3.02 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at beneficial occupancy of Project.

1. Submit separate reports for each system inspection.
 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test piping systems for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 4. Submit separate report for each test.
 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction and the following:
 - a. Exception: Piping with soil tight joints unless required by authorities having jurisdiction.
 - b. Option: Test plastic piping according to ASTM F 1417.
 - c. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).
 6. Force-Main Storm Drainage Piping: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig.
 - a. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.
- C. Leaks and loss in test pressure constitute defects that must be repaired.

- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION

SECTION 00 77 00

STREET LIGHTING

77-1.01 GENERAL

77-1.01A Summary

Section 77-1 includes specifications for street lighting).

Street lighting including:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Standards
6. Luminaires
7. Service equipment enclosure
8. Receptacles

The components of street lighting are shown on the project plans.

77-1.02 MATERIALS

The electrical materials must comply with section 86.

The street lights must be 240V/90w Lumec Domus 50 series as shown on the plans.

Receptacle must be TAYMAC MX320 GFCI duplex type.

Receptacle enclosure must be outdoor rated and lockable while-in-use.

77-1.03 CONSTRUCTION

Install electrical material under section 87.

77-1.04 PAYMENT

The contract lump sum price paid for street lighting shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing street lighting system, receptacles, service equipment enclosure, pull boxes, conduits and conductors, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

END OF SECTION

SECTION 00 86 00

GENERAL ELECTRICAL WORK

Section 86 includes general specifications for furnishing electrical equipment and materials.

Electrical equipment and materials must comply with part 4 of the *California MUTCD* and 8 CA Code of Regs, chapter 4, subchapter 5, "Electrical Safety Orders."

Galvanized equipment and materials must comply with section 75-1.02B.

86-1.01B Definitions

accessible pedestrian signal: Accessible pedestrian signal as defined in the *California MUTCD*.

accessible walk indication: Activated audible and vibrotactile action during the walk interval.

actuation: Actuation as defined in the *California MUTCD*.

ambient sound level: Background sound level in dB at a given location.

ambient sound sensing microphone: Microphone that measures the ambient sound level in dB and automatically adjusts the accessible pedestrian signal speaker's volume.

audible speech walk message: Audible prerecorded message that communicates to pedestrians which street has the walk interval.

CALiPER: Commercially Available LED Product Evaluation and Reporting. A U.S. Department of Energy program that individually tests and provides unbiased information on the performance of commercially available LED luminaires and lights.

controller assembly: Consists of a controller cabinet, controller unit, and auxiliary equipment for system's operation.

controller unit: Part of the controller assembly performing the basic timing and logic functions.

correlated color temperature: Absolute temperature in kelvin of a blackbody whose chromaticity most nearly resembles that of the light source.

detector: Detector as defined in the *California MUTCD*.

electrolier: Assembly of a lighting standard and luminaire.

flasher: Device for opening and closing signal circuits at a repetitive rate.

illuminance gradient: Ratio of the minimum illuminance on a 1-foot square of sign panel to that on an adjacent 1-foot square of sign panel.

inductive loop detector: Detector capable of being actuated by an inductance change caused by a vehicle passing or standing over the loop. An inductive loop detector includes a loop or group of loops installed in the roadway and a lead-in cable installed and connected inside a controller cabinet.

junction temperature: Temperature of the electronic junction of the LED device. The junction temperature is critical in determining photometric performance, estimating operational life, and preventing catastrophic failure of the LED.

L70: Extrapolated life in hours of the luminaire when the luminous output depreciates 30 percent from the initial values.

lighting standard: Pole and mast arm supporting the luminaire.

link: Part of a system which provides a data connection between a transmitter and receiver.

LM-79: Test method from the Illumination Engineering Society of North America specifying the test conditions, measurements, and report format for testing solid state lighting devices, including LED luminaires.

LM-80: Test method from the Illumination Engineering Society of North America specifying the test conditions, measurements, and report format for testing and estimating the long-term performance of LEDs for general lighting purposes.

luminaire: Assembly that houses the light source and controls the light emitted from the light source.

mid-span access method: Procedure in which fibers from a single buffer tube are accessed and spliced to a multi buffer tube cable without cutting the unused fibers in the buffer tube, or disturbing the remaining buffer tubes in the cable.

National Voluntary Laboratory Accreditation Program: U.S. Department of Energy program that accredits independent testing laboratories.

optical time domain reflectometer: Fiber optic test equipment that is used to measure the total amount of power loss between two points and over the corresponding distance. It provides a visual and printed display of the relative location of system components such as fiber sections, splices and connectors as well as the losses that are attributed to each component and or defects in the fiber.

pedestrian change interval: Pedestrian change interval as defined in the *California MUTCD*.

powder coating: Coating applied electrostatically using exterior-grade, UV-stable, polymer powder. **power factor:** Ratio of the real power component to the complex power component.

power meter: Portable fiber optic test equipment that, when coupled with a light source, is used to perform end-to-end attenuation testing. Its display indicates the amount of power injected by the light source at the designed wavelength of the system under testing that arrives

at the receiving end of the link.

programming mechanism: Device to program the accessible pedestrian signal operation.

pull box: Box with a cover that is installed in an accessible place in a conduit run to facilitate the pulling in of wires or cables.

push button information message: Push button information message as defined in the *California MUTCD*.

push button locator tone: Push button locator tone as defined in the *California MUTCD*.

segment: Continuous cable terminated by 2 splices, 2 connectors or 1 splice and 1 connector.

signal face: Signal face as defined in the *California MUTCD*.

signal head: Signal head as defined in the *California MUTCD*.

signal indication: Signal indication as defined in the *California MUTCD*.

signal section: Signal section as defined in the *California MUTCD*.

signal standard: Pole with or without mast arms carrying 1 or more signal faces.

street side lumens: Lumens from a luminaire directed to light up areas between the fixture and the roadway, such as traveled ways and freeway lanes.

surge protection device: Subsystem or component that protects equipment against short-duration voltage transients in power line.

total harmonic distortion: Ratio of the rms value of the sum of the squared individual harmonic amplitudes to the rms value of the fundamental frequency of a complex waveform.

traffic phase: Traffic phase as defined in the *California MUTCD*.

vehicle: Vehicle as defined in the *California Vehicle Code*.

vibrotactile pedestrian device: Vibrotactile pedestrian device as defined in the *California MUTCD*.

86-1.01C Submittals 86-1.01C(1) General

Within 15 days after Contract approval, submit a list of equipment and materials you propose to install. Submit the list before shipping equipment and materials to the job site. The list must include:

1. Manufacturer's name
2. Make and model number
3. Month and year of manufacture
4. Lot and serial numbers

5. Contract number
6. Your contact information

Submit confirmation of the vendor's acceptance of the order for the electrical equipment and materials as an informational submittal.

Submit 3 sets of computer-generated, schematic wiring diagrams for each cabinet.

Diagrams, plans, and drawings must be prepared using graphic symbols in IEEE 315, "Graphic Symbols for Electrical and Electronic Diagrams."

Submit a schedule of values within 15 days after Contract approval.

The schedule of values must include material and installation methods, by plan sheet, for:

1. Foundations
2. Standards and poles
3. Conduit
4. Pull boxes
5. Conductors and cables
6. Luminaires and lighting fixtures

Do not include costs for the traffic control system in the schedule of values.

Submit a manufacturer's maintenance manual or combined maintenance and operation manual as an informational submittal. The manual must have a master item index that includes:

1. Specifications
2. Design characteristics
3. General operation theory
4. Function of all controls
5. Troubleshooting procedure
6. Parts list, descriptions, stock numbers, and settings
7. Block circuit diagram
8. Layout of components
9. Schematic diagrams

86-1.01C(2) Pull Boxes

Submit the manufacturer's installation instructions for pull boxes, including:

1. Quantity and size of entries that can be made without degrading the strength of the pull box below the load rating
2. Locations where side entries can be made
3. Acceptable method for creating the entry

Submit load-rating test reports for pull boxes from an independent laboratory.

86-1.01C(3) Luminaires

Submit for a luminaire:

1. Maximum power in watts
2. Maximum designed junction temperature
3. Heat sink area in square inches
4. Designed junction-to-ambient thermal resistance calculation with thermal resistance components clearly defined
5. L70 in hours when extrapolated for the average nighttime operating temperature
6. Life expectancy based on the junction temperature
7. Manufacturer's data sheet for the power supply, including the rated life

Submit the manufacturer's QC test data for luminaires as an informational submittal.

86-1.01C(4) Reserved

86-1.01C(5) Service Equipment Enclosures

Submit shop drawings for a service equipment enclosure to METS.

86-1.01C(6) Signal Heads

Submit a certificate of compliance and the manufacturer's QC test data for signal heads as an informational submittal.

86-1.01C(7) LED Signal Modules

Submit the manufacturer's QC test data for LED signal modules as an informational submittal.

86-1.01C(8) Visors

Submit a certificate of compliance and the manufacturer's QC test data for visors as an informational submittal.

86-1.01C(9) LED Countdown Pedestrian Signal Face Modules

Submit the manufacturer's QC test data for LED countdown pedestrian signal face modules as an informational submittal.

86-1.01C(10) Accessible Pedestrian Signals

Submit the manufacturer's QC test data for accessible pedestrian signals as an informational submittal.

86-1.01D Quality Assurance 86-1.01D(1) General

Electrical equipment must comply with one or more of the following standards:

1. ANSI
2. ASTM
3. EIA/ECIA
4. NEMA
5. NETA
6. UL/NRTL
7. TIA

Materials must comply with:

1. FCC rules
2. ITE standards
3. NEC
4. California Electrical Code

86-1.01D(2) Source Quality Control

Service equipment enclosures and cabinets must be inspected and tested at the source.

86-1.01D(3) Department Acceptance

Deliver material and equipment for testing to METS.

Allow 30 days for testing. The Department notifies you when testing is complete.

If the Department accepts the material or equipment, you must pick it up from the test site and deliver it to the job site.

If the Department rejects material or equipment, remove it within 5 business days after you are notified it is rejected. If it is not removed within that period, the Department may remove it and ship it to you and deduct the costs of labor, material and shipping.

Resubmit a new sample and allow 30 days for retesting. The retesting period starts when the replacement material or equipment is delivered to METS.

86-1.02 MATERIALS

86-1.02A General

Anchor bolts, anchor bars or studs, and nuts and washers must comply with section 75-1.02.

Bolt threads must accept galvanized standard nuts without requiring tools or causing removal of protective coatings.

86-1.02B Conduit and Accessories

86-1.02B(1) General

Conduit and fittings must comply with the requirements shown in the following table:

Conduit and Fitting Requirements

Type	Requirement
1	Must be hot-dip galvanized rigid steel complying with UL 6 and ANSI C80.1. The zinc coating must comply with copper sulfate test requirements in UL 6. Fittings must be electrogalvanized and certified under UL 514B.
2	Must comply with requirements for Type 1 conduit and be coated with PVC or polyethylene. The exterior thermoplastic coating must have a minimum thickness of 35 mils. The internal coating must have a minimum thickness of 2 mils. Coated conduit must comply with NEMA RN 1, or NRTL PVC-001.
3	Must be Type A, extruded, rigid PVC conduit complying with UL 651 or must be HDPE conduit complying with UL 651A.
4	Must have an inner, flexible metal core covered by a waterproof, nonmetallic, sunlight- resistant jacket, and must be UL listed for use as a grounding conductor. Fittings must be certified under UL 514B.
5	Must be intermediate steel complying with UL 1242 and ANSI C80.6. The zinc coating must comply with copper sulfate test requirements specified in UL 1242. Fittings must be electrogalvanized and certified under UL 514B.

Bonding bushings installed on metal conduit must be insulated and be galvanized or zinc-alloy type. Shop-cut threads must be protected from corrosion under the standards shown in the following table:

Shop-Cut Thread Corrosion Protection

Conduit	Standard
Types 1 and 2	ANSI C80.1
Type 5	ANSI C80.6

Primer for metal conduit threads and damaged areas must be on the Authorized Material List for organic zinc-rich primers. Aerosol cans are not allowed.

High density polyethylene conduit and couplings must be electro fusion type.

Conduit for fiber optic cable systems must be schedule 40 high density polyethylene, complying with NEMA TC-7, except for horizontal directional drilling.

Conduit used for horizontal directional drilling must be high density polyethylene Type IPS, SDR 9 and comply with ASTM F2160.

Sealing plug must:

1. Be reusable

2. Withstand a pressure of 5 psi
 3. Provide an airtight seal
- Seal conduit and innerducts simultaneously

Sealing plug for empty conduit must have a rope tie. Innerduct must be:

1. HDPE tubing or fabric mesh pouch.
2. Nominal 1 inch inside diameter, with a minimum Standard Dimension Ratio (SDR) rating of 11.
3. Continuous without splices or joints.
4. Ribbed inside and outside when used inside a conduit.
5. Ribbed inside and smooth on the outside for direct burial.
6. Unique color throughout the entire length of the conduit segment.
7. Shipped and stored on a reel, covered to protect colors from UV deterioration. The reel must be marked with:
 - 7.1. Manufacturer's name.
 - 7.2. Contract number.
 - 7.3. Size and length of the innerduct.

High density polyethylene for innerduct must:

1. Comply with ASTM D3485, D3035, D2239, and D2447, and NEMA TC7 and TC2
2. Have a minimum tensile yield strength of 3,300 psi under ASTM D638
3. Have a density of 59.6187 lb/ft³ ± 0.3121 lb/ft³ under ASTM D1505

Tracer wire must be a minimum no. 12 copper conductor with orange insulation Type TW, THW, RHW, or USE. For direct burial, the tracer wire insulation must be Type UF.

86-1.02B(2) Structures Accessories

Steel hangers, steel brackets, and other fittings used to support conduit in or on a wall or bridge structure must comply with section 75-3.

Precast concrete cradles for conduit must be made of minor concrete and commercial-quality welded wire fabric. The minor concrete must contain a minimum of 590 lb of cementitious material per cubic yard. The cradles must be moist cured for a minimum of 3 days.

Expansion and deflection fittings must:

1. Be UL listed
2. Be internally grounded per NEC
3. Be for Type 1 conduit

Expansion fittings must:

1. Have a malleable iron or "Feraloy" iron alloy housing
2. Have a hot dipped galvanized or zinc plated finish

3. Have a metallic packing durable sealing ring
4. Have a minimum longitudinal movement of 4 inches

Deflection fittings must:

1. Have a neoprene or silicone rubber sleeve with stainless steel clamps attached to the end of the couplings. The couplings must be bronze, "Feraloy" iron alloy with hot dipped galvanization, or ductile cast iron with zinc.
2. Provide up to 30-degree angular misalignment and a minimum 3/4-inch movement during:
 - 2.1. Parallel misalignment
 - 2.2. Expansion
 - 2.3. Compression

86-1.02C Pull Boxes 86-1.02C(1) General

A pull box cover must have a marking on the top that is:

1. Legible
2. Uniform
3. Parallel to the side
4. From 1 to 3 inches in height

The cover marking must include *CALTRANS* and one of the following:

1. *SERVICE* for service circuits from a service equipment enclosure to a subpanel
2. *SERVICE IRRIGATION* for circuits from a service equipment enclosure to an irrigation controller
3. *SERVICE BOOSTER PUMP* for circuits from a service equipment enclosure to the booster pump
4. *TDC POWER* for circuits from a service equipment enclosure to telephone demarcation cabinet
5. *LIGHTING* for a lighting system
6. *SIGN ILLUMINATION* for a sign illumination system
7. *SIGNAL AND LIGHTING* for a signal and lighting system
8. *RAMP METER* for a ramp metering system
9. *TMS* for a traffic monitoring station
10. *FLASHING BEACON* for a flashing beacon system
11. *CMS* for a changeable message sign system
12. *INTERCONNECT* for an interconnect conduit and cable system
13. *FIBER OPTIC* for fiber optic cable system
14. *ELECTRICAL SYSTEMS* if more than one system is shared in the same pull box
15. *STREET LIGHTING* for City Street lighting system

The cover marking must not include *CALTRANS*, only the following:

1. *ELECTRICAL SERVICE* for circuits from an electrical utility to a service equipment enclosure
2. *TELEPHONE SERVICE* for circuits from a telephone utility to a telephone demarcation cabinet

A metal pull box cover must include a fitting for a bonding conductor.

The hardware must be stainless steel containing 18 percent chromium and 8 percent nickel.

86-1.02C(2) Roadway Pull Boxes 86-1.02C(2)(a) General

A pull box cover must have a nonskid surface.

The pull boxes and covers must not have exposed fibers or reinforcement on the finish surfaces that are exposed.

The load rating must be:

1. Stenciled or stamped on the inside and outside of the pull box
2. Stamped on the outside of the cover

A pull box cover must have the manufacturer's logo.

If a transformer or other device is to be placed in the pull box, include recesses for a hanger. Hold-down bolts must:

1. Be a Penta Head 1/2 inch-13UNC
2. Have a thread lock material
3. Withstand a torque from 55 to 60 ft-lb
4. Withstand a minimum pull-out strength of 750 lb

The opening in which the cover sets must have length and width dimensions 1/8 inch greater than the cover.

86-1.02C(2)(b) Nontraffic Pull Boxes

A nontraffic pull box and cover must comply with ANSI/SCTE 77, "Specification for Underground Enclosure Integrity," for Tier 22 load rating and must be gray or brown.

An extended pull box must be a minimum 22 inches deep and may be a single box or a box with an extension made of the same material as the pull box. The extension may be another pull box if the bottom edge of the pull box fits into the opening for the cover.

The hold down bolts, nuts, and washers must be a captive design.

The pull box must have a 1/2 inch-13 coarse-thread insert with drainage hole, to secure the hold down bolts.

The cover must have a 1/2-by-4 inch pull slot with a 3/16-inch to 1/4-inch center pin.

The cover markings must be cast in the mold of the cover or be engraved on a metal or UV resistant ABS plate secured to the cover with stainless steel screws.

86-1.02C(2)(c) Traffic Pull Boxes

A traffic pull box and cover must comply with AASHTO HS20 and load tested under AASHTO M 306.

A traffic pull box must be reinforced with a galvanized steel Z bar welded frame. The frame must be anchored to the box with 2-1/4-inch-long concrete anchors with a 1/4-inch diameter. No. 5 and no. 6 traffic pull boxes must have 6 concrete anchors, one in each corner, and one in the middle of each longer side. No. 3 traffic pull boxes must have 4 concrete anchors, one in each corner.

The frame must have nuts fabricated with the frame or spot welded to the underside of the frame, to secure the hold down bolts.

The nuts must be zinc-plated carbon steel, vibration-resistant, and have a wedge ramp at the root of the thread.

The cover must:

1. Be steel, reinforced and galvanized post fabrication.
2. Be countersunk approximately 1/4 inch to accommodate the bolt head. When tightened, the hold down bolt head must be no more than 1/8 inch above the top of the cover.
3. Have a 1/2-inch by 2-inch pull slot with a guard under the cover to prevent entry of more than 3 inches below the bottom surface of the cover without deflection.

Prior to applying the label, steel cover must be galvanized. The cover marking must be applied by one of the following methods:

1. Use a galvanized cast iron strip at least 1/4-inch thick with letters engraved or raised a minimum of 1/16 inch. Fasten the strip to the cover with either:
 - 1.1. 1/4-inch, flathead, stainless steel machine bolts and nuts. Peen the bolts after tightening.
 - 1.2. 1/4-inch stainless steel rivets.
2. Use a galvanized sheet steel strip at least 0.027-inch thick with letters engraved or raised a minimum of 1/16 inch. Fasten the strip to the cover by spot welding, tack welding, or brazing with 1/4-inch stainless steel rivets or 1/4-inch, roundhead, stainless steel machine bolts and nuts. Peen the bolts after tightening.
3. Bead weld the letters on the cover such that the letters are raised a minimum of 3/32 inch.

86-1.02C(2)(d) Tamper Resistant Pull Boxes 86-1.02C(2)(d)(i) General

Reserved

86-1.02C(2)(d)(ii) Tamper-Resistant Nontraffic Pull Box 86-1.02C(2)(d)(ii)(A) General

A tamper-resistant nontraffic pull box must include a pull box with one of the following:

1. Anchored cover
2. Lockable cover
3. Pull box insert

86-1.02C(2)(d)(ii)(B) Anchored Cover

The anchored cover must:

1. Be of 1/2-inch-thick mild steel, hot dip galvanized, post fabrication
2. Have spikes removed from the galvanized surfaces.
3. Have a center space for a top lock nut that must be torqued to 200 ft-lb.
4. Have a center opening for a stainless-steel threaded cap to cover the lock nut
5. Weigh a minimum of 85 lb.
6. Include an all-around security skirt of 1/4-inch thick steel. The skirt must be sized to encase a nontraffic pull box or sized to fit within a traffic pull box.
7. Be welded to the skirt.

86-1.02C(2)(d)(ii)(C) Lockable Cover

The lockable cover must:

1. Be manufactured from minimum 3/16-inch-thick galvanized steel or a polymer of minimum strength equal to 3/16-inch steel
2. Be secured to the pull box with a locking mechanism of equal or greater strength than the manufactured material
3. Have 1/2-by-2-inch slot holes for lifting
4. Have dimensions complying with one of the following:
 - 4.1. Department's standards for pull box covers as shown if the lockable cover is secured to the inside lip of the pull box
 - 4.2. Department's standards for the length and width as shown for pull box covers if the lockable cover is secured to the top of the pull box

86-1.02C(2)(d)(ii)(D) Pull Box Insert

The pull box insert must:

1. Be made of minimum 3/16-inch-thick or 10 gauge mild hot-dipped galvanized steel
2. Have a minimum of 2 mounting brackets that rest under the side or end wall
3. Be lockable with a padlock having a minimum 3/8-inch shackle
4. Have dimensions complying with the Department's standards for the length and width as shown for pull box covers

86-1.02C(2)(d)(iii) Tamper Resistant Traffic Pull Box

A tamper resistant traffic pull box must include a pull box with an anchored cover.

