

STEGE SANITARY DISTRICT  
CONTRA COSTA COUNTY  
CALIFORNIA  
**PROJECT SPECIFICATIONS**



**CANON PUMP STATION  
REHABILITATION PROJECT**

**PROJECT NO. 23202  
JULY 2023**

STEGE SANITARY DISTRICT  
7500 SCHMIDT LANE  
EL CERRITO, CA 94530

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**DEADLINE FOR QUESTIONS IS: 01/11/2024 @ 5:00 PM**  
**NO PRE-BID MEETING. BID OPENING 01/16/2024 @ 2:00 PM**

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# **PART I**

# **BID DOCUMENTS**

STEGE SANITARY DISTRICT  
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JULY 2023

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# **PART I**

# **BID DOCUMENTS**

STEGE SANITARY DISTRICT  
PROJECT NO. 23202  
JULY 2023

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STEGE SANITARY DISTRICT  
CONTRA COSTA COUNTY, CALIFORNIA

**NOTICE TO CONTRACTORS  
INVITING SEALED PROPOSALS**

NOTICE IS HEREBY GIVEN that sealed proposals or bids will be received by the Stege Sanitary District (Owner) at the District's Office at 7500 Schmidt Lane, El Cerrito, California 94530 until **Tuesday JANUARY 16, 2024 @ 2:00 P.M.**, at which time they will be publicly opened and read for performing work as follows:

**STEGE SANITARY DISTRICT  
CANON PUMP STATION REHABILITATION PROJECT  
PROJECT NO. 23202 – JULY 2023**

Bids may be delivered to the District Secretary at the District Office at the above address between 9:00 A.M and 3:30 P.M., Monday through Friday or mailed to Stege Sanitary District at 7500 Schmidt Lane, El Cerrito, California 94530.

The principal items of work are:

**Project consists of converting existing dry pit/wet well sanitary sewer pump station to a wet well pump station with new submersible pumps (provide spare 3rd pump), including control panel, shade structure and electrical work. Contractor to bypass sanitary sewer flows without interruption during construction. Remove existing redwood trees. Construct new underground conduits and coordinate with PG&E to remove existing power pole and transition power to a new electrical service as shown on the plans. PG&E planning and agreement has already been arranged by Owner. Site surfacing work includes new concrete paving work and fencing. Additive Bid Items include new permanent generator and automatic transfer switch.**

The basis of Award of Contract is the lowest Total Base Bid Amount Bid or lowest Total Base Bid and Additive Bid by a responsible Contractor, at the discretion of the Owner. No bid will be received unless it is made on the proposal form furnished by the Owner in the bid documents. The contract, if awarded, will be awarded within one-hundred twenty (120) days from the opening of the bids.

No bidder may withdraw his proposal for a period of one-hundred twenty (120) days after the date set for opening of proposals.

All bids are to be compared on the basis of the Engineer's estimate of the quantities of work to be done. The Engineer's estimate is available upon request.

Bids must be accompanied by a proposal guaranty in the amount of **Ten (10) percent** of the bid as described in the specifications. Said guaranty shall be in the form of a certified check, cashier's check, or bid bond executed on the prescribed form in the amount not less than **Ten (10) percent** of the amount bid. **Said guaranty shall be forfeited to the Owner in case the bidder depositing the same does not, within ten (10) days after written notice that the contract has been awarded to the bidder, 1) enter into a contract with the District, and 2) furnish Performance Bond, Labor and Materials Bonds, Insurance Certificates, Contractor Safety Orientation and Contractor Self Certification Worksheet as described in the specifications.**

Pursuant to California Code of Civil Procedures Section 995.311, the District will verify all bonds for this Project are issued and executed by a California admitted surety. Bonds issued by a non-admitted surety will be rejected and will render the submitted bid non-responsive.

The special attention of prospective bidders is called to the "Instructions to Bidders" of the specifications for full directions as to bidding and related matters.

**There will be no pre-bid meeting.** All questions shall be made in writing and delivered to District offices or emailed to: paul@stegesano.org

The Owner reserves the right to reject any or all proposals or to waive any irregularities or informalities in any proposal or in the bidding.

Time of completion for this work is three hundred and sixty five (365) calendar days from the date of the start of work designated in the "Notice to Proceed".

The District has determined the general prevailing rate of per diem wages in the locality in which this work is to be performed for each craft or type of work needed to execute the contract to be as published by the State of California, Department of Industrial Relations, Division of Labor Statistics and Research, a copy of which is available on the Department's website, [www.dir.ca.gov/dlse](http://www.dir.ca.gov/dlse).

It shall be mandatory upon the Contractor to whom the contract is awarded and upon any subcontractor working under his supervision to pay not less than the above rates to all workmen employed by them in the execution of the contract. The successful bidder shall post a copy of such determinations at each job site.

The successful bidder intending to use a craft or classification not shown on the prevailing rate determinations may be required to pay the rate of the craft or classification most closely related to it.