86-1.02C(3) Structure Pull Boxes

A no. 7 pull box must:

1. Be 12 by 12 by 12 inches.
2. Be manufactured with 0.075-inch sheet steel.
3. Have 3/4-inch flanges on the top and bottom.
4. Have one 1-inch and one 1-1/2-inch knockouts on each side, except for the covers.
5. Have drilled and tapped holes on the top and the bottom flanges for the cover screws. The hole pattern and spacing must be the same at the top and bottom.
6. Have covers that secure to the box with eight 1/4-inch diameter, 20NC brass machine screws.

A no. 8 pull box must:

1. Be 12 by 12 by 12 inches.
2. Be manufactured with 0.135-inch sheet steel.
3. Mount to the structure with three 3/8-inch diameter machine screws per side.
4. Have 1-1/2-inch knockouts on each side, except the cover.
5. Have drilled and tapped holes on the sides and the bottom for the cover screws. The holes must be reinforced with a 1-by-1-by-0.135-inch bar inside the box.
6. Have a cover with 3/4-inch flanges on the sides and bottom with the corners welded at the bottom. The cover must secure to the box with, three 1/4-inch diameter by 1/2-inch long cadmium plated brass or stainless steel, machine screws.

A no. 9 pull box must:

1. Be 24 by 9-1/2 by 6-1/4 inches.
2. Be manufactured with 0.075-inch sheet steel.
3. Have a rain tight hood.
4. Have a 1-1/2-by-4-1/2-by-0.135-inch strap welded to the back of the box at each corner, parallel to the long side. The strap must have a 1/4-inch hole on the exposed end.
5. Have a 1-inch lip around the opening.
6. Have drilled and tapped holes with a minimum 1/4-inch thread length, at the ends of the bottom lip for the cover screws.
7. Have a 3-inch knockout on each side at the bottom and at the center of the bottom
8. Have a 2-inch knockout on each side at the top and at both ends of the bottom.
9. Have an L 5/8-by-7/8-by-0.075-inch formed angle spot welded to the inside of the top on both sides and on the bottom.
10. Have a cover manufactured with 0.125-inch steel, that secures to the box with two 3/8-inch diameter by 3/4-inch long stainless-steel flathead screws with 11/16-inch diameter countersink holes. The cover must include a 1/16-inch neoprene gasket.

A no. 9A pull box must:

1. Be 20 by 8 by 8-1/2 inches.
2. Be manufactured with 0.075-inch sheet steel.
3. Have 3/4-inch flanges on the top.
4. Have drilled holes on the short sides for the cover screws. The holes must have a stainless-steel hex nut or a 1/4-by-5/8-by-8-inch bar spot welded to the bottom of the flange.
5. Have a 3-inch knockout on each side at the top and at the center of the bottom.
6. Have a 2-inch knockout on each side at the bottom and at both ends of the bottom.
7. Have a cover manufactured with 0.105-inch steel, that secures to the box with four 3/8-inch diameter stainless steel hex head cap screws, two on each short side. The cover must have a rain tight hood and include a 1/16-inch neoprene gasket.

Pull box corner joints must be lapped and spot welded or riveted. Concentric and eccentric multiple size knockouts are not allowed.

86-1.02D Tapes

86-1.02D(1) General

Reserved

86-1.02D(2) Pull Tape

Pull tape must be a flat, woven, lubricated, soft-fiber, polyester tape with a minimum tensile strength of 1,800 lb. The tape must have sequential measurement markings every 3 feet.

86-1.02D(3) Warning Tape

Warning tape must be orange color polyolefin film, minimum elongation of 500 percent before breakage, water and corrosion resistant, and comply with requirements shown in the following table:

Warning Tape Requirements

Quality characteristic	Requirement
Thickness (min, mil)	4
Width (in)	4
Tensile strength of material (min, psi)	2,800
Message spacing intervals (ft)	3

The warning tape must have a printed message that reads: **CAUTION: CALTRANS FACILITIES BELOW**. The printed text height and color must be 1 inch, black color text over bright orange background.

86-1.02E Piezoelectric Axle Sensors

Piezoelectric axle sensors must be Class II and must be for vehicle classification purposes. Each sensor must:

1. Have a dissipation factor less than 0.04 nF when measured in the 20 nF range
2. Have resistance greater than 20 Megaohms
3. Be 1/4 inch wide by 6 feet long by 1/16 inch thick
4. Have a RG-58C/U coaxial screen transmission cable, jacketed with high-density polyethylene, rated for direct burial and resistant to nicks and cuts
5. Operate over a temperature range from -40 to 160 degrees F
6. Have a signal to noise ratio equal to or greater than 10 to 1
7. Have an output signal of a minimum 250 mV $\pm$ 20 percent for a wheel load of 400 lb at 55 mph and 70 degrees F
8. Have an insulation resistance greater than 500 M Ω
9. Have a life cycle of a minimum 25 million equivalent single axle loadings

86-1.02F Conductors and Cables 86-1.02F(1) General

Conductors and cables must be clearly and permanently marked the entire length of their outer surface with:

1. Manufacturer's name or trademark
2. Insulation-type letter designation
3. Conductor size
4. Voltage
5. Number of conductors for a cable

The minimum insulation thickness and color code requirements must comply with NEC.

The insulation color must be homogeneous throughout the full depth of the insulation. The identification stripe must be continuous throughout the length of the conductor.

Conductors must be copper, except no. 6 and larger must be aluminum.

86-1.02F(2) Conductors 86-1.02F(2)(a) General

A conductor must be UL listed or NRTL certified and rated for 600 V(ac). Insulation for conductors must be one of the following:

1. Type XHHW-2
2. Type USE, RHH, or RHW cross-linked polyethylene

The insulation for no. 2 and larger conductors must be one of the above or THWN. Conductors must be minimum no. 14 AWG:

1. Between luminaire and pull box
2. For lighting control

3. Between flashing beacon enclosure and the signal heads

Conductors must be identified as shown in the following table:

Conductor Identification				
Circuit	Signal phase or function	Identification		
		Insulation color		Band symbols
		Base	Stripe ^a	
Signals (vehicle) ^{a,b}	2, 6	Red, yellow, brown	Black	2, 6
	4, 8	Red, yellow, brown	Orange	4, 8
	1, 5	Red, yellow, brown	None	1, 5
	3, 7	Red, yellow, brown	Purple	3, 7
	Ramp meter 1	Red, yellow, brown	None	No band required
	Ramp meter 2	Red, yellow, brown	Black	No band required
Pedestrian signals	2p, 6p	Red, brown	Black	2p, 6p
	4p, 8p	Red, brown	Orange	4p, 8p
	1p, 5p	Red, brown	None	1p, 5p
	3p, 7p	Red, brown	Purple	3p, 7p
Push button assembly or accessible pedestrian signal	2p, 6p	Blue	Black	P-2, P-6
	4p, 8p	Blue	Orange	P-4, P-8
	1p, 5p	Blue	None	P-1, P-5
	3p, 7p	Blue	Purple	P-3, P-7
Controller cabinet	Ungrounded circuit conductor	Black	None	CON-1
	Grounded circuit conductor	White	None	CON-2
Lighting pull box to luminaire	Ungrounded - line 1	Black	None	No band required
	Ungrounded - line 2	Red	None	No band required
	Grounded	White	None	No band required
Lighting	Ungrounded - line 1	Black	None	ML1
	Ungrounded - line 2	Red	None	ML2
	Ungrounded - line 3	White	None	ML3

Lighting control	Ungrounded - Photoelectric unit	Black	None	C1
	Switching leg from Photoelectric unit or SM transformer	Red	None	C2
Service Equipment Enclosure	Ungrounded - line 1 (signals)	Black	None	No band required
	Ungrounded - line 2 (lighting)	Red	None	No band required
Sign lighting	Ungrounded - line 1	Black	None	SL-1
	Ungrounded - line 2	Red	None	SL-2
Flashing beacons	Ungrounded between flasher and beacons	Red or yellow	None	FB-Location ^c
Grounded circuit conductor	Push button assembly or accessible pedestrian signal	White	Black	No band required
	Signals and multiple lighting	White	None	No band required
	Flashing beacons and sign lighting	White	None	No band required
	Lighting control	White	None	C-3
	Service	White	None	No band required
Spares	--	Black	None	No band required

^a On overlaps, the insulation is striped for the 1st phase in the designation, e.g., phase (2+3) conductor is striped as for phase 2.

^b Band for overlap and special phases as required.

^c Flashing beacons having separate service do not require banding.

Conductors must be copper type.

86-1.02F(2)(b) Aluminum Conductors

Aluminum conductors must comply with ASTM B800 and 801.

86-1.02F(2)(c) Copper Conductors 86-1.02F(2)(c)(i) General

Copper wire must comply with ASTM B3 and B8.

86-1.02F(2)(c)(ii) Bonding Jumpers and Equipment Grounding Conductors

A bonding jumper must be copper wire or copper braid of the same cross-sectional area as a no. 8 conductor or larger.

An equipment grounding conductor must be ~~insulated copper~~ bare.

86-1.02F(2)(c)(iii) Inductive Loop Conductors

An inductive loop conductor must comply with the requirements shown in the following table:

Conductor Requirements for Inductive Loop Detectors

Loop wire	Requirement
Type 1	Type RHW-USE neoprene-jacketed or Type USE cross-linked polyethylene, insulated, no. 12, stranded copper wire with a minimum 40-mils insulation thickness at any point.
Type 2	Type THWN or Type XHHW, no. 14, stranded copper wire in a plastic tubing. The plastic tubing must be polyethylene or vinyl rated for use at 105 degrees C and resistant to oil and gasoline. The outside diameter of the tubing must be at most 0.27 inch with a wall thickness of at least 0.028 inch.

86-1.02F(2)(d) Reserved 86-1.02F(3) Cables

86-1.02F(3)(a) General

Reserved

86-1.02F(3)(b) Aluminum Cables 86-1.02F(3)(b)(i) General Reserved

86-1.02F(3)(b)(ii) Direct Burial Cables

Direct burial cable must be aluminum. The direct burial aluminum cable must:

1. Be a metal-clad type
2. Be UL listed or NRTL certified for direct burial and concrete encasemen
3. Include conductors rated for 90 degrees C
4. Have a galvanized steel or aluminum interlocking metal tape sheath with PVC jacke
5. Have a minimum no. 6 AWG aluminum or copper-clad aluminum equipment grounding conductor

86-1.02F(3)(c) Reserved

86-1.02F(3)(d) Copper Cables 86-1.02F(3)(d)(i) General Reserved

86-1.02F(3)(d)(ii) Conductor Signal Cables

A conductor signal cable must have a black polyethylene jacket with an inner polyester binder

sheath. The cable jacket must be rated for 600 V(ac) and 75 degrees C. Filler material, if used, must be polyethylene.

The individual conductors in the cable must be solid copper complying with ASTM B3 with Type THWN insulation. The minimum thickness of insulation must comply with NEC for conductor sizes no. 14 to no.10. The minimum thickness of the nylon jacket must be 4 mils.

Cable must comply with the requirements shown in the following table:

Cable type	Conductor quantity and type	Cable jacket thickness (mils)		Maximum nominal outside diameter (inch)	Conductor color code
		Average	Minimum		
3CSC	3 no. 14	44	36	0.40	Blue/black stripe, blue/orange stripe, white/black stripe
5CSC	5 no. 14	44	36	0.50	Red, yellow, brown, black, white
9CSC	1 no. 12 8 no. 14	60	48	0.65	No. 12 - white No. 14 - red, yellow, brown, black, red/black stripe, yellow/black stripe, brown/black stripe, white/black stripe
12CSC	1 no. 12 11 no. 14	60	48	0.80	No. 12 - white No. 14 - red, yellow, brown, black, red/black stripe, yellow/black stripe, brown/black stripe, black/red stripe, black/white stripe, red/white stripe, brown/white stripe

86-1.02F(3)(d)(iii) Detector Lead-in Cables

Conductors for a loop detector lead-in cable must be two no. 16, 19-by-29, stranded, tinned copper wires with calculated cross-sectional areas complying with ASTM B286, Table 1 and the requirements shown in the following table:

Conductor Requirements for Loop Detector Lead-In Cables

Lead-in cable	Requirement
Type B	Insulated with 20 mils of high-density polyethylene. Conductors must be twisted together with at least 2 turns per foot, and the twisted pair must be protected with a copper or aluminum polyester shield. A minimum no.

	20 copper drain wire must be connected to the equipment ground within the cabinet. Cable must have a high- density polyethylene or high-density polypropylene outer jacket with a nominal thickness of 32 mils. Include an amorphous, interior, moisture penetration barrier of nonhydroscopic polyethylene or polypropylene fillers.
Type C	Comply with International Municipal Signal Association Specification no. 50-2. A minimum no. 20 copper drain wire must be connected to the equipment ground within the cabinet.

86-1.02F(3)(d)(iv) Railroad Preemption Cables

A railroad preemption cable must be an 18-conductor cable having a polyvinyl chloride or polyethylene jacket. The cable jacket must be rated for 600 V(ac) and 75 degrees C.

The railroad preemption cable color code must be as shown in the following table:

Railroad Preemption Cable Color Code

Conductor no.	Color code
1	Black
2	White
3	Red
4	Green
5	Orange
6	Blue
7	White/black stripe
8	Red/black stripe
9	Green/black stripe
10	Orange/black stripe
11	Blue/black stripe
12	Black/white stripe
13	Red/white stripe
14	Green/white stripe
15	Blue/white stripe
16	Black/red stripe
17	White/red stripe
18	Orange/red stripe

The individual conductors in the cable must:

1. Be stranded and comply with ASTM B286
2. Have Type THW insulation
3. Be no. 14 AWG

86-1.02F(3)(d)(v) Signal Interconnect Cables

A signal interconnect cable must be a 6-pair type with stranded, tinned, copper no. 20 conductors. The insulation for each conductor must be color-coded polypropylene with a minimum 13-mils nominal thickness. The conductors must be in color-coded, twisted pairs. Each pair must be wrapped with an aluminum polyester shield and have a no. 22 or larger, stranded, tinned, copper drain wire inside the shielded pair.

The cable jacket must be black HDPE rated for a minimum of 300 V(ac) and 60 degrees C. The jacket must have a minimum nominal wall thickness of 40 mils.

86-1.02F(3)(d)(vi) Communication Cables 86-1.02F(3)(d)(vi)(A) General

Reserved

86-1.02F(3)(d)(vi)(B) Category 5E Cables

A category 5E cable must be a 4-pair, unshielded, outdoor rated, nongel-filled type and comply with ANSI/TIA/EIA 568-B.

86-1.02F(3)(d)(vi)(C) Category 6 Cables

A category 6 cable must be a 4-pair, unshielded, outdoor rated, nongel-filled type and comply with ANSI/TIA/EIA 568-C.

86-1.02F(3)(d)(vi)(D) Telephone Cables

A telephone cable must be a 6-pair type with solid, tinned, copper no. 22 conductors and comply with RUS Bulletin 1753F-205 (PE-39).

86-1.02G Equipment Identification Characters

Equipment identification characters must be 2-1/2 inch, series D lettering, except on wood poles, they must be 3-inch lettering.

The characters must be self-adhesive reflective labels or paint, except on wood poles, they must be embossed on aluminum.

The self-adhesive reflective labels must:

1. Be from 3 to 5 mils thick
2. Have all black capital characters on a white background
3. Extend beyond the character by a minimum of 1/4 inch

86-1.02H Splicing Materials

Splicing materials include:

1. Connectors
2. Electrical insulating coating
3. PVC electrical tape
4. Butyl rubber stretchable tape
5. PVC pressure-sensitive adhesive tape
6. Heat shrink tubing

Connectors must be C-shaped compression or butt type.

Electrical insulating coating must be a fast drying sealant with low nontoxic fumes. PVC electrical tape must have a minimum thickness of 6 mils.

Butyl rubber stretchable tape with liner must have a minimum thickness of 120 mils.

PVC pressure-sensitive adhesive electrical tape must have a minimum thickness of 6 mils.

Electrical tapes must be self-fusing, oil- and flame-resistant, synthetic rubber and be UL listed or NRTL certified.

Heat-shrink tubing must be made of irradiated polyolefin tubing with a minimum wall thickness of 40 mils before contraction and an adhesive mastic inner wall. When heated, the inner wall must melt and fill the crevices and interstices of the covered splice area and the outer wall must shrink to form a waterproof insulation.

Heat-shrink tubing must comply with the requirements for extruded, insulating tubing at 600 V(ac) specified in UL Standard 468D and ANSI C119.1 and the requirements shown in the following table:

Heat-Shrink Tubing Requirements

Quality characteristic	Requirement
Shrinkage ratio of supplied diameter ^a (max, %)	33
Dielectric strength (min, kV/in)	350
Resistivity (min, Ω /in)	25 x 10 ¹³
Tensile strength (min, psi)	2,000
Operating temperature (°C)	-40–90 (135 °C in emergency)
Water absorption (max, %)	0.5

^a When heated to 125 °C and allowed to cool to 25 °C.

86-1.02I Connectors and Terminals

Copper connectors must comply with UL-486A. Aluminum connector must comply with UL-486B.

Connectors and terminals must be rated for the conductors' size and material type and be prefilled with oxide-inhibiting compound.

Connectors and terminals for copper conductors must be a compression or crimp type.
Connectors and terminals for aluminum conductors must be a compression type.

86-1.02J Standards, Poles, Pedestals, and Posts

Standards, poles, pedestals, and posts must comply with section 56-3.

86-1.02K Luminaires 86-1.02K(1) General A luminaire must:

1. Be self-contained, not requiring assembly.
2. Comply with UL 1598 for luminaires in wet locations.
3. Have a power supply with ANSI/IEC 60529 rating of at least IP65.
4. Weigh less than 35 lb.
5. Have a minimum 60,000 hours L70 rating under LM-80 and TM-21 at an ambient temperature of 25 degrees C.
6. Operate over a temperature range from -40 to 130 degrees F
7. Be operationally compatible with photoelectric controls.
8. Have a nominal correlated color temperature of 3,000 K under ANSI C78.377 and a color rendering index of 70 or greater.
9. Have a maximum effective projected area of 1.4 sq ft when viewed from either side or end.
10. Comply with ANSI C136.31.
11. Have a power factor of 0.90 or greater. The total harmonic distortion, current, and voltage induced into a power line by a luminaire must not exceed 20 percent. Test voltage will be at 120 V(ac), 240 V(ac), or 480 V(ac).
12. Comply with the maximum power consumption and isofootcandle curves as shown, except for roadway luminaires.
13. Be on the Authorized Material List for LED luminaires or must be submitted and passed testing for addition to the AML.

A luminaire must include a surge protection device to withstand high-repetition noise transients caused by utility line switching, lightning strikes, and other interferences. The device must protect the luminaire from damage and failure due to transient voltages and currents as defined in Tables 1 and 4 of ANSI/IEEE C64.41.2 for location category C-High. The surge protection device must comply with UL 1449 and ANSI/IEEE C62.45 based on ANSI/IEEE C62.41.2 definitions for standard and optional waveforms for location category C-High.

The luminaire must operate over the voltage range:

1. From 95 to 277 V(ac) for luminaires rated 120, 240, or 277 V(ac)
2. From 347 to 480 V(ac) for luminaires rated 480 V(ac)

The fluctuations of line voltage must have no visible effect on the luminous output.

The luminaire's housing, external bolts, screws, hinges, hinge pins, and door closure devices must withstand a 1,008 hour cyclic salt fog spray/UV test under ASTM D5894 and an evaluation under ASTM D714 with a blister rating of 8 or greater and no more than medium

density.

The luminaire's housing must be marine-grade alloy with less than 0.2 percent copper or die cast aluminum.

The housing must be designed to prevent the buildup of water on its top surface. Exposed heat sink fins must be oriented to allow water to run off the luminaire and carry dust and other accumulated debris away from the unit. The optical assembly of the luminaire must be protected against dust and moisture intrusion to at least an ANSI/IEC 60529 rating of IP66. The power supply enclosure must be protected to at least an ANSI/IEC 60529 rating of IP43.

If the components are mounted on a down-opening door, the door must be hinged and secured to the luminaire's housing separately from other components. The door must be secured to the housing to prevent accidental opening. A safety cable must mechanically connect the door to the housing.

A luminaire must have a barrier-type terminal block secured to the housing to connect field wires. The terminal screws must be captive and equipped with wire grips for conductors up to no. 6.

Terminals must be identified and marked.

If needed, each refractor or lens must be made of UV-inhibiting high-impact plastic, such as acrylic or polycarbonate, or heat and impact-resistant glass. The refractor or lens must be resistant to scratching. Polymeric materials, except for the lenses of enclosures containing either the power supply or electronic components of the luminaire, must be made of UL94 V-0 flame-retardant materials.

The luminaire must be permanently marked inside the unit and outside of its packaging box. Marking consists of:

1. Manufacturer's name or trademark
2. Month and year of manufacture
3. Model, serial, and lot numbers
4. Rated voltage, wattage, and power in VA

An LED luminaire must:

1. Comply with Class A emission limits under 47 CFR 15(B) for unintentional radiators.
2. Have a power supply with:
 - 2.1. 2 leads to accept standard 0-10 V(dc) control.
 - 2.2. Dimming control compatible with IEC 60929, Annex E. If the control leads are open or the analog control signal is lost, the circuit must default to 100-percent power.
 - 2.3. Case temperature self-rise of 77 degrees F or less above ambient temperature in free air with no additional heat sinks.
3. Not be cooled by fans or other mechanical devices.

86-1.02K(2) Roadway Luminaires

A roadway luminaire must:

1. Have a housing color that matches a color no. 26152 to 26440, 36231 to 36375, or 36440 of AMS- STD-595.
2. Have an ANSI C136.41-compliant, locking-type, photocontrol receptacle with dimming connections and a watertight shorting cap.
3. Have an uplight rating of "U0" per IES TM-15-11.
4. Have identification labels outside the unit on the side that will face the road. The labels include:
 - 4.1. Equipment identification characters as shown in the following table:

Equipment Identification Characters

Luminaire Type	Label
Roadway 11	R11
Roadway 12	R12
Intersection small A	SA
Intersection small B	SB
Intersection small C	SC
Intersection medium A	MA
Intersection medium B	MB
Intersection medium C	MC
Intersection large A	LA
Intersection large B	LB
Intersection large C	LC

- 4.2. Rated wattage.

The luminaire's housing must have a slip fitter that must:

1. Fit on mast arms with outside diameters from 1-5/8 to 2-3/8 inches
2. Be adjustable to a minimum of ± 5 degrees from the axis of the tenon in a minimum of 5 steps: +5, +2.5, 0, -2.5, -5
3. Have clamping brackets that:
 - 3.1. Are made of corrosion-resistant materials or treated to prevent galvanic reactions
 - 3.2. Do not bottom out on the housing bosses when adjusted within the designed angular range
 - 3.3. Do not permanently set more than 1/32 inch when tightened

86-1.02K(3) Overhead Sign Luminaires

An overhead sign luminaire must:

1. Have a uniformity average to minimum ratio of 10:1 for the distribution of light reflected on a 16' wide by 12' high sign panel
2. Not allow more than 2.5 percent of the rated lumens to project above 65 degrees

- measured up from the horizontal plane in the direction of the sign panel
- 3. Mount at a maximum height of 12 inches above the top of the mounting rails
- 4. Mount directly to the sign structure as shown or with a mounting adapter that meets the material requirements of the luminaire's housing

86-1.02L Reserved

86-1.02M Photoelectric Controls

Photoelectric control types are as shown in the following table:

Photoelectric Control Types

Control type	Description
I	Pole-mounted photoelectric unit. Test switch and a 15-A circuit breaker per ungrounded conductor, housed in an enclosure.
II	Pole-mounted photoelectric unit. Contactor, a 15-A circuit breaker per ungrounded conductor, and test switch located in a service equipment enclosure.
III	Pole-mounted photoelectric unit. Contactor, a 15-A circuit breaker per ungrounded conductor, and a test switch housed in an enclosure.
IV	A photoelectric unit that plugs into a NEMA twist-lock receptacle, integral with the luminaire.
V	A photoelectric unit, contactor, a 15-A circuit breaker per ungrounded conductor, and test switch located in a service equipment enclosure.

The pole-mounted adaptor for Type I, II, and III photoelectric controls must include a terminal block and cable supports or clamps to support the wires.

Photoelectric unit must:

- 1. Have a screen to prevent artificial light from causing cycling.
- 2. Have a rating of 60 Hz, 105–130 V(ac), 210–240 V(ac), or 105–240 V(ac).
- 3. Operate at a temperature range from -20 to 55 degrees C.
- 4. Consume less than 10 W.
- 5. Be a 3-prong, twist-lock type with a NEMA IP 65 rating, ANSI C136.10-compliant.
- 6. Have a fail-on state.
- 7. Fit into a NEMA-type receptacle
- 8. Turn on from 1 to 5 footcandles and turn off from 1.5 to 5 times the turn-on level. Measurements must be made by procedures in *EEI-NEMA Standards for Physical and Electrical Interchangeability of Light-Sensitive Control Devices Used in the Control of Roadway Lighting*.

Type I, II, III, and V photoelectric controls must have a test switch to allow manual operation of the lighting circuit. Switch must be:

1. Single-hole mounting, toggle type
2. 15 A, single pole and single throw
3. Labeled *Auto-Test* on a nameplate

Photoelectric control's contactor must be:

1. Normally open
2. Mechanical-armature type with contacts of fine silver, silver alloy, or equal or better material
3. Installed to provide a minimum space of 2-1/2 inches between the contactor terminals and the enclosure's sides

The terminal blocks must be rated at 25 A, 600 V(ac), molded from phenolic or nylon material, and be the barrier type with plated-brass screw terminals and integral marking strips.

86-1.02N Fused Splice Connectors

The fused splice connector for 240 and 480 V(ac) circuits must simultaneously disconnect both ungrounded conductors. The connector must not have exposed metal parts except for the head of the stainless steel assembly screw. The head of the assembly screw must be recessed a minimum of 1/32 inch below the top of the plastic boss that surrounds the head.

The connector must protect the fuse from water or weather damage. Contact between the fuse and fuse holder must be spring loaded.

Fuses must:

1. Be standard, midjet, ferrule type
2. Have a nontime-delay feature
3. Be 13/32 by 1-1/2 inches

Fuse ratings for luminaires are shown in the following table:

Fuse Current Rating Requirements

Circuit voltage	Fuse voltage rating	Soffit and roadway luminaires
120 V(ac)	250 V(ac)	5 A
240 V(ac)	250 V(ac)	5 A
480 V(ac)	500–600 V(ac)	5 A

Fuse ratings for transformers are shown in the following table:

Fuse Current Rating Requirements

Circuit voltage	Fuse voltage rating	Fuse current rating for single phase (two wires) transformers (primary side)		
		1 kVA	2 kVA	3 kVA
120 V(ac)	250 V(ac)	10 A	20 A	30 A
240 V(ac)	250 V(ac)	6 A	10 A	20 A
480 V(ac)	500–600 V(ac)	3 A	6 A	10 A

86-1.02O Grounding Electrodes

Grounding electrode must be:

1. 1 piece
2. Minimum 10-foot length of one of the following:
 - 2.1. Galvanized steel rod or pipe not less than 3/4 inch in diameter
 - 2.2. Copper clad steel rod not less than 5/8 inch in diameter

86-1.02P Enclosures 86-1.02P(1) General

The enclosures must be rated NEMA 3R and include a dead front panel and a hasp with a 7/16-inch- diameter hole for a padlock.

Except for a service equipment enclosure, an enclosure must:

1. Be manufactured from steel and either galvanized, cadmium plated, or powder coated
2. Mount to a standard, pole, post, or sign structural frame
3. Provide a minimum space of 2-1/2 inches between the internal components and the enclosure's sides

The enclosure's machine screws and bolts must not protrude outside the cabinet wall.

The fasteners on the exterior of an enclosure must be vandal resistant and not be removable. The exterior screws, nuts, bolts, and washers must be stainless steel.

86-1.02P(2) Service Equipment Enclosures

Service equipment enclosure must:

1. Comply with the Electric Utility Service Equipment Requirements Committee
2. Meet the requirements of the service utility
3. Be watertight
4. Be factory wired and manufactured from steel and galvanized or have factory-applied, rust-resistant prime and finish coats, except Types II and III
5. Be marked as specified in NEC to warn of potential electric-arc flash hazards

Type II and III service equipment enclosures must:

1. Be made of 0.125-inch minimum thickness 5052-H32 aluminum sheet complying with ASTM B209.
2. Be manufactured using gas metal arc welding with bare aluminum welding electrodes. The electrodes must comply with AWS A5.10 Class ER5356.
3. Be manufactured using welding procedures, welders, and welding operators that comply with the requirements for welding procedures, welders, and welding operators in AWS B2.1, "Specification for Welding Procedure and Performance Qualification."
4. Have full-seal weld exterior seams.
5. Exterior welds must be ground smooth and edges filed to a radius of at least 0.03 inch.
6. Have a surface finish that complies with MIL-A-8625 for a Type II, Class I coating, except the anodic coating must have a minimum thickness of 0.0007 inch and a minimum coating weight of 0.001 oz/sq in.

If a Type III enclosure houses a transformer of more than 1 kVA, the enclosure must have effective screened ventilation louvers of no less than 50 sq. in for each louver. The framed screen must be stainless no. 304 with a no. 10 size mesh and secured with at least 4 bolts.

The dead front panel on a Type III service equipment enclosure must have a continuous stainless steel or aluminum piano hinge. The panel must be secured with a latch or captive screws. No live part must be mounted on the panel.

Internal conductors for the photoelectric control unit must be 600 V(ac), no. 14 AWG (THHN) stranded machine tool wire. Where subject to flexing, 19 stranded wire must be used.

Service equipment enclosure must have the meter view windows located on the front side of the enclosure for Types III-AF, BF, CF and DF.

Service equipment enclosure must have the meter view windows located on the back side of the enclosure for Types III-AR, BR, CR and DR.

The meter area must have a sealable, lockable, weather-tight cover that can be removed without the use of tools.

For Type III-A, III-B, and III-C enclosures, the meter socket must be a 5-clip type, and the landing lug must be suitable for multiple conductors.

For a Type III-D enclosure, the meter socket must be a 7-clip type, and the landing lug must be suitable for multiple conductors.

Landing lugs must be (1) sized for the incoming service utility conductors, (2) compatible with either copper or aluminum conductors, and (3) made of copper or tin-plated aluminum. Live parts of the electrical equipment must be guarded against accidental contact.

The main and neutral busses of the enclosure must be made of tin-plated copper, be rated for 125 A, and be suitable for copper or aluminum conductors.

Each service equipment enclosure must have up to 2 main circuit breakers that will simultaneously disconnect ungrounded service-entrance conductors.

Circuit breaker for a service equipment enclosure must:

1. Be quick-break on either automatic or manual operation
2. Be trip indicating
3. Be internal-trip type
4. Be UL listed or NRTL certified and comply with UL 489 or equal
5. Be clearly marked with the frame size
6. Have an operating mechanism that is enclosed and trip-free from the operating handle on overload
7. Have the trip rating clearly marked on the operating handle
8. Have an interior made of copper

Circuit breakers used as disconnects must have a minimum interrupting capacity of 10,000 A, rms.

The interior of the enclosure must accept plug-in circuit breakers. A minimum of 6 standard single-pole circuit breakers, 3/4" nominal, must be provided for branch circuits.

Identify each circuit breaker and component by description using an engraved phenolic nameplate attached with stainless steel rivets or screws.

Nameplate must be installed:

1. Adjacent to the breaker on the dead front panel. The characters must be a minimum of 1/8 inch high.
2. Adjacent to the component on the back panel. The characters must be a minimum of 1/8 inch high.
3. At the top exterior of the door panel. The nameplate must include the system number, voltage, and number of phases engraved in minimum 3/16-inch-high characters.

A plastic-laminated wiring diagram must be attached inside the enclosure with brass eyelets by a UL- listed or NRTL-certified method.

86-1.02P(3) Flashing Beacon Enclosures

Flashing beacon enclosures must have:

1. Barrier-type terminal blocks rated for 25 A, 600 V(ac), made of molded phenolic or nylon material and plated-brass screw terminals and integral marking strips
2. Solid state flasher complying with section 8 of NEMA standards publication no. TS 1 for 10 A, dual circuits
3. 15 A circuit breaker

86-1.02Q Cabinets 86-1.02Q(1) General

Cabinets must be factory wired except for battery backup system cabinets.

The fasteners on the exterior of a cabinet, except for battery backup system cabinets, must be removable and vandal resistant. The exterior screws, nuts, bolts, and washers must be stainless steel.

Terminal blocks, circuit breakers, and a power supply must be UL approved.

86-1.02Q(2) Controller Cabinets

The controller cabinet must comply with TEES.

86-1.02Q(3) Telephone Demarcation Cabinets 86-1.02Q(3)(a) General

The doors of a telephone demarcation cabinet must be attached using continuous aluminum steel piano hinges.

86-1.02Q(3)(b) Type A Telephone Demarcation Cabinets

Reserved

86-1.02Q(3)(c) Type B Telephone Demarcation Cabinets

A Type B telephone demarcation cabinet consists of a mounting panel, outlets, circuit breaker, fan, dead front plates, and fuse.

The mounting panel must be made of 3/4-inch-thick ACX-grade plywood.

The mounting panel must be fastened to the cabinet with nuts, lock washers, and flat washers to 10 welded studs.

The cabinet must be made of 0.125-inch-thick anodized aluminum.

The cabinet door must be hung and secured with drawn latches, lockable with a padlock. The padlock latches must each have a minimum 7/16-inch-diameter hole.

Ventilation louvers must be located on the door.

The fan must be located in a ventilator housing and be controlled thermostatically. The thermostat control must have a range from 80 to 130 degrees F.

The thermostat and fan circuit must be protected with a fuse rated for 175 percent of the motor capacity. The fan capacity must be a minimum 25 cfm.

86-1.02Q(3)(d) Type C Telephone Demarcation Cabinets

Reserved

86-1.02Q(4) Battery Backup System Cabinets

A battery backup system includes the cabinet, batteries, and the Department-furnished electronics assembly.

The electronics assembly includes the inverter/charger unit, manual bypass, and the battery harness. The cabinet for a battery backup system must:

1. Comply with TEES
2. Be submitted and pass testing for addition to the Authorized Material List

86-1.02R Signal Heads 86-1.02R(1) General

A signal head consists of a signal mounting assembly, backplate, and signal face.

The signal head must have a terminal block attached to the back of one housing. The terminal block must have enough positions to accommodate all indications. Each position must be permanently labeled for the indications used.

The metal signal heads must not fracture or deflect more than half the lens diameter when tested under California Test 666.

The plastic signal heads must not fracture or deflect when tested under California Test 605.

The deflection must not be more than 10 degrees in either the vertical or horizontal plane after the wind load has been removed from the front of the signal face or more than 6 degrees in either the vertical or horizontal plane after the wind load has been removed from the back of the signal face.

86-1.02R(2) Signal Mounting Assemblies

Signal mounting assembly must include:

1. 1-1/2-inch-diameter steel pipe or galvanized conduit
2. Pipe fitting made of ductile iron, galvanized steel, bronze, or aluminum alloy, Type AC-84B, no. 380
3. Mast arm and post-top slip fitters and terminal compartments made of cast bronze or hot-dip galvanized ductile iron

The horizontal distance between the vertical centerline of a terminal compartment or slip fitter and the centerline of each signal face must not exceed 22 inches except when authorized for signal face alignment.

Bracket arms must be long enough to allow proper alignment of signals and backplate installation.

The mounting assembly must be watertight and free of sharp edges or protrusions that might damage conductor insulation. The assembly must have positive-locking serrated fittings that

prevent signal faces from rotating when the fittings are mated with similar fittings on the faces.

Each terminal compartment must be fitted with a terminal block having a minimum of 12 positions, each with 2 screw-type terminals. Each terminal must accommodate at least five no. 14 conductors. The terminal compartment must have a cover for easy access to the terminal block.

86-1.02R(3) Backplates

The backplate material must be a homogeneous black color with a lusterless finish.

A metal backplate must be made of a minimum 1/16-inch-thick aluminum alloy 3003-H14.

A plastic backplate must have a minimum thickness of 1/16 inch and be formed from sheet plastic or assembled from extruded, molded, or cast plastic sections. Sections must be factory joined using one of the following:

1. Appropriate solvent cement
2. Aluminum rivets and washers painted or permanently colored to match the backplate
3. No. 10 machine screws with flat washers, lock washers, and nuts painted to match the backplate

Each plastic backplate must be secured to the plastic signal face such that it resists removal or permanent deformation.

Backplates for traffic signals at intersections must be manufactured with a 2-inch retroreflective strip on the face around the perimeter. The strip must be Type XI fluorescent yellow retroreflective sheeting on the Authorized Material List for signing and delineation materials.

86-1.02R(4) Signal Faces 86-1.02R(4)(a) General

Signal face consists of signal sections with signal housings, LED modules, and visors. Signal face must:

1. Be adjustable and allow for 360-degree rotation about the vertical axis
2. Comply with ITE publications ST-052-E, *Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement* and ST-054, *Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement*
3. Be sealed with a neoprene gasket at the top opening

A metal signal face must have a metal backplate and visor. A plastic signal face must have a plastic backplate and visor.

If a signal face is supported by a Type MAS slip fitter, spacers are required between the 2 sections. The spacers must be made of the same material as the housing. The vertical dimension of the spacers must allow proper seating of the serrations between the slip fitter and the 2 sections. The 2 sections must be joined with at least two no. 10 minimum machine screws through holes near the front of the housing and the spacers and matching holes in a

reinforcing plate installed in the housing.

86-1.02R(4)(b) Signal Sections 86-1.02R(4)(b)(i) General Signal section must have:

1. Opening at the top and bottom for a 1-1/2-inch pipe

2. Maximum height of 10-1/4 inches for an 8-inch section and 14-3/4 inches for a 12-inch section
3. Hinge pins, door-latching devices, and other exposed hardware manufactured of Type 304/304L or 305 stainless steel
4. Interior screws and fittings manufactured of stainless steel or steel with a corrosion-resistant plating or coating
5. Gaskets made of a material that is not degraded if installed in a section with metal or plastic housing

Sections must be capable of being joined together to form a signal face in any combination. This interchangeability is not required between metal and plastic sections.

Each section must be joined to an adjacent section by one of the following:

1. Minimum of 3 machine screws for 8-inch sections and 4 machine screws for 12-inch sections, installed through holes near the front and back of the housing. Each screw must be a no. 10 and have a nut, flat washer, and lock washer.
2. 2 machine screws, each with a nut, flat washer, and lock washer, installed through holes near the front of the housing and a fastener through the 1-1/2-inch pipe opening. The fastener must have 2 large, flat washers to distribute the load around the pipe's opening and 3 carriage bolts, each with a nut and lock washer. The minimum screw size must be no. 10, and the carriage bolt size must be 1/4 inch.

The holes for the machine screws must be either cast or drilled during signal section fabrication. Each hole must be surrounded by a minimum 1/8-inch-wide boss to allow contact between signal sections about the axis of the hole.

A serrated nylon washer must be inserted between each plastic signal section and the metal mounting assembly. Each serrated nylon washer must be from 3/16 to 1/4 inch thick. The serrations must match those on the signal section and the mounting assembly.

86-1.02R(4)(b)(ii) Programmed Visibility Signal Sections

Programmed visibility signal section must have:

1. Nominal 12-inch-diameter circular or arrow indication
2. Cap visor
3. Adjustable connection that
 - 3.1. Provides incremental tilting from 0 to 10 degrees above or below the horizontal
 - 3.2. Maintains a common vertical axis through couplers and mountings

The terminal connection must allow external adjustment about the mounting axis in 5-degree increments. The visibility of each signal section must be capable of adjustment or programming within the section.

The adjustment for the section must be preset at 4 degrees below the horizontal.

86-1.02R(4)(b)(iii) Signal Housings

The signal housing must:

1. Be die-cast aluminum, permanent mold-cast aluminum, or if specified, structural plastic
2. Comply with ITE publications ST-052-E, *Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement* and ST-054, *Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement* if made of die-cast or permanent mold-cast aluminum
3. Have a 1-piece, hinged, square-shaped door that is:
 - 3.1. Designed to allow access for replacement of modules without the use of tools
 - 3.2. Secured such that it remains closed during loading tests
4. Have a watertight module or lens mounted in the door
5. Have a terminal block attached to the back, with the terminals permanently labeled for conductors to facilitate field wiring

Each housing must have reinforcement plates. Reinforcement plates must be either sheet aluminum, galvanized steel, or cast aluminum. Each plate must have a minimum thickness of 0.11 inch and a hole concentric with a 1-1/2-inch pipe-mounting hole in the housing.

Reinforcement plates must be placed as specified in the following table:

Reinforcement Plate Placement

Material	Placement
Sheet aluminum	Inside and outside of housing
Galvanized steel	Inside of housing
Cast aluminum	Outside of housing

Reinforcement plates placed outside of the housing must be finished to match the signal housing color and be designed to allow a proper serrated coupling between the signal face and the mounting hardware. A minimum of three no. 10 machine screws must be installed through holes in each plate and matching holes in the housing. Each screw must have a round or binder head, a nut, and a lock washer.

A metal housing must have a metal visor. Plastic housing must:

1. Be molded in a single piece or fabricated from 2 or more pieces joined into a single piece
2. Be a black color throughout, including the door, matching color no. 17038, 27038, or 37038 of AMS- STD-595
3. Have UV stability
4. Be self-extinguishing

If reinforcing webs are used to connect the back of the housing to the top, bottom, and sides of the adjacent housing, reinforcement plates are not required.

The exterior of the housing must be painted as specified in sections 78-4.08 and 59.

86-1.02R(4)(c) LED Signal Modules

An LED signal module must be on the Authorized Material List for LED traffic signal modules.

An LED signal module must comply with ITE publications ST-052-E, *Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement* and ST-054, *Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement*, except:

1. Maximum module weight must be 4 lb
2. Module must be a sealed unit with:
 - 2.1. 2 color-coded conductors for the power connection except lane control modules must use 3 color-coded conductors
 - 2.2. Printed circuit board that complies with TEES, chapter 1, section 6
 - 2.3. Lens that is:
 - 2.3.1. Convex or flat with a smooth outer surface
 - 2.3.2. Made of UV-stabilized plastic or glass
 - 2.4. 1-piece EPDM gasket
3. Module must include 3-foot-long conductors with attached quick-disconnect terminals
4. Identification must include:
 - 4.1. Month and year of manufacture
 - 4.2. 1-inch-diameter symbol of the module type with the module color written adjacent to the symbol in 0.50-inch-high letters
5. LED must be the ultra-bright type rated for 100,000 hours of continuous operation
6. Module must have an integral power supply

Individual LEDs must be wired such that a loss or failure of 1 LED will not result in a loss of more than 5 percent of the module's light output. Failure of an individual LED in a string must not result in a loss of an entire string or other indication.

The symbol for a 12-inch U-turn section must be a 15/16-inch-wide inverted *U* with an arrow on the left end.

A lane control section must be a combination module with a red X and green arrow. The conductor function and color code must be as shown in the following table:

Conductor Function and Color Code

Function	Color
Neutral	White
Red X	Red
Green arrow	Brown

The minimum power consumption for an LED signal module must be 5 W.