The Contract Documents may be examined at the following locations:

Builders Exchange of Alameda County, San Leandro  
Builders Exchange of Contra Costa County, Concord  
Reed Construction Data, Norcross, GA  
Sierra Contractors Exchange, Burson  
Placer County Builders Exchange, Auburn  
Nevada County Contractors, Grass Valley  
Construction Bidboard, San Diego  
Stege Sanitary District, El Cerrito

Copies of the plans and specifications, forms of proposals, bonds and contract may be obtained at the office of the Stege Sanitary District, 7500 Schmidt Lane, El Cerrito, California 94530 (510) 524-4668, upon payment of \$30.00 per set if picked up or upon payment of \$40.00 per set if mailed. All payments are non-refundable.

In accordance with the provisions of California Public Contract Code Section 3300, the Owner has determined that the Contractor shall possess a valid Engineering Class A, Pipeline Class C-34, or Sewer Contractor Class C-42 license at the time that the contract is awarded. Failure to possess the specified license(s) shall render the bid as non-responsive and shall act as a bar to award of the contract to any bidder not possessing said license(s) at the time of award.

Stege Sanitary District

Date: **JULY 2023**

STEGE SANITARY DISTRICT  
Contra Costa County, California

**INSTRUCTION TO BIDDERS**

1. Bidder's attention is directed to the conditions of the General Conditions for the requirements and conditions which must be adhered to in the preparation of the proposal form and submission of this proposal.
2. Proposals shall be submitted in a sealed envelope, addressed to STEGE SANITARY DISTRICT. Each sealed envelope containing a Bid must be plainly marked on the outside as:

**STEGE SANITARY DISTRICT  
CANON PUMP STATION REHABILITATION PROJECT  
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and the envelope should bear the Bidder's address, and Contractor's license number on the outside. If forwarded by mail, the sealed envelope containing the Bid must be enclosed in another envelope addressed to STEGE SANITARY DISTRICT, 7500 SCHMIDT LANE, EL CERRITO, CALIFORNIA 94530.

3. Bidder's attention is directed to the requirements to complete and sign the following documents **WHICH ARE TO BE SUBMITTED WITH THE BID**:
  1. List of Subcontractors.
  2. Receipt of Addenda.
  3. Bidder's Experience Statement.
  4. Personnel Experience Statement.
  5. Contractor's License Statement.
  6. Non-Collusion Declaration
  7. Security for Compensation Certification.
  8. Bid Bond.
  9. Certification Concerning State Labor Standards and Prevailing Wages.
  10. Non-Discrimination Clause.
  11. Safety Program Qualification Criteria – Experience Modification Rate (EMR or Exmod).
  12. Safety Program Qualification Criteria – Recordable Incident Rate (RIR).
  13. Safety Program Qualification Criteria – Lost Time Incident Rate (LTIR).

The forms for the **Performance Bond, Labor and Material Bond** and the **Agreement** are attached herein for information and reference only and are to be filled out by the successful bidder upon instructions by the Owner. The **Contractor Safety Orientation** and **Contractor Self Certification Worksheet**, provided during the Pre-Bid meeting, are also to be completed and signed by the successful bidder upon instructions by the Owner prior to award.

4. All Bids shall be made on the required Bid forms supplied herein. All blank spaces for Bid prices must be filled in, in ink or typewritten, and the Bid forms must be fully completed and executed when submitted. Only one copy of the Bid forms is required.
5. The District (the OWNER) may waive any informalities or minor defects or reject any or all Bids. Any Bid may be withdrawn prior to the scheduled time for the opening of Bids or authorized postponement thereof. Any Bid received after the time and date specified shall not be considered. Should there be reasons why the contract cannot be awarded within the specified period; the time may be extended by mutual agreement between the OWNER and the Bidder.

6. Bidders must satisfy themselves of the accuracy of the estimated quantities in the Bid schedule by examination of the site and a review of the drawings and specifications including Addenda. After Bids have been submitted, the Bidder shall not assert that there was a misunderstanding concerning the quantities of work or of the nature of the work to be done.
7. The Contract Documents contain the conditions required for the construction of the Project. Information obtained from an officer, agent, or employee of the OWNER or any other person shall not affect the risks or obligations assumed by the Contractor or relieve the Contractor from fulfilling any of the conditions of the contract.
8. Each Bid must be accompanied by a **Proposal Guaranty** payable to the OWNER in the amount of not less than **Ten (10) percent** of the Bid. Such guaranty shall be in the form of a certified check, cashier's check, or bid bond executed on the prescribed form in the amount not less than **Ten (10) percent** of the amount bid. As soon as the Bid prices have been compared and reported to the Owner, the Owner will return the Proposal Guaranties of all except the three lowest responsive, responsible Bidders. When the Agreement is executed the Proposal Guaranties of the two remaining Bidders will be returned.
9. A **Performance Bond** and a **Labor and Material Bond** each in the amount of **100 percent of the contract price, including additive bid (\$bid price)**, with a corporate surety approved by the OWNER will be required for the faithful performance of the contract. The bond forms provided in this document must be used.
10. Attorneys-in-fact who sign Bid Bonds or Performance Bonds and Labor and Material Bonds must file with each Bond a certified and effective dated copy of their power of attorney.
11. If the surety on any bond furnished by the Bidder is declared bankrupt, or becomes insolvent, or its right to do business is terminated, the Bidder shall, within five (5) days thereafter, notify the OWNER and substitute another bond and surety, both of which must be acceptable to the OWNER.
12. The party to whom the contract is awarded will be required to execute the Agreement and provide the necessary insurance certifications within ten (10) calendar days from the date the Notice of Award is delivered to the Bidder. The Notice of Award shall be accompanied by the necessary Agreement.