The maximum power consumption for an LED signal module must be as shown in the following table:

Maximum Power Consumption

LED signal module type	Power consumption (W)					
	Red		Yellow		Green	
	25 °C	74 °C	25 °C	74 °C	25 °C	74 °C
8-inch circular	8	13	13	16	12	12
12-inch circular	11	17	22	25	15	15
12-inch arrow	9	12	10	12	11	11
12-inch U-turn	9	12	10	12	11	11
Bicycle	11	17	22	25	15	15
Programmed visibility	11	17	22	25	15	15
Lane control (X)	9	12	--	--	--	--
Lane control (Arrow)	--	--	--	--	11	11

Red and green LED signal modules operating over a temperature range from -40 to 74 degrees C and yellow LED signal modules operating at 25 degrees C must maintain the minimum illumination values for 48 months as shown in the following tables:

Minimum Maintained Intensities for Circular Indications

Angle (v,h)	Intensities (cd)					
	8-inch			12-inch		
	Red	Yellow	Green	Red	Yellow	Green
2.5, ±2.5	133	267	267	339	678	678
2.5, ±7.5	97	194	194	251	501	501
2.5, ±12.5	57	113	113	141	283	283
2.5, ±17.5	25	48	48	77	154	154
7.5, ±2.5	101	202	202	226	452	452
7.5, ±7.5	89	178	178	202	404	404
7.5, ±12.5	65	129	129	145	291	291
7.5, ±17.5	41	81	81	89	178	178
7.5, ±22.5	18	37	37	38	77	77
7.5, ±27.5	10	20	20	16	32	32
12.5, ±2.5	37	73	73	50	101	101
12.5, ±7.5	32	65	65	48	97	97
12.5, ±12.5	28	57	57	44	89	89
12.5, ±17.5	20	41	41	34	69	69
12.5, ±22.5	12	25	25	22	44	44
12.5, ±27.5	9	16	16	16	32	32
17.5, ±2.5	16	32	32	22	44	44
17.5, ±7.5	14	28	28	22	44	44
17.5, ±12.5	10	20	20	22	44	44
17.5, ±17.5	9	16	16	22	44	44
17.5, ±22.5	6	12	12	20	41	41

17.5, ± 27.5	4	9	9	16	32	32

Minimum Maintained Luminance for Indications

Indication type	Luminance (fL)		
	Red	Yellow	Green
Arrow	1,610	3,210	3,210
U-turn	1,610	3,210	3,210
Bicycle	1,610	1,610	1,610
Lane control (X)	1,610	--	--
Lane control (Arrow)	--	--	1,610

Minimum Maintained Luminance for Programmed Visibility Indications

Indication type	Luminance (cd)		
	Red	Yellow	Green
PV at angle $v=2.5$, $h=\pm 2.5$	314	314	314

Conductors must be prewired to the terminal block.

86-1.02R(4)(d) Visors and Directional Louvers

The visor must be a tunnel type.

The visor must have a downward tilt from 3 to 7 degrees with a minimum length of 9-1/2 inches for nominal 12-inch round lenses and 7 inches for nominal 8-inch round lenses.

A metal visor must be formed from minimum 0.050-inch-thick aluminum alloy sheet.

A plastic visor must be either formed from sheet plastic or blow-molded. The plastic must be a black homogeneous color with a lusterless finish. A visor must withstand a wind load applied to its side for 24 hours without permanent deformation or removal from its door when tested under California Test 605 for plastic visors and California Test 666 for metal visors.

If directional louvers are used, the louvers must fit into full-circular signal visors. Louvers must consist of one of the following:

1. Outside cylinder constructed of sheet steel with a minimum nominal thickness of 0.030 inch and vanes constructed of sheet steel with a minimum nominal thickness of 0.016 inch
2. Outside cylinder and vanes constructed of 5052-H32 aluminum alloy of equal thickness

86-1.02S Pedestrian Signal Heads 86-1.02S(1) General

A pedestrian signal head consists of a pedestrian signal mounting assembly and a pedestrian

signal face comprising of a pedestrian signal housing, an LED countdown pedestrian signal face module, and a front screen.

86-1.02S(2) Pedestrian Signal Mounting Assemblies

A pedestrian signal mounting assembly must comply with the specifications for a signal mounting assembly in section 86-1.02R, except mast arm slip fitters are not required.

86-1.02S(3) Pedestrian Signal Faces 86-1.02S(3)(a) General

Each pedestrian signal face must include a light-duty terminal block rated at 5 A and have 12 positions with no. 6-by-1/8-inch binder head screws. Each position must have 1 screw-type terminal.

The wiring and terminal block must comply with ITE publication ST-055-E, *Pedestrian Traffic Control Signal Indicators: Light Emitting Diode (LED) Signal Modules*.

86-1.02S(3)(b) Pedestrian Signal Housings

Pedestrian signal housing must comply with the specifications for a signal housing in 86-1.02R(4)(b)(iii), except the maximum overall dimensions must be 18-1/2 inches wide, 19 inches high, and 11-1/2 inches deep and without:

1. Visor
2. Watertight module or lens mounted in the door
3. Reinforcement plates

The housing must have a terminal block attached to the back. The terminal block must have enough positions to accommodate all indications. Each position must be permanently labeled for the indications used.

86-1.02S(3)(c) LED Countdown Pedestrian Signal Face Modules

An LED countdown pedestrian signal face module must be on the Authorized Material List for LED countdown pedestrian signal face modules.

An LED countdown PSF module must:

1. Comply with ITE publication ST-055-E, *Pedestrian Traffic Control Signal Indicators: Light Emitting Diode (LED) Signal Modules*.
2. Be manufactured with materials that comply with ASTM D3935.
3. Have circuit boards that comply with TEES, chapter 1, section 6.
4. Have symbols that are at least 9 inches high and 5-1/4 inches wide each. The 2-digit countdown display, *Upraised Hand*, and *Walking Person* indications must be electronically isolated from each other. The 3 indications must not share a power supply or interconnect circuitry.
5. Use ultra-bright-type LED rated for 60,000 hours of continuous operation. Individual LEDs must be wired such that a loss or failure of 1 LED will not result in a loss of more

than 5 percent of the module's light output. Failure of an individual LED in a string must not result in a loss of an entire string or other indication.

6. Have a manual control to turn on and off the 2-digit countdown display.
7. Have the lot number, month, and year of manufacture permanently marked on the back.

Have prominent and permanent vertical markings for accurate indexing and orientation within the pedestrian signal housing. Markings must be a minimum of 1 inch in height and include an up arrow and the word *up* or *top*.

Upon initial testing at 25 degrees C, the module must have at least the luminance values shown in the following table:

Luminance Values

PSF module symbol	Luminance (fL)
Upraised hand and 2-digit countdown timer	1,094
Walking person	1,547

The module must not exceed the power consumption requirements shown in the following table:

Maximum Power Consumption Requirements

PSF module display	At 24 °C	At 74 °C
<i>Upraised Hand</i>	10.0 W	12.0 W
<i>Walking Person</i>	9.0 W	12.0 W
2-digit countdown timer	6.0 W	8.0 W

If the pedestrian change interval is interrupted, then the 2-digit countdown timer and display must reset to the full pedestrian change interval before being initiated the next time. The 2-digit countdown display on the PSF module must go dark within a second after displaying "0".

86-1.02S(3)(d) Front Screen

Pedestrian signal face must have a front screen that is one of the following types:

1. 3/8-inch-thick aluminum honeycomb screen with 0.2-inch-wide cells or a 1/2-inch-thick plastic screen with 3/8-inch-wide squares with 1/16-inch wall thickness that:
 - 1.1. Is installed so it tilts downward at an angle of 15 ± 2 degrees from the top and completely covers the message plate
 - 1.2. Includes a clear front cover made of either a minimum 1/8-inch-thick acrylic plastic sheet or a minimum 1/16-inch-thick polycarbonate plastic
 - 1.3. Is held firmly in place, including the cover, with stainless steel or aluminum clips or stainless steel metal screws
2. Polycarbonate screen that:

- 2.1. Has a nominal thickness of 1/32 inch
- 2.2. Is a 1-1/2-inch-deep eggcrate or Z-crate type
- 2.3. Is mounted in a frame constructed of aluminum alloy or polycarbonate with a minimum thickness of 0.040 inch
- 2.4. Is held in place with stainless steel screws

The screen and frame of a pedestrian signal face must be made of either (1) plastic that is a flat black color or (2) anodized aluminum that is a flat black color or finished with lusterless, black, exterior-grade latex paint formulated for application to metal surfaces.

86-1.02T Accessible Pedestrian Signals

Accessible pedestrian signal (APS) must be on the Authorized Material List for Accessible Pedestrian Signals.

An APS must comply with the *California MUTCD*, chapter 4E, and must:

1. Have an audible speech message that plays when the push button is actuated. The accessible pedestrian signal must have at least 5 audible message options.
2. Have a push button locator tone that clicks or beeps.
3. Allow the pushbutton to activate the pedestrian phase during any failure of the APS features.
4. Have a controllable and programmable volume level and messaging.
5. Be weatherproof and shockproof.
6. Weigh 7 lb maximum.
7. Measure 16 by 6 by 5 inches, maximum.
8. Have a switch for a push button.
9. Have a vibrotactile device on the push button or on the arrow.
10. Have an internal weatherproof speaker.
11. Have a microphone that senses the ambient sound level.
12. Include touch-free technology.

Theft-proof bolts used for mounting the housing to the standard must be stainless steel with a content of 17 percent chromium and 8 percent nickel. The housing must be shaped to fit the pole's curvature.

The color of the housing must match color no. 33538, 17038, 27038, or 37038 of AMS-STD-595.

The separation between adjacent holes used for conductors and mounting must be at least twice the diameter of the larger hole.

The speaker grill must be located on the surface of the housing. The speaker must not interfere with the housing or its mounting hardware.

The signal interface cable between the APS and the pedestrian signal head must be rated for outdoor use and have:

1. Four no. 18 stranded tinned copper conductors with a minimum insulation thickness of 15 mils
2. Cable jacket with a minimum thickness of 20 mils and rated for a minimum:
 - 2.1. 300 V(ac)
 - 2.2. 176 degrees F
3. Nominal outside diameter less than 350 mils
4. Conductor color code of black, white, red, and green

Touch-free technology must:

1. Activate a pedestrian phase when a pedestrian hand motion is detected during a set time interval
2. Have user adjustable detection area and time interval parameters
3. Detect the pedestrian hand motion up to a 6-inch range from the face of the sensor within a minimum ± 45 -degree cone zone from the center of the sensor

86-1.02U Push Button Assemblies

The housing for a push button assembly must be made of die-cast aluminum, permanent mold-cast aluminum, or UV-stabilized self-extinguishing structural plastic.

The housing must have a uniform color that matches color no. 17038, 27038, or 37038 of AMS-STD-595. If the push button is to be attached to a pole, the housing must be shaped to fit the pole's curvature.

The assembly must be waterproof and shockproof.

The push button's switch must be a single-pole, double-throw switching unit with screw-type terminals rated 15 A at 125 V(ac).

Switch for the push button must have:

1. Plunger actuator and a U frame to allow recessed mounting in the push button housing
2. Operating force of 3.5 lb
3. Maximum pretravel of 5/64 inch
4. Minimum overtravel of 1/32 inch
5. Differential travel from 0.002 to 0.04 inch
6. Minimum 2-inch diameter actuator

86-1.02V Reserved

86-1.02W Loop Detector Sealants 86-1.02W(1) General

Sealant for filling loop detector slots must be one of the following:

Asphaltic emulsion

1. Elastomeric sealant

2. Epoxy sealant for inductive loops
3. Hot-melt rubberized asphalt

86-1.02W(2) Asphaltic Emulsion Sealant

Asphaltic emulsion sealant must comply with the State Specification 8040-41A-15.

86-1.02W(3) Elastomeric Sealant

Elastomeric sealant must be a polyurethane material that cures only in the presence of moisture if used within the stated shelf life. The sealant must be suitable for use in both asphalt concrete and concrete pavement.

The cured elastomeric sealant must comply with the requirements shown in the following table:

Cured Elastomeric Sealant Requirements

Quality characteristic	Test method	Requirement
Hardness	ASTM D2240a	65–85
Tensile strength (min, MPa)	ASTM D412b	3.45
Elongation (min, %)		400
Flex at -40 °C ^c	--	No cracks
Weathering resistance	ASTM D822d	Slight chalking
Salt spray resistance:	ASTM B117e	
Tensile strength (min, MPa)		3.45
Elongation (min, %)		400
Dielectric constant (%)	ASTM D150f	<25

^a Indentation at 25 °C and 50% relative humidity (Rex. Type A, Model 1700 only).

^b Die C pulled at 508 mm/minute.

^c 0.6-mm free film bend (180°) over 13-mm mandrel.

^d Weatherometer 350 h, cured 7 days at 25 °C and 50% relative humidity. e28 days at 38 °C with 5% NaCl, Die C, and pulled at 508 mm/minute. fChange over a temperature range from -30 to 50 °C.

86-1.02W(4) Hot-Melt Rubberized Asphalt Sealant

Hot-melt rubberized asphalt sealant must:

1. Be in solid form at room temperature and fluid at an application temperature range from 190 to 205 degrees C
2. Not produce toxic fumes
3. Be suitable for use in both asphalt concrete and concrete pavement
4. Be packaged in containers clearly marked *Detector Loop Sealant* with the manufacturer's batch and lot number

The cured hot-melt rubberized asphalt sealant must comply with the requirements shown in the following table:

Cured Hot-Melt Rubberized Asphalt Sealant Requirements

Quality characteristic	Test method	Requirement
Cone penetration, 25 °C, 150 g, 5 s (max, 1/10 mm)	ASTM D5329	35
Flow, 60 °C, 5 h (max, mm)		5
Resilience, 25 °C (min, %)		25
Softening point (min, °C)	ASTM D36	82
Ductility, 25 °C, 5 cm/min (min, cm)	ASTM D113	30
Flash point, Cleveland Open Cup (min, °C)	ASTM D92	288
Viscosity, no. 27 spindle, 20 rpm, 190 °C (Pa•s)	ASTM D4402	2.5–3.5

86-1.02X Electronic Markers and Locators

The electronic marker must be discrete or cast inside the pull box cover. An electronic marker must:

1. Be passive
2. Be energized solely by electromagnetic energy received from the interrogating electronic marker locator
3. Operate over a temperature range from -4 to 122 degrees F
4. Operate at a frequency range between 30 kHz to 300 kHz and comply with FCC part 15
5. Have a watertight and moisture-resistant housing

In addition, a discrete electronic marker must:

1. Have a maximum diameter of 6 inches
2. Weigh a maximum of 2 lb
3. Be colored red for power and orange for communication circuits
4. Be self-leveling or omnidirectional

The electronic marker locator must:

1. Be compatible with the electronic marker
2. Detect the electronic marker in pull boxes buried under dirt, sand, or snow
3. Detect the electronic marker from a maximum distance of 5 feet vertically with a 6-inch offset
4. Have a headphone jack
5. Have a battery level indicator
6. Have a large character display
7. Have a numeric and audible signal strength indicator
8. Have a speaker volume adjustment

86-1.02Y Transformers

A transformer must be single-phase and may be a nonsubmersible or submersible type.

A transformer must be a dry type designed for operation on a 60 Hz supply. The transformer must have a decal showing a connection diagram. The diagram must show either color coding or wire tagging with primary (H1, H2) or secondary (X1, X2) markers and the primary and secondary voltage and volt-ampere rating. A transformer must comply with the electrical requirements shown in the following table:

Transformer Electrical Requirements

Quality characteristic	Requirement
Rating (V(ac))	120/240, 120/480, 240/120, 240/480, 480/120, or 480/240
Efficiency (%)	> 95
Secondary voltage regulation and tolerance from half load to full load (%)	±3

Secondary 240 and 480 V(ac) windings must be center tapped.

The transformer must withstand the application of 2,200 V(ac) from core to coils and from coil to coil for a 1-minute period when tested immediately after operation of the transformer at full load for 24 hours.

The external leads for the secondary connections must be no. 10 Type USE rated for 600 V(ac). The transformer's leads must extend a minimum of 12 inches from the case.

The transformer's insulation must be NEMA 185 C or better. Each transformer must:

1. Include metal half-shell coil protection
2. Have moisture-resistant, synthetic-varnish-impregnated windingsBe waterproof and suitable for outdoor operation

1.01 Each submersible transformer must:

1. Include a handle and a hanger.
2. Be securely encased in a rugged, corrosion-resistant, watertight case
3. Have leads that extend out through 1 or more sealed hubs.
4. Be manufactured to withstand a 5-day test with 12-hour on and off periods submerged in 2 feet of salt water that is 2 percent salt by weight. The operating periods must be at full load.

86-1.02Z Batteries

Battery must:

1. Be deep-cycle, sealed, prismatic, lead-calcium-based, absorbed-glass-mat, valve-regulated, lead- acid type.

2. Be rated for 12 V.
3. Be rated for a temperature range from -25 to 60 degrees C.
4. Be group size 24.
5. Be commercially available and stocked locally.
6. Be marked with a date code, maximum recharge data, and recharge cycles.
7. Be new and fully charged when furnished.
8. Be free from damage or deformities.
9. Have a carrying handle.
10. Have 2 top-mounted, threaded-stud posts that include all washers and nuts.
11. Include insulating rubber protection covers for the lugs, posts, and wiring. The protection covers must be red for the positive terminal and black for the negative terminal.
12. Accommodate 3/8-inch ring lugs.

If a battery is used for a battery backup system, it must accommodate 3/8-inch ring lugs of a Department- furnished battery harness.

86-1.03 CONSTRUCTION

Not Used

86-1.04 PAYMENT

Not Used

END OF SECTION

SECTION 00 87 00

GENERAL ELECTRICAL SYSTEMS

87-1.01 GENERAL

87-1.01A Summary

Section 87-1 includes general specifications for constructing and installing electrical systems.

The Department deducts the cost for maintenance performed by the Department on new or portions of existing systems modified under the Contract.

87-1.01B Definitions

Reserved

87-1.01C Submittals

Submit a digital file for geographic information system mapping for:

1. Conduit
2. Pull boxes
3. Cabinets
4. Service equipment enclosures
5. Standards

The digital file must consist of:

1. Longitudinal and latitude coordinates, under the WGS84 reference coordinate system. The coordinates must be in decimal format having 6 significant figures after the decimal point. Coordinates must be read at the center of pull boxes, cabinet, standards, and service equipment enclosures; and on top of conduit at 20-foot intervals before backfill.
2. Type, depth and size for conduits.
3. Type for pull boxes, standards, cabinets, and service equipment enclosures.

87-1.01D Quality Assurance

87-1.01D(1) General

Reserved

87-1.01D(2) Quality Control

87-1.01D(2)(a) General

Before shipping the material to the job site, submit to METS test samples of:

1. Accessible pedestrian signals
2. LED countdown pedestrian signal face modules
3. LED signal modules
4. Luminaires

Submit a sample size as shown in the following table:

Electrical Material Sampling	
Contract quantity	Test sample size
1–8	1
9–15	2
16–25	3
26–90	5
91–150	8
151–280	13
281–500	20
501–1,200	32

Before starting operation of an electrical system, perform conductor and system grounding tests in the presence of the Engineer.

Conductor test consists of testing each conductor and the conductors in cables for:

1. Continuity.
2. Insulation resistance at 500 V(dc) between the circuit and ground. A minimum insulation resistance of 100 MΩ on circuits must be attained.

Start the operational test of the system on any day except Friday or the day before a holiday. The operational test for signals must start from 9:00 a.m. to 2:00 p.m. Notify the Engineer 48 hours before starting the test.

An operational test consists of a minimum of 5 business days of continuous, satisfactory operation of the system. If the system fails, correct the problem and retest the system. A shutdown of the system caused by traffic, a power interruption, or unsatisfactory performance of Department-furnished materials does not constitute discontinuity of the test.

87-1.01D(2)(b) Electronic Markers

Electronic marker test consists of placing the electronic marker in the pull box, temporarily marking the pull box location with a utility flag, and using a compatible electronic marker locator to perform the following location test in the presence of the Engineer:

1. Within a 10 foot radius of the electronic marker, slowly move the locator toward the marker to determine the exact location of the pull box.
2. Repeat the test at four different points at 90 degree from each other on a horizontal plane, away from the marker location, as shown. Take the average of the four points to

- determine the detected location of the pull box.
3. Detected location of the pull box must be within 0.5 feet of the actual location.

87-1.01D(2)(c) Battery Backup System

Notify the Engineer 48 hours before testing the battery backup system.

Test the battery backup system in the presence of the Engineer by turning off the service power to the electrical system to be powered by the battery backup system. The electrical system must remain in full continuous operation for 30 minutes. If the test fails, correct the problem and retest the system. After successful completion of the test, turn on the service power for the electrical system.

87-1.01D(2)(d) Piezoelectric Axle Sensors

Piezoelectric axle sensors test consists of:

1. Demonstrating for each sensor:
 - 1.1. Capacitance is within 20 percent of the value shown on the sensor's data sheet
 - 1.2. Dissipation factor is less than 0.04 nF when measured in the 20 nF range
 - 1.3. Resistance is greater than 20 Megaohms
2. Collecting a minimum of 100 vehicle records for each lane and demonstrating
 - 2.1. Volume is within ± 3 percent accuracy
 - 2.2. Vehicle classification is within 95 percent accuracy by type

87-1.02 MATERIALS

Not Used

87-1.03 CONSTRUCTION

87-1.03A General

The Engineer determines the final locations of electrical systems.

Verify the locations of electrical systems and the depths of existing detectors, conduits, and pull boxes. Notify the Engineer before performing work on the existing system.

You may shut down the system for alteration or removal.

Where an existing Department underground facility is shown within 10 feet of any excavation, locate and field mark the facility before performing work that could damage or interfere with the existing facility.

If a mandrel is used, it must be sized per the manufacturer's requirements.

If an existing facility is within 2 feet of an excavation, determine the exact location of the facility

by excavating with hand tools before using any power-operated or power-driven excavating or boring equipment. A vacuum excavator may be used if authorized.

Notify the Engineer immediately if an existing facility is damaged by your activities:

1. Damaged existing traffic signal systems must be repaired or replaced within 24 hours. If the system cannot be fixed within 24 hours or it is located on a structure, provide a temporary system until the system can be fixed.
2. Damaged existing lighting systems must be repaired or replaced by nightfall. If the system cannot be fixed by nightfall, provide a temporary system until the system can be fixed.

If existing underground conduit is to be incorporated into a new system, clean it with a mandrel or cylindrical wire brush and blow it clean with compressed air.

Limit the shutdown of traffic signal systems to normal working hours. Notify the local traffic enforcement agency before shutting down the signal.

Place temporary W3-1 and R1-1 signs in each direction to direct traffic through the intersection during shutdown of the signal. Place two R1-1 signs for 2-lane approaches. The signs must comply with part 2 of the *California MUTCD*.

Cover signal faces when the system is shut down overnight. Cover temporary W3-1 and R1-1 signs when the system is turned on.

If you work on an existing lighting system and the roadway is to remain open to traffic, ensure the system is in operation by nightfall.

Replace detectors you damage within 72 hours, or the Department replaces them and deducts the cost. Work performed on an existing system not described is change order work.

Do not use electrical power from existing highway facilities unless authorized.

Maintain a minimum 48-inch clearance for a pedestrian pathway when placing equipment.

Except for service installation or work on service equipment enclosures, do not work above ground until all materials are on hand to complete the electrical work at each location.

Bond all metal components to form a continuous grounded system as specified in NEC. Ground metallic equipment mounted less than 8 feet above the ground surface on a wood pole.

If you damage any portion of a concrete curb, sidewalk, curb ramp, driveway, or gutter depression, replace the entire section between contraction or expansion joints under section 73.

Apply equipment identification characters.

Orient louvers, visors, and signal faces such that they are clearly visible to approaching traffic from the direction being controlled.

Test loops and the detector lead-in cable circuit for continuity, ground, and insulation resistance at the controller cabinet before connecting detector lead-in cable to the terminal block.

Perform an operational test of the systems.

Before starting the operational test for systems that impact traffic, the system must be ready for operation and all signs, pavement delineation, and pavement markings must be in place at that location.

Collect the geographic information system mapping data.

87-1.03B Conduit Installation 87-1.03B(1) General

The installation of conduit includes installing caps, bushings, and pull tape and terminating the conduit in pull boxes, foundations, poles, or a structure.

Limit the number of bends in a conduit run to no more than 360 degrees between pull points.

Use conduit to enclose conductors except where they are installed overhead or inside standards or posts.

You may use a larger size conduit than specified for the entire length between termination points. Do not use a reducing coupling.

Extend an existing conduit using the same material. Terminate conduits of different materials in a pull box.

Install conduit of a minimum size:

1. 1-1/2 inches from adjacent pull box to:
 - 1.1. Electroliner.
 - 1.2. Type 2 post.
2. 2 inches from adjacent pull box to:
 - 2.1. Signal standard.
 - 2.2. Overhead sign.
3. 3 inches from adjacent pull box to:
 - 3.1. Service equipment enclosure.
 - 3.2. Controller cabinet. Install two conduits.
4. 1-1/2 inches when not specified.

Make conduit cuts square and true.

Thread metal conduit with standard conduit-threading dies.

Ream the ends of shop-cut and field-cut conduit to remove burrs and rough edges.

Do not use slip joints or running threads to couple metal conduit. If a standard coupling cannot be used use a threaded union coupling. Tighten couplings for metal conduit to maintain a good electrical connection.

Use Type 1 conduit:

1. On exposed surfaces unless otherwise shown
2. In concrete structures
3. Between a structure and the nearest pull box

Cut Type 2 conduit with pipe cutters; do not use hacksaws. Tighten conduit into couplings or fittings using strap wrenches or approved groove joint pliers.

Apply 2 coats of unthinned primer and paint all metal conduit:

1. Exposed threads
2. Field-cut threads, before installing conduit couplings
3. Damaged surfaces

Do not remove shop-installed conduit couplings.

Repair damaged Type 2 conduit and coupling coating by:

1. Cleaning the conduit or coupling and painting it with 1 coat of rubber-resin-based adhesive under the manufacturer's instructions. Wrap the damaged area with at least 1 layer of 2-inch-wide, 20 mils- minimum-thickness, PVC tape under ASTM D1000 with a minimum tape overlap of 1/2 inch.
2. Painting damaged spots of 1/4 inch or less in diameter with a brushing-type compound supplied by the conduit manufacturer.

Cut Type 3 conduit with tools that do not deform the conduit. Use solvent weld connections.

If factory bends are not used, bend the conduit to a radius no less than 6 times its inside diameter without crimping or flattening it. Comply with the bending requirements shown in the following table:

Conduit-Bending Requirements	
Type	Requirement
1	Use equipment and methods under the conduit manufacturer's instructions.
2	Use a standard bending tool designed for use on thermoplastic-coated conduit. The conduit must be free of burrs and pits.
3	Use equipment and methods under the conduit manufacturer's instructions. Do not expose the conduit to a direct flame.
5	Use equipment and methods under the conduit manufacturer's

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Do not install new conduit through foundations.

Install conduit terminating in a standard or pedestal from 2 to 3 inches above the foundation. Slope the conduit toward the handhole opening.

Terminate conduit installed through the bottom of a nonmetallic pull box 2 inches above the bottom and 2 inches from the wall closest to the direction of the run.

Cap the ends of conduit for future use or until installation of conductors or cables. Cap the threaded ends of metal conduit with standard pipe caps. Install a plastic cap on all other types of conduit.

Install threaded bushings on metal conduits and bond them using a jumper. Install nonmetallic bushings or end bells on other types of conduit.

Install pull tape in conduit or innerducts to remain empty, with at least 2 feet of slack at each end. Attach the tape's ends to the conduit.

87-1.03B(2) Conduit Installation for Structures 87-1.03B(2)(a) General

Paint exposed Type 1 conduit on painted, stained, or colored structures. Comply with section 59-3 except the final coat of paint must match the structure.

Install galvanized steel hangers, steel brackets, and other fittings to support conduit in or on a wall or bridge structure.

Cast into concrete or pass-through openings conduit installed inside box girders. Size openings to fit the conduit and fittings, and remove lost deck material. Do not install conduit through drainage openings.

Install conduit parallel or at right angles to girders.

Install expansion fittings on structures with only longitudinal movement. Size the fittings for the longitudinal movement of the structure. The piston inside expansion fittings must be positioned so the piston expands the full movement of the bridge without damaging the fitting.

Install deflection fittings on structures with only transverse movement. Size the fittings for the transverse movements of the structure. All block outs for deflection fittings must have clearance or be sized for the physical size and the maximum rated movement of the fittings without touching concrete or structural elements.

Install multiple expansion, and deflection, or combination expansion-deflection fittings in series on structures with longitudinal and transverse movement. Size the fittings for the longitudinal and transverse movements of the structure. The total movement of the multiple fittings must be greater than the structure movement range.

Fill expansion and deflection fitting pockets with resilient weatherproof compound. Install expansion and deflection fittings parallel to superstructure girders.

87-1.03B(2)(b) New Structures

Seal and make watertight the conduits which lead to soffits, wall-mounted luminaires, other lights, and fixtures located below the pull box grade.

If you place a conduit through the side of a nonmetallic pull box, terminate the conduit 2 inches from the wall and 2 inches above the bottom. Slope the conduit toward the top of the box.

For ease of installation and if authorized, you may use Type 4 conduit instead of Type 1 conduit for the final 2 feet of conduit entering a pull box in a reinforced concrete structure.

For conduit installed inside of bridge structures, you must:

1. Install precast concrete cradles.
2. Bond precast concrete cradles with one of the following:
 - 2.1. Epoxy adhesive for bonding freshly mixed concrete to hardened concrete
 - 2.2. Rapid-set epoxy adhesive for pavement markers
 - 2.3. Standard-set epoxy adhesive for pavement markers
3. Use a pipe sleeve or form an opening for a conduit through a bridge structure. The sleeve or opening through a prestressed member or conventionally reinforced precast member must be:
 - 3.1. Oriented transverse to the member
 - 3.2. Located through the web
 - 3.3. No more than 4 inches in diameter
4. Wrap the conduit with 2 layers of asphalt felt building paper and securely tape or wire the paper in place for a conduit passing through a bridge abutment wall. Fill the space around the conduit with mortar under section 51-1, except the proportion of sand to cement must be 3 to 1. Fill the space around the conduits after prestressing is completed.

Mark the location of conduit ends with a 3-inch tall "Y" for all conduits installed in structures or terminating at curbs. Mark the "Y" on the face of a curb, gutter or wall, directly above the conduit, and above grade line.

87-1.03B(2)(c) Existing Structures

Install surface-mounted conduit:

1. Straight and true to:
 - 1.1. The horizontal alignment of structures
 - 1.2. The vertical alignment of walls
2. Parallel to the walls when mounted on ceilings or similar surfaces

Support conduit at maximum 5-foot intervals with galvanized, malleable-iron, conduit clamps,

and clamp backs secured with expansion anchorage devices. Use the largest diameter of galvanized, threaded studs that will pass through the mounting hole in the conduit clamp.

87-1.03B(3) Conduit Installation Underground

87-1.03B(3)(a) General

Notify the Engineer at least 4 business days before starting horizontal directional drilling method or jack and drill method.

Install conduit to a depth of:

1. 18 inches, minimum, under sidewalk and curbed paved median areas
2. 42 inches, minimum, below the bottom of the rail of railroad tracks
3. 30 inches, minimum, everywhere else below grade

Install Type 1 or Type 2 conduit with explosion-proof sealing fittings, within the limits of hazardous locations as specified in NEC for Class I, division 1.

Install a minimum 1-1/2-inch diameter Type 1 or Type 2 conduit under railroad tracks.

You may lay conduit on existing pavement within a new curbed median constructed on top.

Install conduit under pavement by either the horizontal directional drilling method or jack and drill method.

You may use the trench-in-pavement method to install conduit under existing pavement:

1. If the delay to vehicles will be less than 5 minutes.

Install conduit to a depth of 14 inches for the trench-in-pavement method. Do not use the trench-in-pavement method for conduit installation under freeway lanes, freeway connectors or freeway ramps.

Conduit shown under a sidewalk may be installed in the street within 3 feet of and parallel to the face of the curb. Install pull boxes behind the curb.

Place conduit couplings at a minimum of 6 inches from the face of a foundation.

Use Type 3 conduit for underground installation.

Use Type 1 conduit between a receptacle enclosure and an adjacent pull box.

87-1.03B(3)(b) Conduit in Trenches 87-1.03B(3)(b)(i) General

Backfill trench with:

1. A minimum of 2 inches of sand bedding before installing the conduit

2. 18 inches of slurry concrete over the conduit
3. Native material over the slurry cement

Use slurry concrete under section 19-3.02E except, the size of the aggregate must be 3/8 inch or smaller. Place warning tape in the trench 6 inches below finished grade.

Grade the trench surface to match the existing grade.

87-1.03B(3)(b)(ii) High Density Polyethylene Conduit Installation

For sweeps, maintain a conduit bend radius of a minimum 10 times the outside diameter of the conduit.

Conduits must not protrude more than 2 inches inside the pull box and vaults, and must enter at an angle less than 20 degrees from either the vertical or horizontal axis.

Demonstrate a minimum of 2 test fusions to the Engineer prior to performing fusion operations on HDPE conduit to be installed. Join HDPE conduit using electro fusion couplings under the manufacturer's instructions. Do not expose conduit to direct flame. The electro fusion must be performed by a person certified by the conduit manufacturer.

Slurry concrete must be pigmented to match color no. 21105 of AMS-STD-595.

Blow out all conduits with compressed air until all foreign material is removed, before installing innerducts.

Install innerducts as one continuous unit between vaults. Innerducts may be interrupted inside pull boxes located between vaults and cabinets.

Lubricate innerducts per manufacturer's instructions during installation. Seal the ends of conduit after cables or pull tape are installed.

87-1.03B(3)(b)(iii) Trench-In-Pavement Method

Install conduit in a trench approximately 2 inches wider than the outside diameter of the conduit but not exceeding 6 inches in width.

Dig the trench by hand to the required depth at pull boxes.

Backfill the trench with slurry cement to the top of the pavement's surface by the end of each workday.

When work includes resurfacing the roadway, complete the trenching before the final pavement layer is applied.

When work does not include resurfacing the roadway, within 3 days after trenching:

1. Cold plane under section 39-3, a minimum 2 feet wide area along the trench
2. Clean the cold planed area and apply a tack coat
3. Place HMA Type A under section 39-2

87-1.03B(3)(c) Horizontal Directional Drilling Method

Install a conduit to a minimum depth of 4 feet and maximum depth of 6 feet. If you must install a conduit less than 4 feet in depth or greater than 6 feet in depth, the installation must be authorized.

The diameter of the bore hole must be no larger than 1.5 times the outside diameter of the conduit.

Water-based mineral slurry or wetting solution may be used to lubricate the boring tool and stabilize the soil surrounding the boring path.

Dispose of residue per section 13-4.03D.

The horizontal directional drilling equipment must have directional control of the boring tool and have an electronic boring tool location detection system. During operation, the equipment must be able to determine the location of the tool both horizontally and vertically.

Use a mandrel to prove the conduit is free and clear of dirt, rocks, and other debris after installation.

87-1.03B(3)(d) Jack and Drill Method

Keep the jacking or drilling pit 2 feet away from the edge of pavement except when installing conduit under rail-road tracks. Construct the jacking or drilling pit a minimum of 13 feet from the centerline of the track to the closest side of the pit. Do not weaken the pavement or soften the subgrade with excessive use of water.

Cover the jacking pit with planking if left overnight.

If an obstruction is encountered, obtain authorization to cut small holes in the pavement to locate or remove the obstruction.

You may install Type 2 or Type 3 conduit under the pavement if a hole larger than the conduit's diameter is predrilled. The predrilled hole must be less than one and half the conduit's diameter.

Remove the conduit used for drilling or jacking and install new conduit for the completed work.

87-1.03C Installation of Pull Boxes 87-1.03C(1) General

Install pull boxes no more than 200 feet apart. Place the cover on the box when not working in it.

87-1.03C(2) Roadway Pull Boxes

87-1.03C(2)(a) General

You may install larger pull boxes than specified or shown and additional pull boxes to facilitate the work except in structures.

Where a roadway pull box is adjacent to a post or standard, place the pull box within 5 feet from the post or standard on the downstream side of traffic when practical.

~~Install a pull box on a minimum 6-inch deep bed of crushed rock and grout it before installing conductors. The grout must be from 0.5 to 1 inch thick and sloped toward the drain hole. Place a layer of roofing paper between the grout and the crushed rock sump. Make a 1-inch drain hole through the grout at the center of the pull box.~~

Install a pull box on a bed of crushed rock.

Set the pull box such that the top is 1-1/4 inches above the surrounding grade in unpaved areas and leveled with the finished grade in sidewalks and other paved areas.

Grout around conduits that are installed through the sides of the pull box.

Bond and ground the metallic conduit before installing conductors and cables in the conduit. Bond metallic conduits in a nonmetallic pull box using bonding bushings and bonding jumpers. Do not install pull boxes in concrete pads, curb ramps, or driveways.

Reconstruct the sump of a pull box if disturbed by your activities. If the sump was grouted, remove and replace the grout.

87-1.03C(2)(b) Nontraffic Pull Boxes

For a buried nontraffic pull box, install the electronic marker and set the box such that the top is from 6 to 8 inches below the surrounding grade. Place a 20-mil-thick plastic sheet made of HDPE or PVC virgin compounds to prevent water from entering the box.

When a pull box is in a structure, modify the base as required.

Place mortar between a nontraffic pull box and a pull box extension.

Where a nontraffic pull box is in the vicinity of a curb in an unpaved area, place the box adjacent to the back of the curb if practical.

If you replace the cover on a nontraffic pull box, anchor it to the box. Perform the electronic marker test.

87-1.03C(2)(c) Traffic Pull Boxes

Place minor concrete around and under a traffic pull box as shown. Bolt the steel cover to the box when not working in it.

Bond the steel cover to the conduit with a minimum 3-foot-long jumper and bolt it down after installing the conductors and cables.

87-1.03C(2)(d) Tamper-Resistant Pull Boxes

Install the tamper-resistant pull boxes under the manufacturer's instructions.

87-1.03C(3) Structure Pull Boxes

Install structure pull boxes parallel to the structure.

After removing the knockouts, flatten the surrounding area.

Bond conduit to a structure pull box using locknuts on the inside and outside of the box.

Cover pull boxes with a 1/4-inch plywood during pouring of PCC. For a no. 9 pull box, the upper edge of the plywood must fit against the lower edge of the rain tight hood.

Install no. 7 pull box with bottom flanges flush with the bottom of the box girder. Place top and bottom covers and seal the pull box during PCC pouring.

For no. 9 and 9A pull boxes:

1. Form a 1:1 chamfer around the cover
2. Use the drain hole in the center if the box is horizontal and the low end drain hole if the box is inclined
3. Mounted in a sloping parapet, drill a 1/2-inch elongated drain hole in the center if the box is horizontal or the low end if the box is inclined

87-1.03D Battery Backup System Cabinets

Install the battery backup system cabinet to the right side of the controller cabinet. If installation on the right side is not possible, obtain authorization for installation on the left side.

Construct access opening between controller cabinet and battery backup cabinet using:

1. 2-inch nylon-insulated, steel chase nipple
2. 2-inch steel sealing locknut
3. 2-inch nylon-insulated, steel bushing

Remove the jumper between the terminals labeled *BBS-1* and *UBS-1* and the jumper between the terminals labeled *BBS-2* and *UBS-2* in the 7-position terminal block in the controller cabinet before connecting the electronics assembly.

Install the electronics assembly and batteries in the battery backup system cabinet. Obtain authorization for installation of the electronics assembly in the controller cabinet.

87-1.03E Excavating and Backfilling for Electrical Systems 87-1.03E(1) General

Notify the Engineer at least 72 hours before starting excavation activities. Dispose of surplus excavated material.

Restrict closures for excavation on a street or highway to 1 lane at a time unless otherwise specified.

87-1.03E(2) Trenching

Do not trench until conduit or direct burial cables are on-site and ready for installation. Place excavated material in a location that will not interfere with traffic or surface drainage. Compact native material backfill to a minimum relative compaction of:

1. 95 percent when placed within the hinge points and in areas where pavement is to be constructed
2. 90 percent when placed outside the hinge points and not under pavement

Restore the sidewalks, pavement, and landscaping at a location before starting excavation at another location.

87-1.03E(3) Concrete Pads, Foundations, and Pedestals

Construct concrete pads, foundations, and pedestals under section 56-3.

Construct a pad in front of a Type III service equipment enclosure. The pad must be 24 inches in length, 4 inches in thickness, and must match the width of the foundation.

In unpaved areas, place the top of the foundation 6 inches above the surrounding grade, except place the top:

1. 1 foot 6 inches above the grade for 336LS cabinets
2. 1 foot 8 inches above the grade for Type C telephone demarcation cabinets
3. 2 inches above the grade for Type III service equipment enclosures

The pad must be 2 inches above the surrounding grade in unpaved areas.

In or adjacent to paved areas, place the top of the foundation 4 inches above the surrounding grade, except place the top:

1. 1 foot 6 inches above the grade for 336LS cabinets
2. 1 foot 8 inches above the grade for Type C telephone demarcation cabinets
3. Level with the finished grade for Type III service equipment enclosures

The concrete pad must be level with the finished grade in paved areas.

87-1.03F Conductors and Cables Installations 87-1.03F(1) General

The installation of conductors and cables includes splicing conductors and attaching the terminals and connectors to the conductors.

Clean the conduit, install conduit bushings, and pull all conductors and cables as a unit. If new conductors or cables are to be added in an existing conduit:

1. Remove the content
2. Clean the conduit
3. Pull both old and new conductors and cables as a unit

Provide conductor and cable slack to comply with the requirements shown in the following table:

Conductor and Cable Slack Requirements

Location	Slack (feet)
Signal standard	1
Lighting standard	1
Signal and lighting standard	1
Pull box	3
Splice	3
Controller cabinet	6
Standards with slip base	0

Wrap conductors and secure cables to the end of the conduit in a pull box.

Seal the ends of conduits with a sealing compound after installing conductors or cables.

Neatly arrange conductors and cables inside pull boxes and cabinets. Tie the conductors and cables together with self-clinching nylon cable ties or enclose them in a plastic tubing or raceway.

Identify conductors and cables by direct labeling, tags, or bands fastened in such a way that they will not move. Use mechanical methods for labeling.

Provide band symbol identification on each conductor or each group of conductors comprising a signal phase in each pull box and near the end of terminated conductors.

Tape the ends of unused conductors and cables in pull boxes to form a watertight seal.

Do not connect the push-button or accessible pedestrian signal neutral conductor to the signal neutral conductor.

Install a tracer wire.

87-1.03F(2) Cables

87-1.03F(2)(a) General

Reserved

87-1.03F(2)(b) Communication Cables

87-1.03F(2)(b)(i) General

Terminate the ends of the communication cables as shown.

87-1.03F(2)(b)(ii) Category 5E and 6 Cables

Do not splice category 5E and 6 cables.

87-1.03F(2)(b)(iii) Telephone Cables

Do not splice telephone cables between the telephone demarcation point and the controller cabinet.

87-1.03F(2)(c) Copper Cables 87-1.03F(2)(c)(i) General Reserved

87-1.03F(2)(c)(ii) Detector Lead-in Cables

Install a Type B or C detector lead-in cable in conduit.

Seal the ends of the lead-in cable before installing it in the conduit to prevent moisture from entering the cable.

Splice loop conductors for each direction of travel for the same phase, terminating in the same pull box, to a separate lead-in cable running from the pull box adjacent to the loop detector to a sensor unit mounted in the controller cabinet. Install the lead-in cable without splices except at the pull box when connecting to loop wire.

Verify in the presence of the Engineer that the loops are operational before making the final splices between loop conductors and the lead-in cable.

Identify and tag each lead-in cable with the detector designation at the cabinet and pull box adjacent to the loops.

87-1.03F(2)(c)(iii) Conductors Signal Cables

Do not splice signal cables.

Provide identification at the ends of terminated conductors in a cable as shown.

Provide identification for each cable in each pull box showing the signal standard to which it is connected. Connect conductors in a 12-conductor cable as shown in the following table:

12CSC Color Code and Functional Connection

Color code	Termination	Phase
Red	Red signal	2, 4, 6, or 8
Yellow	Yellow signal	2, 4, 6, or 8
Brown	Green signal	2, 4, 6, or 8
Red/black stripe	Red signal	1, 3, 5, or 7
Yellow/black stripe	Yellow signal	1, 3, 5, or 7
Brown/black stripe	Green signal	1, 3, 5, or 7
Black/red stripe	Spare or as required for red or <i>DONT WALK</i>	--

Black/white stripe	Spare or as required for yellow	--
Black	Spare or as required for green or <i>WALK</i>	--
Red/white stripe	Pedestrian signal <i>DONT WALK</i>	--
Brown/white stripe	Pedestrian signal <i>WALK</i>	--
White	Terminal block	Neutral

Use the neutral conductor only with the phases associated with that cable. Do not intermix neutral conductors from different cables except at the signal controller.

87-1.03F(2)(c)(iv) Signal Interconnect Cables

Do not splice the cable unless authorized.

If splices are authorized, insulate the conductor splices with heat-shrink tubing and overlap the insulation at least 0.6 inch. Cover the splice area of the cable with heat-shrink tubing and overlap the cable jacket a least 1-1/2 inches. Provide a minimum of 3 feet of slack at each splice.

87-1.03F(2)(c)(v) Railroad Preemption Cables

Do not splice railroad preemption cable from controller cabinet to railroad cabinet. Terminate individual conductors with ferrule connectors in the controller cabinet.

Provide identification on both ends of the cable and connect the cable end in the controller cabinet as shown in the following table:

Color Code and Functional Connection

Conductor no.	Color code	Controller cabinet field terminal connections	Conductor identification
1	Black	Not Used	Spare
2	White	Not Used	Spare
3	Red	FT8-A145	Health Status DC+
4	Green	Not Used	Spare
5	Orange	FT7-A134	Simultaneous DC-
6	Blue	FT7-A131	Advance DC-
7	White/black stripe	Not Used	Spare
8	Red/black stripe	FT8-A144	Gate Down/Island
9	Green/black stripe	Field Terminal FT8-A142	Advance Pedestrian Preemption
10	Orange/black stripe	FT7-A135	Simultaneous Primary
11	Blue/black stripe	FT7-A132	Advance Primary
12	Black/white stripe	Not Used	Spare
13	Red/white stripe	FT8-A143	Gate Down/Island DC-
14	Green/white stripe	FT8-A141	Advance Pedestrian Preemption DC-
15	Blue/white stripe	FT7-A133	Advance Secondary
16	Black/red stripe	Not Used	Spare

17	White/red stripe	FT8-A146	Health Status DC-
18	Orange/red stripe	FT7-A136	Simultaneous Secondary

Keep all exposed conductors the same length and individually insulate spare conductors against each other.

Provide a minimum 6 feet of slack in the pull box adjacent to the railroad cabinet.

Connect the cable end in the railroad cabinet as directed by the railroad agency representative.

87-1.03F(3) Conductors 87-1.03F(3)(a) General

Do not run conductors to a terminal block on a standard unless they are to be connected to a signal head mounted on that standard.

Provide 3 spare conductors in all conduits containing ramp metering and traffic signal conductors.

Install a separate conductor for each terminal of a push button assembly and accessible pedestrian signal.

87-1.03F(3)(b) Reserved

87-1.03F(3)(c) Copper Conductors 87-1.03F(3)(c)(i) General

Install a minimum no. 8 grounding copper conductor in conduit and connect it to all-metal components.

Where conductors from different service points occupy the same conduit or standard, enclose the conductors from one of the services in flexible or rigid metal conduit.

87-1.03F(3)(c)(ii) Inductive Loop Conductors

Install a Type 1 or 2 inductive loop conductor except use Type 2 for Type E and F loop detectors. Install the conductor without splices except at the pull box.

87-1.03F(4) Manual Installation Method

Use an inert lubricant for placing conductors and cables in conduit.

Pull the conductors and cables into the conduit by hand using pull tape.

87-1.03F(5) Direct Burial Aluminum Cable Installation Method

Install direct burial aluminum cable at a minimum 30 inches below grade in unpaved areas or at a minimum 18 inches below finished grade in paved areas.

Do not splice the direct burial aluminum cable between pull boxes and enclosures.

Fill trench with slurry cement backfill to between 4 to 6 inches below finished grade under section 19- 3.02E.

Fill the remaining trench to finished grade with native material. In paved area, fill the remaining trench to finished grade with the same material of the paved area.

87-1.03G Equipment Identification Characters

The Engineer provides you with a list of the equipment identification characters. Stencil the characters or apply the reflective self-adhesive labels to a clean surface. Treat the edges of self-adhesive characters with an edge sealant.

Place the characters on the side facing traffic on:

1. Front doors of cabinets and service equipment enclosures
2. Wood poles, fastened with 1-1/4-inch aluminum nails, for pole mounted enclosures
3. Adjacent bent or abutment at approximately the same station as an illuminated sign or soffit luminaire
4. Underside of the structure adjacent to the illuminated sign or soffit luminaire if no bent or abutment exists nearby
5. Posts of overhead signs
6. Standards

Before placing new characters on existing or relocated equipment, remove the existing characters.

87-1.03H Conductor and Cables Splices 87-1.03H(1) General

You may splice:

1. Grounded conductors in a pull box
2. Accessible pedestrian signal and push button conductors in a pull box
3. Ungrounded signal conductors in a pull box if signals are modified
4. Ungrounded signal conductors to a terminal compartment or a signal head on a standard with conductors of the same phase in the pull box adjacent to the standard
5. Ungrounded lighting circuit conductors in a pull box if lighting circuits are modified

Solder all copper conductor splices using the hot iron, pouring, or dipping method. Do not perform open- flame soldering.

Do not solder aluminum conductors.

87-1.03H(2) Splice Insulation Methods

Insulate splices in a multiconductor cable to form a watertight joint and to prevent moisture

absorption by the cable.

Use ~~heat-shrink tubing or~~ Method B to insulate a splice. ~~Use heat-shrink tubing as follows:~~

- ~~1. Cover the splice area completely with an electrical insulating coating and allow it to dry.~~
- ~~2. Place mastic around each conductor before placing them inside the tubing. Use the type of mastic specified in the tubing manufacturer's instructions.~~
- ~~3. Heat the area under the manufacturer's instructions. Do not perform open flame heating. After contraction, each end of the heat-shrink tubing or the open end of the tubing's end cap must overlap the conductor insulation at least 1-1/2 inches.~~
- ~~4. Cover the entire splice with an electrical insulating coating and allow it to dry.~~

Use Method B as follows:

1. Cover the splice area completely with an electrical insulating coating and allow it to dry.
2. Apply 3 layers of half-lapped, PVC electrical tape.
3. Apply 2 layers of butyl-rubber, stretchable tape with liner.
4. Apply 3 layers of half-lapped, PVC, pressure-sensitive, adhesive tape.
5. Cover the entire splice with an electrical insulating coating and allow it to dry.

87-1.03I Connectors and Terminals

Apply connectors and terminals to cables and conductors using a crimping compression tool under the manufacturer's instructions. The tool must prevent opening of the handles until the crimp is completed.

Install crimp-style terminal lugs on stranded conductors smaller than no. 14. Solder no. 8 and smaller copper conductors to connectors and terminal lugs.

87-1.03J Standards, Poles, Pedestals, and Posts

Install standards, poles, pedestals, and posts under section 56-3.

Ground standards with a handhole by attaching a bonding jumper from the bolt or lug inside the standard to a metal conduit or to the grounding wire in the adjacent pull box. The bonding jumper must be visible when the handhole cover is removed.

Ground standards without a handhole or standards with a slip base by attaching a bonding jumper to all anchor bolts using ground clamps and connecting it to a metal conduit or to the grounding wire in the adjacent pull box. The bonding jumper must be visible after mortar has been placed on the foundation.

87-1.03K Piezoelectric Axle Sensors

Obtain authorization for exact locations for installation of the piezoelectric axle sensors.

Cut slots for axle sensors and screened transmission cables under section 87-1.03V(2).

Install piezoelectric axle sensors in slots. Fill the slot with epoxy grout under section 95-1.02H. Ensure the grout does not exceed 165 degrees F while curing. Do not reopen the lane to traffic until the epoxy sets.

Perform the conductor test.

Connect the field wiring to the terminal blocks in the controller cabinet. Perform the piezoelectric axle sensor test.

Perform the operational test. Failure of the system to record and store data as required for an accumulated time exceeding 3 hours during the 5-day period is cause for the operational test to be rejected and repeated.

87-1.03L Utility Service 87-1.03L(1) General

Install the service equipment early enough to allow the utility to complete its work before completion of the electrical work.

At least 15 days before permanent electrical and telecommunication service is required, request the service connections for permanent installations. The Department arranges with the utilities for completion of the connections and pays all costs and fees required by the utilities.

87-1.03L(2) Electric Service 87-1.03L(2)(a) General

If service equipment is to be installed on a utility-owned pole, furnish and install the conduit, conductors, pull boxes, and other necessary material to complete the service installation. The service utility decides the position of the riser and equipment on the pole.

87-1.03L(2)(b) Electric Service for Irrigation

Establishing electric service for irrigation includes installing conduit, conductors, and pull boxes and making connections from the service point to the irrigation controllers.

87-1.03L(2)(c) Electric Service for Booster Pumps

Establishing electric service for a booster pump includes installing conduit, conductors, and pull boxes and making connections from the service point to the booster pump enclosure.

87-1.03L(3) Telecommunications Service

Establishing telecommunication service includes installing conduit, conductors, and pull boxes and making connections from the service point to the telephone demarcation cabinet.

87-1.03M Photoelectric Controls

Mount the photoelectric unit on the top of the pole for Type I, II, and III photoelectric controls. Use mounting brackets where pole-top mounting is not possible. Orient the photoelectric unit to face north

Mount the enclosure at a height of 6 feet above finished grade on the same standard as the photoelectric unit.

Install a minimum 100 VA, 480/120 V(ac) transformer in the contactor enclosure to provide 120 V(ac) for the photoelectric control unit when switching 480 V(ac), 60 Hz circuits.

87-1.03N Fused Splice Connectors

Install a fuse splice connector with a fuse in each ungrounded conductor for luminaires, except for overhead sign luminaires. The connector must be located in the pull box adjacent to the luminaires.

If the pull box for the roadway luminaire is tamper resistant, install a fuse splice connector with 10 A fuse in the pull box and an additional fuse splice connector with a 5 A fuse in the handhole.

Install a fuse splice connector with a fuse on primary side of transformer.

Crimp the connector terminals onto the ungrounded conductors using a tool under the manufacturer's instructions. Insulate the terminals and make them watertight.

87-1.03O Grounding Electrodes

Install a grounding electrode for each cabinet, service equipment enclosure, and transformer.

Attach a grounding conductor to the electrode using either a ground clamp or exothermic weld. Connect the other end of the conductor to the cabinet, service equipment enclosure, and transformer.

87-1.03P Service Equipment Enclosures

Installing a service equipment enclosure includes constructing the foundation and pad and installing conduit, adjacent pull boxes, and grounding electrode.

Locate the foundation such that the minimum clearance around the front and back of the enclosure complies with NEC, article 110.26, "Spaces About Electrical Equipment, (600 V, nominal or less)."

Apply a sealing compound between the foundation and the enclosure before installing the enclosure.

Bond and ground metal conduit as specified in NEC and by the service utility except the grounding electrode conductor must be no. 6 or larger.

If circuit breakers and components do not have a description on engraved phenolic nameplates, install them using stainless steel rivets or screws under section 86-1.02P(2).

87-1.03Q Cabinets 87-1.03Q(1) General

Installing a cabinet includes constructing the foundation and pad and installing conduit, adjacent pull boxes, and grounding electrode.

Apply a mastic or caulking compound before installing the cabinet on the foundation to seal the openings.

Connect the field wiring to the terminal blocks in the cabinet. Neatly arrange and lace or enclose the conductors in plastic tubing or raceway. Terminate the conductors with properly sized captive or spring spade terminals. Apply a crimp-style connector and solder them.

Install and solder a spade-type terminal on no. 12 and smaller field conductors and a spade-type or ring-type terminal on conductors larger than no. 12.

87-1.03Q(2) Department-Furnished Controller Cabinets

Arrange for the delivery of Department-furnished controller cabinets.

87-1.03Q(3) Reserved

87-1.03Q(4) Telephone Demarcation Cabinets

Installing a telephone demarcation cabinet includes installing conduit, cable, and pull boxes to the controller cabinet.

Install the cabinet with the back toward the nearest lane of traffic.

87-1.03R Signal Heads 87-1.03R(1) General

Installing a signal head includes mounting the heads on standards and mast arms, installing backplates and visors, and wiring conductors to the terminal blocks.

Keep the heads covered or direct them away from traffic until the system is ready for operation.

87-1.03R(2) Signal Faces

Use the same brand and material for the signal faces at each location.

Program the programmable visibility signal faces under the manufacturer's instructions. The indication must be visible only in those areas or lanes to be controlled.

87-1.03R(3) Backplates

Install backplates using at least six 10-24 or 10-32 self-tapping and locking stainless steel machine screws and flat washers.

If a plastic backplate requires field assembly, attach each joint using at least four no.10 machine screws. Each machine screw must have an integral or captive flat washer, a hexagonal head slotted for a standard screwdriver, and either a locking nut with an integral or captive flat washer or a nut, flat washer, and lock washer. Machine screws, nuts, and washers must be stainless steel or steel with a zinc or black oxide finish.

If a metal backplate has 2 or more sections, fasten the sections with rivets or aluminum bolts peened after assembly to avoid loosening.

Install the backplate such that the background light is not visible between the backplate and the signal face or between sections.

87-1.03R(4) Signal Mounting Assemblies

Install a signal mounting assembly such that its members are arranged symmetrically and plumb or level. Orient each mounting assembly to allow maximum horizontal clearance to the adjacent roadway.

For a bracket-mounted assembly, bolt the terminal compartment or pole plate to the pole or standard.

In addition to the terminal compartment mounting, attach the upper pipe fitting of Type SV-1-T with 5 sections or a SV-2-TD to the standard or pole using the mounting detail for signal heads without a terminal compartment.

Use a 4-1/2-inch slip fitter and set screws to mount an assembly on a post top.

After installing the assembly, clean and paint the exposed threads of the galvanized conduit brackets and bracket areas damaged by the wrench or vise jaws. Use a wire brush to clean and apply 2 coats of unthinned, organic zinc-rich primer. Do not use an aerosol can to apply the primer.

Install the conductors in the terminal compartment and secure the cover.

87-1.03S Pedestrian Signal Heads

Installing a pedestrian signal head includes mounting the heads on standards and wiring conductors to the terminal blocks.

Install the pedestrian signal mounting assembly under section 87-1.03R(4).

Use the same brand and material for the pedestrian signal faces at each location.

Install a pedestrian signal face such that its members are arranged symmetrically and plumb or level.

87-1.03T Accessible Pedestrian Signals

Install accessible pedestrian signals of the same manufacturer at each location. Do not install APS components inside the controller cabinet.

Identify conductors on both ends of the signal interface cable. Label each conductor according to their function under the manufacturer's instructions.

Connect the signal interface cable to the terminal blocks in the APS and pedestrian signal head.

Attach the accessible pedestrian signal to the standard with hex screws by drilling and tapping. Drill a 1- inch diameter hole on the standard for the signal interface cable.

Install the 9 by 12 inches R10-3j (CA) sign using the adapter plate provided by the APS manufacturer. Point the arrow on the accessible pedestrian signal in the crossing direction.

Cut Type 2 post 2 inches above the R10 series sign.

Furnish the equipment and hardware to set up and calibrate the accessible pedestrian signal.

Arrange to have a manufacturer's representative at the job site to program the accessible pedestrian signal with an audible message or tone.

87-1.03U Push Button Assemblies

Install the push button assembly and the R10 series sign on the crosswalk side of the standard. Attach the sign to the assembly for Type B assemblies.

Attach the sign to the standard using 2 straps and saddle brackets for Type C assemblies. You may use straps and saddle brackets to secure the push button to the standard.

Cut Type 2 post 2 inches above the R10 series sign.

87-1.03V Detectors 87-1.03V(1) General

Installing a detector includes installing inductive loop conductors, sealant, conduit, and pull boxes. Center the detectors in the traffic lanes.

Do not splice the detector conductor.

87-1.03V(2) Inductive Loop Detectors

Mark the location of the inductive loop detectors such that the distance between the side of the

loop and a lead-in saw cut from an adjacent detector is at least 2 feet. The distance between lead-in saw cuts must be at least 6 inches.

Saw cut the slots under section 13-4.03E(7). The bottoms of the slots must be smooth with no sharp edges. For Type E detector loops, saw the slots such that the sides are vertical.

Wash the slots clean using water and blow dry them with compressed air to remove all moisture and debris.

Identify the start of the conductor.

Waterproof the ends of a Type 2 loop conductor before installing it in the conduit to prevent moisture from entering the cable.

Install the loop conductor in the slots and lead-in saw cuts using a 3/16- to 1/4-inch-thick wood paddle. Hold the conductors in place at the bottom of the slot with wood paddles during placement of the sealant.

Wind adjacent loops on the same sensor unit channel in opposite directions.

Twist the conductors for each loop into a pair consisting of a minimum of 2 turns per foot before placing them in the lead-in saw cut and the conduit leading to the pull box. Do not install more than 2 twisted pairs of conductors per lead-in saw cut.

Test each loop for continuity, circuit resistance, and insulation resistance before filling the slots with sealant.

Remove excess sealant from the adjacent road surface before it sets. Do not use solvents to remove the excess.

Identify the loop conductor pair in the pull box, marking the start with the letter *S* and the end with the letter *F*. Band conductors in pairs by lane in the pull box adjacent to the loops and in the cabinet. Identify each pair with the detector designation and loop number.

Install the conductors in a compacted layer of HMA immediately below the uppermost layer if more than one layer will be placed. Install the loop conductors before placing the uppermost layer of HMA. Fill the slot with a sealant flush to the surface.

Install the conductors in the existing pavement if one layer of HMA is to be placed. Install the loop conductors before placing the layer of HMA. Fill the slot with a sealant flush to the surface.

87-1.03V(3) Preformed Inductive Loop Detectors

Install a preformed inductive loop detector consisting of 4 turns in the loop and a lead-in conductor pair twisted at least 2 turns per foot all encased in conduit and sealed to prevent water penetration. The detector must be 6-foot square unless shown otherwise.

Construct the loop detector using a minimum 3/8-inch Schedule 40 or Schedule 80 PVC or polypropylene conduit and no. 16 or larger conductor with Type THWN insulation.

In new roadways, place the detector in the base course with the top of the conduit flush with the top of the base. Cover with HMA or concrete pavement. Protect the detector from damage before and during pavement placement.

In new reinforced concrete bridge decks, secure the detector to the top of the uppermost layer of reinforcing steel using nylon wire ties. Hold the detector parallel to the bridge deck using PVC or polypropylene spacers where necessary. Place conduit for lead-in conductors between the uppermost 2 layers of reinforcing steel.

Do not install detectors in existing bridge decks unless authorized.

Install a detector in existing pavement before placement of concrete or HMA as follows:

1. Saw cut slots at least 1-1/4 inches wide into the pavement.
2. Place the detector in the slots. The top of the conduit must be at least 2 inches below the top of the pavement.
3. Test each loop circuit for continuity, circuit resistance, and insulation resistance.
4. Fill saw cuts with elastomeric or hot melt rubberized asphalt sealant for asphalt concrete pavement and with epoxy sealant or hot melt rubberized asphalt sealant for concrete pavement.

87-1.03W Sealants 87-1.03W(1) General Reserved

87-1.03W(2) Elastomeric Sealant

Apply an elastomeric sealant with a pressure feed applicator.

87-1.03W(3) Asphaltic Emulsion Sealant

Asphaltic emulsion sealant must:

1. Be used for filling slots in asphalt concrete pavement of a maximum width of 5/8 inch
2. Not be used on concrete pavement or where the slope causes the material to run from the slot
3. Be thinned under the manufacturer's instructions
4. Be placed when the air temperature is at least 45 degrees F

87-1.03W(4) Hot-Melt Rubberized Asphalt Sealant

Melt the sealant in a jacketed, double-boiler-type, melting unit. The temperature of the heat transfer medium must not exceed 475 degrees F.

Apply the sealant with a pressure feed applicator or a pour pot when the surface temperature of the pavement is greater than 40 degrees F.

87-1.03X Reserved

87-1.03Y Transformers

Installing a transformer includes placing the transformer inside a pull box, a cabinet, or an enclosure. Use a submersible type transformer inside pull boxes.

Wire the transformer for the appropriate voltage.

Ground the secondary circuit of the transformer as specified in the NEC.

87-103Z Reserved

87-1.04 PAYMENT

Not Used

**87-1 LIGHTING
SYSTEMS**

87-2.01 GENERAL

87-2.01A Summary

Section 87-2 includes specifications for constructing lighting systems. Lighting system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Standards
6. Luminaires
7. Service equipment enclosure
8. Photoelectric control
9. Fuse splice connectors
10. High mast lighting assemblies

The components of a lighting system are shown on the project plans.

87-2.01B Definitions

Reserved

87-2.01C Submittals

Submit a certificate of compliance and test data for the high mast lighting luminaires.

87-2.01D Quality Assurance

Reserved

87-2.02 MATERIALS

87-2.02A General

Reserved

87-2.02B High Mast Lighting Assemblies

A high mast lighting assembly includes the foundation, pole, lowering device system, luminaires, and control pedestal.

Each luminaire in a high mast lighting assembly must include a housing, an optical system, and a ballast. The housing must be made of aluminum.

A painted or powder-coated housing for a high mast lighting luminaire must be able to

withstand a 1,000- hour salt spray test as specified in ASTM B117.

The optical system, consisting of the reflector, refractor or lens, lamp socket, and lamp, must be in a sealed chamber. The chamber must be sealed by a gasket between the reflector and refractor or lens and a gasket between the reflector and lamp socket. The chamber must have a separate filter or filtering gasket for flow of air.

An asymmetrical luminaire must have a refractor or reflector that is rotatable 360 degrees around a vertical axis to orient the distribution of light.

The luminaire must have a slip fitter for mounting on a 2-inch horizontal pipe tenon and must be adjustable ± 3 degrees from the axis of the tenon.

The reflector must have a specular surface made of silvered glass or aluminum protected by either an anodized finish or a silicate film. The reflector must be shaped such that a minimum of light is reflected through the arc tube of the lamp.

The refractor and lens must be made of heat-resistant glass.

The lamp socket must be a porcelain-enclosed, mogul-multiple type. The shell must contain integral lamp grips to ensure electrical contact under conditions of normal vibrations. The socket must be rated for 1,500 W, 600 V(ac) and 4,000 V(ac) pulse for a 400 W lamp and 5,000 V(ac) pulse for a 1,000 W lamp.

The luminaire must have a dual fuse holder for 2 fuses rated at 5 A, 480 V(ac). The fuses must be 13/32 inch by 1-1/2 inches, standard midget ferrule type with a nontime-delay feature.

The lamps must be vertical burning, protected from undue vibration, and prevented from backing out of the socket by a stainless steel clamp attached to the luminaire.

A 1,000 W metal halide lamp must have an initial output of 100,000 lumens and an average rated life of 12,000 hours based on 10 hours per start.

A 400 W high-pressure sodium lamp must have an initial output of 50,000 lumens. A 1,000 W high- pressure sodium lamp must have an initial output of 140,000 lumens.

The ballast for the luminaire must be a regulator type and have a core and coils, capacitors, and starting aid.

Ballast must be:

1. Mounted within a weatherproof housing that integrally attaches to the top of a luminaire support bracket and lamp support assembly
2. Readily removable without removing the luminaire from the bracket arm
3. Electrically connected to the optical assembly by a prewired quick disconnect

The ballast for a metal halide luminaire must comply with luminaire manufacturer's specifications.

The wattage regulation spread at any lamp voltage, from nominal through the life of the lamp, must vary no more than 22 percent for a 1,000 W lamp and a ± 10 percent input voltage variation. The ballast's starting line current must be less than its operating current.

87-2.02C Soffit and Wall-Mounted Luminaires 87-2.02C(1) General

Soffit and wall-mounted luminaires must be weatherproof and corrosion resistant.

Each luminaire must include a 70 W high-pressure sodium lamp with a minimum average rated life of 24,000 hours. The lamp socket must be positioned such that the light center of the lamp is located within 1/2 inch of the designed light center of the luminaire.

Luminaire wiring must be SFF-2.

Flush-mounted soffit luminaire must have:

1. Metal body with two 1-inch-minimum conduit hubs and a means of anchoring the body into the concrete
2. Prismatic refractor made of heat-resistant polycarbonate
 - 2.1. Mounted in a door frame
 - 2.2. With the street side identified
3. Aluminum reflector with a specular anodized finish
4. Ballast located either within the housing or in a ceiling pull box if shown
5. Lamp socket

The door frame assembly must be hinged, gasketed, and secured to the luminaire body with at least 3 machine screws.

A pendant soffit luminaire must be enclosed and gasketed and have an aluminum finish. Luminaire must have:

1. Aluminum reflector with a specular anodized finish
2. Refractor made of heat-resistant polycarbonate
3. Optical assembly that is hinged and latched for lamp access and a device to prevent dropping
4. Ballast designed for operation in a raintight enclosure
5. Galvanized metal box with a gasketed cover, 2 captive screws, and 2 chains to prevent dropping and for luminaire mounting

Wall-mounted luminaire must have:

1. Cast metal body
2. Prismatic refractor:
 - 2.1. Made of glass

- 2.2. Mounted in a door frame
3. Aluminum reflector with a specular anodized finish
4. Integral ballast
5. Lamp socket
6. Gasket between the refractor and the body
7. At least 2 mounting bolts of minimum 5/16-inch diameter

A cast aluminum body of a luminaire to be cast into or mounted against concrete must have a thick coat of alkali-resistant bituminous paint on all surfaces to be in contact with the concrete.

87-2.02C(2) High-Pressure Sodium Lamp Ballasts 87-2.02C(2)(a) General

A high-pressure sodium lamp ballast must operate the lamp for its rated wattage.

Starting aids for a ballast must be interchangeable between ballasts of the same wattage and manufacturer without adjustment.

The ballast must be provided with a heat-generating component to serve as a heat sink. The capacitor must be placed at the maximum practicable distance from the heat-generating components or thermally shielded to limit the case temperature to 75 degrees C.

The transformer and inductor must be resin impregnated for protection against moisture. Capacitors, except for those in starting aids, must be metal cased and hermetically sealed.

The ballast must have a power factor of 90 percent or greater.

For the nominal input voltage and lamp voltage, the ballast design center must not vary more than 7.5 percent from the rated lamp wattage.

87-2.02C(2)(b) Regulator-Type Ballasts

A regulator-type ballast must be designed such that a capacitance variance of ± 6 percent does not cause more than ± 8 percent variation in the lamp wattage regulation.

The ballast must have a current crest factor not exceeding 1.8 for an input voltage variation of ± 10 percent.

The lamp wattage regulation spread for a lag-type ballast must not vary by more than 18 percent for ± 10 percent input voltage variations. The primary and secondary windings must be electrically isolated.

The lamp wattage regulation spread for a constant-wattage, autoregulator, lead-type ballast must not vary by more than 30 percent for ± 10 percent input voltage variations.

87-2.02C(2)(c) Nonregulator-Type Ballasts

A nonregulator-type ballast must have a current crest factor not exceeding 1.8 for an input

voltage variation of ± 5 percent.

The lamp wattage regulation spread for an autotransformer or high reactance type ballast must not vary by more than 25 percent for ± 5 percent input voltage variations.

87-2.03 CONSTRUCTION

87-2.03A General

Set the foundations for standards such that the mast arm is perpendicular to the centerline of the roadway.

Tighten the cap screws of the luminaire's clamping bracket to 10 ft-lb for roadway luminaires. Label the month and year of the installation inside the luminaire housing's door.

Perform the conductor and operational tests for the system.

87-2.03B High Mast Lighting Assemblies

Mount and connect the luminaires to the accessory support ring. Aim the asymmetrical luminaire to orient the distribution of light.

87-2.03C Soffit and Wall-Mounted Luminaires

For a flush-mounted soffit luminaire:

1. Prevent concrete from getting into the housing during pouring of the concrete for the structure
2. Install the luminaire with the axis vertical and the street side of the refractor oriented as indicated
3. Locate the luminaire to provide a minimum 2-foot clearance from the inside surface of the girders and 1-foot clearance from the near face of the diaphragm
4. Install the bridge soffit and ceiling pull box over the same lane

For a pendant soffit luminaire:

1. Cast in place the inserts for the no. 8 pull box during concrete placement for a new structure
2. Drill holes for expansion anchors to support the no. 8 pull box on existing structures
3. Bond the suspension conduit and luminaire to the pull box

For a wall-mounted luminaire, provide:

1. Extension junction box or ring on a new structure
2. 4 external mounting taps on an existing structure

Place the soffits or wall-mounted luminaires in operation as soon as practicable after the

falsework has been removed from the structure.

If the Engineer orders soffit or wall-mounted luminaires to be activated before permanent power service is available, installing and removing the temporary power service is change order work.

87-2.04 PAYMENT

Not Used

87-2 SIGN ILLUMINATION SYSTEMS

87-3.01 GENERAL

Section 87-3 includes specifications for constructing sign illumination systems. Sign illumination system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Overhead sign luminaires
6. Service equipment enclosure
7. Photoelectric control

The components of a sign illumination system are shown on the project plans.

87-3.02 MATERIALS

Not Used

87-3.03 CONSTRUCTION

Perform the conductor test.

Install overhead sign luminaires under the manufacturer's instructions. Do not modify the sign structure or mounting channels.

Perform the operational tests for the system.

87-3.04 PAYMENT

Not Used

87-3 SIGNAL AND LIGHTING SYSTEMS

87-4.01 GENERAL

Section 87-4 includes specifications for constructing signal and lighting systems. Signal and lighting system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors and cables
5. Standards
6. Signal heads
7. Service equipment enclosure
8. Department-furnished controller assembly
9. Detectors
10. Telephone demarcation cabine
11. Accessible pedestrian signals
12. Push button assemblies
13. Pedestrian signal heads
14. Luminaires
15. Photoelectric control
16. Fuse splice connectors
17. Battery backup system
18. Flashing beacons
19. Flashing beacon enclosure

The components of a signal and lighting system are shown on the project plans.

87-4.02 MATERIALS

87-4.02A General

Reserved

87-4.02B Railroad Preemption

A wire jumper for railroad preemption must be:

1. Stranded
2. No. 14 AWG
3. White with red stripes

87-4.03 CONSTRUCTION

87-4.03A General

Set the foundation for a standard such that the mast arm is perpendicular to the centerline of the roadway.

Tighten the cap screws of the roadway luminaire's clamping bracket to 10 ft-lb. Label the month and year of the installation inside the luminaire housing's door. Perform the conductor and operational tests for the system.

87-4.03B Railroad Preemption

Connect the C16 harness plug to the C16 socket on the Output File no. 2LX in the controller cabinet.

Connect the terminated conductors of the C16 harness to terminal block TB9 on input panel no.1 in the controller cabinet as shown in the following table:

Input Panel No. 1 Connections

Pin	Label	TB9
1	J-12D	4
2	J-12J	5
3	J-13D	7
4	J-13J	8
5	J-14D	10
6	J-14J	11

Terminate wire jumpers with spade connectors on both ends.

Connect three wire jumpers approximately 4 feet in length as show in the following table:

Jumper Connections

Jumper	Bus	TB9
1	DC-	6
2	DC-	9
3	DC-	12

Connect three wire jumpers approximately 2 inches in length as show in the following table:

Jumper Connections

Jumper	Terminal Block	Pin	Pin
1	TB-12	5	7
2	TB-13	5	7
3	TB-14	5	7

87-4.04 PAYMENT

Not Used

87-5 RAMP METERING SYSTEMS

87-5.01 GENERAL

Section 87-5 includes specifications for constructing ramp metering systems. Ramp metering system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Standards
6. Signal heads
7. Service equipment enclosure
8. Department-furnished controller assembly
9. Detectors
10. Flashing beacons

The components of a ramp metering system are shown on the project plans.

87-5.02 MATERIALS

Not Used

87-5.03 CONSTRUCTION

Connect the field wiring to the terminal blocks in the controller cabinet. The Engineer provides you a list of field conductor terminations for each controller cabinet.

Perform the conductor and operational tests for the system.

87-5.04 PAYMENT

Not Used

87-5 TRAFFIC MONITORING STATION SYSTEMS

87-6.01 GENERAL

Section 87-6 includes specifications for constructing traffic monitoring station systems. Traffic monitoring station system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Cables
5. Conductors

6. Service equipment enclosure
7. Controller cabinet
8. Detectors
9. Telephone demarcation cabinet

The components of a traffic monitoring station system are shown on the project plans.

87-6.02 MATERIALS

Not Used

87-6.03 CONSTRUCTION

Connect the field wiring to the terminal blocks in the controller cabinet. The Engineer provides you a list of field conductor terminations for the controller cabinet.

Perform the conductor and operational tests for the system.

87-6.04 PAYMENT

Not Used

87-6 FLASHING BEACON SYSTEMS

87-7.01 GENERAL

Section 87-7 includes specifications for constructing flashing beacon systems. Flashing beacon system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Standards
6. Service equipment enclosure
7. Signal heads
8. Flashing beacon enclosure

The components of a flashing beacon system are shown on the project plans.

The flash rate for the flashing beacon must comply with chapter 4L, "Flashing Beacons," of the *California MUTCD*.

The flashing beacon must allow alternating flashing wig-wag operation. The flashing beacon enclosure must have a separate flasher unit installed.

87-7.02 MATERIALS

Not Used

87-7.03 CONSTRUCTION

Perform the conductor and operational tests for the system.

87-7.04 PAYMENT

Not Used

87-7 PEDESTRIAN HYBRID BEACON SYSTEMS

87-8.01 GENERAL

87-8.01A Summary

Section 87-8 includes specifications for constructing pedestrian hybrid beacon systems. A pedestrian hybrid beacon system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors and cables
5. Standards
6. Pedestrian hybrid beacon face
7. Pedestrian signal heads
8. Service equipment enclosure
9. Department-furnished controller assembly
10. Accessible pedestrian signals
11. Push button assemblies
12. Luminaires
13. Fuse splice connectors
14. Battery backup system

The components of a pedestrian hybrid beacon system are shown on the project plans.

87-8.01B Definitions

Reserved

87-8.01C Submittals

Reserved

87-8.01D Quality Assurance 87-8.01D(1) General Reserved

87-8.01D(2) Quality Control

Verify the sequence for the pedestrian hybrid beacon system per California *MUTCD*, Chapter 4F, Figure 4F-3 "Sequence for a Pedestrian Hybrid Beacon" during the operational test.

Test the battery backup system.

87-8.02 MATERIALS

87-8.02A General

The pedestrian hybrid beacon system must comply with California *MUTCD*, Chapter 4F.

87-8.02B Pedestrian Hybrid Beacon Face

A pedestrian hybrid beacon face consists of two red indications on the top and one yellow indication on the bottom.

87-8.03 CONSTRUCTION

Install pedestrian hybrid beacon system under section 87-4.03A. Install battery backup system.

87-8.04 PAYMENT

Not Used

87-12 CHANGEABLE MESSAGE SIGN SYSTEM

87-12.01 GENERAL

Section 87-12 includes specifications for constructing changeable message sign systems.
Changeable message sign system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors and cables
5. Service equipment enclosure
6. Department-furnished controller cabinet
7. Department-furnished changeable message sign
8. Department-furnished wiring harness
9. Sign disconnect

The components of a changeable message sign system are shown on the project plans.

87-12.02 MATERIALS

Not Used

87-12.03 CONSTRUCTION

Install changeable message sign on sign structure under section 56-2.

Connect the field wiring to the terminal blocks in the sign assembly and controller cabinet.

The Engineer provides you a list of field conductor terminations for each sign cabinet and controller cabinet.

The Department maintains the sign assemblies.

87-12.04 PAYMENT

Not Used

87-13 RESERVED

87-14 RADAR SPEED FEEDBACK SIGN SYSTEMS

87-14.01 GENERAL

87-14.01A Summary

Section 87-14 includes specifications for installing radar speed feedback sign systems. Radar speed feedback sign system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors and cables
5. Standards or wood posts
6. Vehicle speed feedback sign
7. Service equipment enclosure
8. Signs

The components of a radar speed feedback sign system are shown on the project plans.

87-14.01B Definitions

Reserved

87-14.01C Submittals

Submit 2 copies of:

1. Test data report complying with NEMA-TS-2 for the vehicle speed feedback sign
2. Shop drawings or installation manuals for the sign support, electrical connections, attachments, and mounting configurations

87-14.01D Quality Assurance 87-14.01D(1) General Reserved

87-14.01D(2) Quality Control

Equipment setup must comply with the sign manufacturer's instructions.

Notify the Engineer at least 5 business days before performing the system test. Test the system in the presence of the Engineer.

Radar speed feedback sign system test consists of:

1. Turning on the radar speed feedback sign system
2. Driving a vehicle and recording the speeds displayed
 - 2.1. By the vehicle speedometer
 - 2.2. On the vehicle speed feedback sign for the vehicles
3. Performing the test 5 times per lane detected
4. Ensuring that the 5 recorded speeds of the vehicle speed feedback sign are within ± 1 mph of the vehicle speeds recorded from the vehicle speedometer

After successful testing, present the recorded results to the Engineer.

87-14.01D(3) Training

Provide training to a maximum of 4 Department employees on the operation of the vehicle speed feedback sign. Training must be a minimum of 1 hour and include how to program,

adjust, troubleshoot, and repair the sign.

87-14.02 MATERIALS

87-14.02A General

Vehicle speed feedback sign consists of a housing, display window, and radar unit. Sign must:

1. Comply with the California MUTCD, Chapter 2B
2. Have an operating voltage of 120 V(ac) for permanent installations
3. Have a maximum weight of 45 lb
4. Have a wind load rating of 90 mph
5. Have an operating temperature range from -34 to 165 degrees F
6. Have a retroreflective white sheeting background

87-14.02B Housings

Housing must:

1. Be weatherproof (NEMA 3R or better) and vandal resistant
2. Be made of 0.09-inch-gauge welded aluminum with the outer surfaces being UV resistant
3. Have the manufacturer's name, model number, serial number, date of manufacture, rated voltage and rated current marked inside
4. Have the internal components easily accessible for field repair without removal of the sign

87-14.02C Display Windows

Display window consists of a cover, LED character display, and dimming control. Character display and cover must deflect together without damage to the internal electronics and speed detection components.

Cover must be:

1. Vandal resistant and shock absorbent
2. Field replaceable with the removal of external stainless-steel, tamper proof fasteners

Cover must be made of a minimum 0.25-inch-thick, shatter-resistant polycarbonate. LED character display must:

1. Consist of two 7-segment, solid-state, numeric characters, which must
 - 1.1. Be a minimum:
 - 1.1.1. 18 inches in height for freeways and expressways
 - 1.1.2. 14 inches in height for conventional highways
 - 1.2. Have a width-to-height ratio between 0.7 and 1.0
 - 1.3. Have a stroke width-to-height ratio of 0.2
 - 1.4. Be visible from a minimum distance of 1,500 feet and legible from a minimum distance of 750 feet
 - 1.5. Consist of a minimum 16 LEDs, which must:
 - 1.5.1. Be amber and have a wavelength from 590 to 600 nm and rated for

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minimum 60,000 hours

1.5.2. Maintain a minimum 85 percent of the initial light output after 48 months of continuous use over the temperature range

2. Be capable of displaying the detected vehicle speed within 1 second
3. Remain blank when no vehicles are detected within the radar detection zone
4. Have the option to flash the pre-set speed limit when the detected vehicle speed is 5 miles higher than the pre-set speed
5. Be viewable only by the approaching traffic

Dimming control must:

1. Automatically adjust the character light intensity to provide optimum character visibility and legibility under all ambient lighting conditions
2. Have minimum 3 manual dimming modes of different intensities

87-14.02D Radar Units

Radar unit must:

1. Be able to detect up to 3 lanes of approaching traffic
2. Operate with an internal, low power, 24.159 GHz (K-band)
3. Be FCC approved Part 15 certified
4. Have a speed accuracy of ± 1 mph
5. Have a maximum 15 W power consumption

87-14.03 CONSTRUCTION

Install the vehicle speed feedback sign under the manufacturer's instructions. Install R2-1 SPEED LIMIT sign.

Perform the conductor test.

Configure the radar speed feedback sign system to detect only traffic in the approach direction of travel.

Perform the radar speed feedback sign system test.

Perform the operational test for the system.

87-14.04 PAYMENT

Not Used

87-15 – 87-17 RESERVED

87-18 INTERCONNECTION CONDUIT AND CABLE

87-18.01 GENERAL

Section 87-18 includes specifications for constructing interconnection conduit and cable.

Interconnection conduit and cable includes:

1. Pull boxes
2. Conduit
3. Signal interconnect cables
4. 12 position terminal block

The components of an interconnection conduit and cable are shown.

87-18.02 MATERIALS

Terminal block must comply with TEES, chapter 1, section 3.

87-18.03 CONSTRUCTION

Test the signal interconnect cable.

Install the terminal block on the input panel in the controller cabinet.

Connect the signal interconnect cable to the terminal block as shown in the following table:

Signal Interconnect Termination	
Terminal Block	Color
1	BLUE
2	BLACK
3	RED
4	BLACK
5	BROWN
6	BLACK
7	GREEN
8	BLACK
9	YELLOW
10	BLACK
11	WHITE
12	BLACK

87-18.04 PAYMENT

Not Used

87-19 FIBER OPTIC CABLE SYSTEM

87-19.01 GENERAL

87-19.01A Summary

Section 87-19 includes specifications for constructing fiber optic cable systems. A fiber optic cable system includes:

1. Conduit and accessories
2. Vaults
3. Warning tape
4. Fiber optic cables
5. Fiber optic splice enclosures
6. Fiber distribution units
7. Fiber optic markers
8. Fiber optic connectors and couplers

The components of a fiber optic system are shown on the project plans.

87-19.01B Definitions

Reserved

87-19.01C Submittals

At least 15 days before cable installation, submit:

1. Manufacturer's procedures for pulling fiber optic cable
2. Test reports from a laboratory accredited to International Standards Organization/International Electrotechnical Commission 17025 by the American Association for Laboratory Accreditation (A2LA) or the ANSI-ASQ National Accreditation Board (ANAB) for:
 - 2.1. Water penetration
 - 2.2. Cable temperature cycling
 - 2.3. Cable impact
 - 2.4. Cable tensile loading and fiber strain
 - 2.5. Cable compressive loading
 - 2.6. Compound flow
 - 2.7. Cyclic flexing
3. Proof of calibration for the test equipment including

- 3.1. Name of calibration facility
- 3.2. Date of calibration
- 3.3. Type of equipment, model number and serial number
- 3.4. Calibration result

Submit optical time-domain reflectometer data files for each test in a Microsoft Excel format.

After performing the optical time-domain reflectometer test and the power meter and light source test, submit within 4 business days a hard copy and electronic format:

1. Cable Verification Worksheet
2. Segment Verification Worksheet
3. Link Loss Budget Worksheet

The worksheets are available at the Division of Construction website.

87-19.01D Quality Assurance 87-19.01D(1) General Reserved

87-19.01D(2) Quality Control

Notify the Engineer 4 business days before performing field tests. Include exact location of the system or components to be tested. Do not proceed with the testing until authorized. Perform each test in the presence of the Engineer.

The optical time-domain reflectometer test consists of:

1. Inspecting the cable segment for physical damage.
2. Measuring the attenuation levels for wavelengths of 1,310 and 1,550 nm in both directions for each fiber using the optical time-domain reflectometer.
3. Comparing the test results with the data sheet provided with the shipment. If there are attenuation deviations greater than 5 percent, the test will be considered unsatisfactory and the cable segment will be rejected. The failure of any single fiber is a cause for rejection of the entire segment. Replace any rejected cable segments and repeat the test.

The power meter and light source test consists of:

1. Testing each fiber in a link using a light source at one end of the link and a power meter at the other end
2. Measuring and recording the power loss for wavelengths of 1,310 and 1,550 nm in both directions

Index matching gel is not allowed.

Installation and splicing of the fiber optic cable system must be performed by a certified fiber optic installer.

The optical time-domain reflectometer test and the power meter and light source test must be performed by a certified fiber optic technician.

Certification for the fiber optic installer and technician must be from an organization recognized by the cable manufacturer and current throughout the duration of the project.

87-19.02 MATERIALS

87-19.02A General

All metal components of the fiber optic cable system must be corrosion resistant. All connectors must be factory-installed and tested.

Patch cords, pigtails, and connectors must comply with ANSI/TIA-568. Pigtails must have a minimum 80 N pull out strength.

A splice cassette may be used in place of a pigtail and a splice tray.

Each cable reel must have a weatherproof label or tag with information specified in ANSI/ICEA S-87-640 including:

1. Contractor's name
2. Contract number
3. Number of fibers
4. Cable attenuation loss per fiber at 1,310 and 1,550 nm

The labeled or tagged information must also be in a shipping record in a weatherproof envelope. The envelope must be removed only by the Engineer.

87-19.02B Vaults

A vault must:

1. Comply with section 86-1.02C and AASHTO HS 20-44, and load tested under AASHTO M 306
2. Be a minimum:
 - 2.1. 4 feet wide by 4 feet high by 4 feet long nominal inside dimensions for box type
 - 2.2. 4 feet high by 4 feet outside diameter for round type
3. Have a minimum access of:
 - 3.1. 30 inches diameter for round type
 - 3.2. 3 feet wide by 3 feet long for box type
4. Be precast either modular or monolithic.
5. Have cable racks installed on the interior sides. A rack must:
 - 5.1. Be fabricated from ASTM A36 steel plate
 - 5.2. Support a minimum of 100 pounds per rack arm
 - 5.3. Support a minimum of 4 splice enclosures and a minimum of 4 cables with a minimum slack of 50 feet each

- 5.4. Be hot-dip galvanized after manufacturing
- 5.5. Be bonded and grounded
6. Have a minimum:
 - 6.1. Two 4-inch diameter knockouts on each side for box type
 - 6.2. Two 4-inch diameter knockouts placed every 90 degrees for round type
7. Have a minimum 2-inch-diameter drain hole at the center of base.

Entry points for knockouts must not cause the cable to exceed its maximum bend radius. The access cover must:

1. Be a two-piece torsion-assisted sections or a minimum 30-inch-diameter cast iron
2. Have inset lifting pull slots
3. Have markings *CALTRANS* and *FIBER OPTIC*

87-19.02C Fiber Optic Cable

The fiber optic cable must:

1. Comply with 7 CFR parts 1755.900, 1755.901, and 1755.902, and ANSI/ICEA S-87-640
2. Be a singlemode, zero-dispersion, and have non-gel loose type buffer tubes
3. Have no splices
4. Have a Type H or Type M outer jacke
5. Be shipped on a reel
6. Have 10 feet of length on each end of the cable accessible for testing

87-19.02D Fiber Optic Splice Enclosures

A fiber optic splice enclosure must:

1. Not exceed 36 inches in length, 8 inches in width, and 8 inches in height
2. Be made of thermoplastic material, weather proof, chemical and UV resistant, and re-sealable
3. Accommodate a minimum of 8 internal splice trays
4. Have from 1/4 to 1 inch in diameter cable entry ports
5. Have brackets, clips and cable ties
6. Have means to anchor the dielectric member of the fiber optic cable
7. Include grounding hardware

87-19.02E Fiber Distribution Units

The fiber distribution unit) consists of a housing, a patch panel, a 12-multicolor pigtail, and a splice tray. The fiber distribution unit must be self-contained and pre-assembled.

The housing must:

1. Be a 19-inch rack-mountable modular-metal enclosure
2. Be a one rack unit

3. Have cable clamps to secure buffer tube to the chassis
4. Have cable accesses with rubber grommets or similar material to prevent the cable from coming in contact with the bare metal
5. Be weatherproof
6. Have a hinged top door with a latch or thumbscrew to hold it in the closed position

A patch panel must have a minimum of 12-singlefiber type connector sleeves. A pigtail must:

1. Be a simplex single mode fiber in a 900 μ m tight buffer with a 12-inch-outer-diameter PVC jacket
2. Have a fiber optic connector attached on one end and bare fiber on the other end
3. Be at least 3 feet in length
4. Have the manufacturer's part number on the jacke

Pigtails must be single-fiber or ribbon type.

87-19.02F Patch Cords

Patch cords must:

1. Be a singlemode fiber in a 900 μ m tight buffer with a 0.12-inch-outer-diameter PVC jacket
2. Have fiber optic connectors attached on both ends
3. Be at least 6 feet in length
4. Have manufacturer's part number on the jacket

Duplex patch cords must be of round cable structure, and not have zip-cord structure.

87-19.02G Splice Trays

Splice trays must:

1. Have brackets to spool incoming fibers a minimum of 2 turns.
2. Have means to secure and protect incoming buffer tubes, pigtails, and a minimum of 12 heat shrink fusion splices.
3. Be stackable.
4. Have a snap-on or hinged cover. The cover may be transparent

87-19.02H Fiber Optic Markers

Fiber optic markers must be:

1. Type K-2 (CA) object markers for vaults or pull boxes.
2. Disk markers for paved areas and transition points from unpaved to paved areas. The disk marker must be metallic, lead free and 4 inches in diameter, and must have a mounting stem at the center of the disk. The mounting stem must be a minimum 3 inches long and a minimum 0.70 inch in diameter.

3. Non-reflective Class 1, Type F, flexible post delineators for unpaved areas.

87-19.02I Fiber Optic Connectors and Couplers

Connectors must be:

1. 0.1-inch ceramic ferrule pre-radiused type
2. Capped when not used

Couplers must be made of the same material as the connector's housing and have ceramic sleeves. Singlemode fiber optic connectors must have a yellow strain relief boot or a yellow base.

87-19.03 CONSTRUCTION

87-19.03A General

Perform the optical time-domain reflectometer test:

1. On the fiber optic cable upon its arrival to the job site and before its installation. Complete the Cable Verification Worksheet. Do not install the fiber optic cable until the Engineer's written approval is received.
2. After the fiber optic cable segments have been pulled, but before breakout and termination. Complete the Segment Verification Worksheet.
3. Once the passive cabling system has been installed and is ready for activation. If the measured individual fusion splice losses exceed -0.30 dB, re-splice and retest. At the conclusion of the optical time-domain reflectometer test, perform the power meter and light source test. If the measured link loss exceeds the calculated link loss, replace the unsatisfactory cable segments or splices and retest. Complete the Link Loss Budget Worksheet.

87-19.03B Vaults Installation

Install a vault as shown and with the side facing the roadway a minimum of 2 feet from the edge of pavement or back of dike, away from traffic.

Install the top of the vault flush with surrounding grade in paved areas and 2 inches above the surrounding grade in unpaved areas.

Place 6 inches of minor concrete around vaults. In unpaved areas, finish top of concrete at a 2 percent slope away from cover. In paved areas, finish top of concrete to match existing slope.

Bolt the steel cover to the vault when not working in it.

87-19.03C Fiber Optic Cable Installation

Install fiber optic cable by a certified installer or a representative from the fiber optic cable

manufacturer during installation.

When using mechanical aids to install fiber optic cable:

1. Maintain a cable bend radius at least twenty times the outside diameter of the cable
2. Use cable grips having a ball bearing swivel
3. Use a pulling force on a cable not to exceed 500 pound-foot or manufacturer's recommended pulling tension, whichever is less

When installing the cable using the air blown method, the cable must withstand a static air pressure of 110 psi.

Lubricate the cable using a lubricant recommended by the cable manufacturer. Install fiber optic cable without splices except where shown.

Provide a minimum of 65 feet of slack for each fiber optic cable at each vault. Divide the slack equally on each side of the splice enclosure.

Install tracer wires in the fiber optic conduits and innerducts as shown. Provide a minimum 3 feet of slack tracer wire in each pull box and splice vault from each direction. You may splice tracer wire at intervals of not less than 500 feet and only inside splice vaults or pull boxes.

If a fiber optic cable and tracer wire are installed in an innerduct, pulling a separate fiber optic cable into a spare duct to replace damaged fiber will not be allowed.

Apply a non-hygroscopic filling compound to fiber optic cable openings. Seal the ends of conduit and innerducts after cables are installed.

Install strain relief for fiber optic cable entering a fiber optic enclosure.

Identify fibers and cables by direct labeling, metal tags, or bands fastened in such a way that they will not move. Use mechanical methods for labeling.

Provide identification on each fiber optic cable or each group of fiber optic cables in each vault and at the end of terminated fibers. Fiber optic cable must be identified as shown in the following table:

Cable Identification^a

Sequence order	Description	Code	Numbers of characters
1	Fiber type	S: Singlemode	1
2	Fiber count	###: Example 048	3

3	Begin point	T: TMC H: Hub V: Video Node D: Data Node C: Cable Node TV: Camera CM: CMS E: Traffic Signal RM: Ramp Meter TM: Traffic Monitoring/ Count Station/Vehicle Count Station (VDS, TMS) HA: Highway Advisory Radio EM: Extinguishable Message Sign RW: Roadway Weather Information System WM: Weigh In Motion WS: Weigh-Station Bypass System SV: Vault SC: Splice Cabinet	1 or 2
4	Begin point county abbreviation	AA or AAA: Examples: Orange (ORA), San Mateo (SM)	2 or 3
5	Begin point route number	###: Examples: 005, 082, 114	3
6	Begin point post mile	#####: 02470 (example 024.70): Actual PM value to the 1/100 value	5
7	End Point	In the same way as for Begin Point	1 or 2
8	End point county abbreviation	In the same way as for Begin Point County Abbreviation	2 or 3
9	End point route number	In the same way as Begin Point Route Number	3
10	End point post mile	In the same way as Begin Point Post Mile	5

^aCable identification example: The cable code S 048 SV SM 084 02470 SV SC 082 02510 describes a singlemode, 48 strand, cable starting at a fiber optic vault in San Mateo County on Route 84 at post mile 24.70, and ending at another fiber optic vault in Santa Clara County on Route 82 at post mile 25.10.

Place labels on the cables at the following points:

1. Fiber optic vault and pull box entrances and exits
2. Splice enclosures entrance and exit
3. Fiber distribution unit entrance

Lace fiber optic cable inside controller cabinets and secure to the cage.

Support the fiber optic cable within 6 inches from a termination and every 2 feet. Secure fiber optic cables to the cable racks. Store excess cable in a figure 8 fashion.

87-19.03D Fiber Optic Cable Splices

Use fusion splicing for fiber optic cables.

Splice single-buffer tube cable to multi-buffer tube cable using the mid-span access method under manufacturer's instructions. Any mid-span access splice or fiber distribution unit termination must involve only those fibers being spliced as shown.

Place fiber splices in the splice enclosures installed in the vaults.

87-19.03E Splice Enclosures Installation

Maintain an equal amount of slack on each side of the splice enclosure. Secure the fiber optic splices in splice tray.

Secure the splice trays to the inner enclosure. Label cables and buffer tubes.

Do not seal fiber splice enclosure until authorized and the power meter and light source test is performed. Seal the enclosure under manufacturer's instructions.

Flash test the outer enclosure under manufacturer's instructions in the presence of the Engineer. Visually inspect the enclosure. If bubbles are present, identify the locations where the bubbles are present, take corrective actions and repeat the flash test until no bubbles are present.

Attach the splice enclosure to the side wall of a vault or hub with a minimum 2 feet distance between the ground and the bottom of the enclosure.

Secure fiber optic cables to the chassis using cable clamps for fiber optic units.

Connect a minimum of one bonding conductor to a grounding electrode after mounting the fiber optic enclosure to the wall. If there are multiple bonding conductors, organize the conductors in a neat way.

87-19.03F Fiber Optic Distribution Unit Installation

Spool incoming buffer tubes 2 feet in the splice tray and expose 1 foot of individual fibers. Maintain a minimum 2-inch-bend radius during and after installation in the splice tray.

Splice incoming fibers in the splice tray.

Restrain each fiber in the splice tray. Do not apply stress on the fiber when located in its final position. Secure buffer tubes near the entrance of the splice tray.

Secure splice trays under manufacturer's instructions. Label splice tray after splicing is

completed.

Install patch cords in fiber distribution units and patch panels. Permanently label each cord and each connector in the panel with the system as shown.

87-19.03G Fiber Optic Markers Installation

Install fiber optic markers at 12-inch offset on the side furthest away from the edge of travel way:

1. For fiber optic cable at 500 feet apart in areas where the distance between vaults or pull boxes is greater than 500 feet
2. Adjacent to vaults and pull boxes
3. For fiber optic cable turns at:
 - 3.1. Beginning of the turn
 - 3.2. Middle of the arc
 - 3.3. End of the turn

When a fiber optic cable crosses a roadway or ramp, install a disk marker over the conduit trench on:

1. Every shoulder within 6 inches from the edge of pavement
2. Delineated median
3. Each side of a barrier

Install markers under section 81 except each retroreflective face must be parallel to the road centerline and facing away from traffic.

87-19.04 PAYMENT

Not Used

87-20 TEMPORARY ELECTRICAL SYSTEMS

87-20.01 GENERAL

Section 87-20 includes specifications for providing, maintaining, and removing temporary electrical systems.

Temporary systems may be mounted on wood posts or trailers.

Obtain the Department's authorization for the type of temporary electrical system and its installation method.

A temporary system must operate on a continuous, 24-hour basis.

A temporary electrical system must have a primary power source and a back-up power source from:

1. Commercial utility company
2. Generator system
3. Photovoltaic system

87-20.02 MATERIALS

87-20.02A General

Temporary wood poles must comply with section 48-6.

The components of a temporary system are shown on the project plans. If you use Type UF-B cable, the minimum conductor size must be no. 12. A back-up power source must:

1. Have an automatic transfer switch
2. Start automatically and transfer the system load upon reaching the operating voltage in the event of a power source failure

A trailer must be equipped with devices to level and plumb the temporary system.

87-20.02B Generators

A generator must:

1. Be 120 V(ac) or 120/240 V(ac), 60 Hz, 2.5 kW minimum, continuous-duty type
2. Be powered by a gasoline, LPG, or diesel engine operating at approximately 1,800 rpm with an automatic oil feed
3. Be equipped to provide automatic start-stop operation with a 12 V starting system
4. Have generator output circuits that have overcurrent protection with a maximum setting of 15 A
5. Have a spark arrester complying with Pub Cont Code § 4442

87-20.02C Automatic Transfer Switches

An automatic transfer switch must provide:

1. Line voltage monitoring in the event of a power outage that signals the back-up power source to start
2. Start delay, adjustable from 0 to 6 seconds, to prevent starting if the power outage is only momentary and a stop delay, adjustable from 0 to 8 minutes, to allow the back-up power source to unload
3. Transfer delay from 0 to 120 seconds to allow the back-up power source to stabilize before connecting to the load and retransfer delay from 0 to 32 minutes

- to allow the line voltage to stabilize
4. Mechanical interlock to prevent an application of power to the load from both sources and to prevent backfeeding from the back-up power source to the primary power source

87-20.02D–87-20.02G Reserved

87-20.02H Temporary Flashing Beacon Systems

A temporary flashing beacon system consists of a flashing beacon system, wood pole, and a power source.

The system must comply with the specifications for flashing beacon systems in section 87-7.

87-20.02I Temporary Lighting Systems

A temporary lighting system consists of a lighting system, a power source, and wood poles. The system must comply with the specifications for lighting systems in section 87-2.

87-20.02J Temporary Signal Systems

A temporary signal system consists of a signal and lighting system, wood poles and posts, and a power source.

The system must comply with the specifications for signal and lighting systems in section 87-4, except signal heads may be mounted on a wood pole, mast arm, tether wire, or a trailer.

87-20.02K Temporary Radar Speed Feedback Sign Systems

A temporary radar speed feedback sign system must comply with the specifications for a radar speed feedback sign system in section 87-14, except, the LED character display must remain blank when no vehicles are detected or when the detected vehicle speed is 10 miles less than the preset speed.

87-20.03 CONSTRUCTION

87-20.03A General

Provide power and telecommunication services for temporary systems. Do not use existing services unless authorized.

Commercial power must be 120 V(ac) or 120/240 V(ac) single phase. Make arrangements with the utility company for providing service. Protect the power source in

a locked enclosure. Provide keys for all locks to the Engineer.

You may install conductors and cables:

1. In a conduit
2. Suspended from wood poles at least 25 feet above the roadway
3. Suitable for direct burial

Install conduit outside the paved area at a minimum of 12 inches below grade for Type 1 and 2 conduit and at a minimum of 18 inches below grade for Type 3 conduit.

Install direct burial conductors and cables outside the paved area at a minimum depth of 24 inches below grade.

Install conductors and cables in Type 1, 2, or 3 conduit when mounted on wood poles to a height of 10 feet above the grade.

Place conductors across structures in a Type 1, 2, or 3 conduit. Attach the conduit to the outside face of the structure.

Mount the photoelectric unit at the top of the standard or wood post. You may abandon:

1. Conductors and cables in sawed slots
2. Underground conduit after removing conductors

87-20.03B–87-20.03G Reserved

87-20.03H Temporary Flashing Beacon Systems

Protect each flashing beacon with a fused splice connector on the line side. Wherever conductors are run overhead, install the fused splice connector in the line side outside of the control assembly.

87-20.03I Temporary Lighting Systems

Protect each luminaire with a fused splice connector on the line side. Wherever conductors are run overhead, install the fused splice connectors in the line side before entering the mast arm.

87-20.03J Temporary Signal Systems

You may splice conductors that run to a terminal compartment or a signal head on a pole to the through conductors of the same phase in a pull box adjacent to the pole. Do not splice conductors or cables except in a pull box or in a NEMA 3R enclosure.

The Department provides the timing for the temporary signal.

Maintain the temporary signal except for the Department-furnished controller assembly.

87-20.03K Reserved 87-20.04 PAYMENT

Not Used

8-21 EXISTING ELECTRICAL SYSTEMS

87-21.01 GENERAL

Section 87-21 includes general specifications for performing work on existing electrical systems.

87-21.02 MATERIALS

Not Used

87-21.03 CONSTRUCTION

87-21.03A General

You may abandon unused underground conduit after pulling out all conductors and removing conduit terminations from the pull boxes.

Remove foundation under section 56-3.01C(2)(a). If standards are to be salvaged, remove:

1. All components
2. Mast arms from the standards
3. Luminaires, signal heads, and signal mounting assemblies from the standards and mast arms

If the existing material is unsatisfactory for reuse and the Engineer orders you to replace it with new material, replacing the existing material with new material is change order work.

If the removed electrical equipment is to be reinstalled, supply all materials and equipment, including signal mounting assemblies, anchor bolts, nuts, washers, and concrete, needed to complete the new installation.

Match the color of the existing housing, when replacing an existing accessible pedestrian signal or push button assembly.

Remove electrical equipment, designated as a hazardous waste.

87-21.03B Maintaining Existing Electrical Systems 87-21.03B(1) General

Maintain the existing electrical system in working order during the progress of the work. Conduct your operations to avoid damage to the elements of the systems.

Obtain authorization at least 72 hours before interrupting communication between an existing system and the traffic management center.

If the Engineer notifies you that an existing system is not fully operational due to your activities, repair or replace the system within 72 hours. If the system cannot be fixed within 72 hours or it is located on a structure, provide a temporary system within 24 hours until the system can be fixed. Perform a functional test of the system in the presence of the Engineer. If you fail to perform the necessary repair or replacement work, the Department may perform the repair or replacement work and deduct the cost.

If you damage an existing fiber optic cable, install a new cable such that the length of cable slack is the same as before the damage, measured from an original splice point or termination. All splices must be made using the fusion method.

You may interrupt the operation of traffic monitoring stations:

1. For 60 days if another operational traffic monitoring station is located within 3 miles
2. For 15 days if another operational traffic monitoring station is located more than 3 miles away

If a traffic monitoring station must be interrupted for longer periods than specified, provide a temporary detection system. Obtain the Department's authorization for the type of temporary system and its installation method.

87-21.03B(2) Maintaining Existing Traffic Management System Elements During Construction

Section 87-21.03B(2) applies if a bid item for maintaining existing traffic management system elements during construction is shown on the Bid Item List.

Maintain the following:

1. Ramp metering system
2. Traffic monitoring stations
3. Microwave vehicle detection system
4. Changeable message sign system
5. Extinguishable message sign system
6. Highway advisory radio system
7. Camera system
8. Roadway weather information system

87-21.03C Modifying Existing Electrical Systems

Modify electrical systems as shown.

87-21.03D Removing Existing Electrical Systems

The components to be removed are shown on the project plans.

87-21.04 PAYMENT

Not Used

END OF SECTION