The amount payable to the Owner under the proposal guaranty bond shall be forfeited to the Owner as liquidated damages in case of a failure of the Bidder to furnish, execute and deliver to the Owner the required performance bond, labor and material bond, evidence of insurance, and to enter into, execute and deliver to the Owner the Agreement on the form provided herewith within ten (10) days after being notified in writing by the Owner that the award has been made and the Agreement is ready for execution.
13. The OWNER within ten (10) days of receipt of an acceptable Performance Bond, Labor and Material Bond and Agreement signed by the party to whom the Agreement was awarded, shall sign the Agreement and return to such party an executed duplicate of the Agreement. Should the OWNER not execute the Agreement within such period, the Bidder may by Written Notice withdraw the signed Agreement. Such notice of withdrawal shall be effective upon receipt of the notice by the OWNER.
14. The OWNER may make such investigations as deemed necessary to determine the ability of the Bidder to perform the work, and the Bidder shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. A Bidders prior history of unsatisfactory performance on work for the District shall constitute grounds for disqualifying a Bidder.
15. The OWNER reserves the right to reject any Bid if the evidence submitted by, or investigation of such Bidder fails to satisfy the OWNER that such Bidder is properly qualified to carry out the obligations of the Agreement and to complete the work contemplated therein.
16. In accordance with Section 4104 of the California Public Contract Code, each bidder, in its Bid, shall set forth: (1) the name and location of the place of business of each subcontractor who will perform work or labor, render services to the contractor in or about the construction of the work, or improvement, in an



amount in excess of one-half of one percent of the Contractor's total bid; and (2) the portion of the work which will be done by each such subcontractor. In accordance with Section 4107 of the California Public Contract Code, no Contractor whose bid is accepted shall without consent of the OWNER either: (1) substitute any person as a subcontractor in place of the subcontractor designated in the original bid; or (2) permit any such subcontract to be assigned or transferred, or allowed it to be performed by anyone other than the original subcontractor listed in the bid; or (3) Sublet or subcontract any portion of the work in excess of one-half of one percent of the Contractor's total bid as to which his original bid did not designate a subcontractor. Penalties for failure to comply with the foregoing sections of the California Public Contract Code are set forth in Section's 4106, 4110 and 4111 of the Public Contract Code.

17. Notice is hereby given that, pursuant to Section 1773 of the Labor Code of the State of California, the Owner has obtained from the Director of the Department of Industrial Relations the general prevailing rate of per diem wages and the general prevailing rate for holidays and overtime work for each craft, classification, or type of worker required to execute the contract. A copy of said prevailing rate of per diem wages is on file in the principal office of the OWNER, to which reference is hereby made for further particulars. Said prevailing rate of per diem wages will be made available to any interested party upon request, and a copy thereof shall be posted at each job site.
18. Bid specifications and contracts and other procedures in connection with bids or contracts shall be subject to modification to comply with revisions in federal minimum wage schedules without the necessity of republication of duplication of other formal statutory requirements.
19. In accordance with Section 1775 of the California Labor Code, the Contractor shall as a penalty to the State of political subdivision on whose behalf a contract is made or awarded, forfeit up to two hundred Dollars (\$200.00) for each calendar day or portion thereof, for each worker paid less than the stipulated prevailing rates for any public work done under the Contract by the Contractor or by any subcontractor under the Contractor.
20. In accordance with Section 1813 of the California Labor Code, the Contractor shall as a penalty to the State or political subdivision on whose behalf the Contractor is made or awarded, forfeit twenty-five (\$25.00) dollars for each worker employed in the execution of the Contract by the Contractor or by any subcontractor for each calendar day during which said worker is required or permitted to work more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week in violation of Section's 1810-1815 of the California Labor Code.
21. As required by Section 1860 of the California Labor Code and in accordance with the provisions of Section 3700 of the Labor Code, every contractor will be required to secure the payment of worker's compensation to its employee.
22. In accordance with Section 1860 of the California Labor Code, the Contractor shall furnish the Owner a notarized statement as follows: "I am aware of the provisions of Section 3700 of the Labor Code which requires every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work of this Contract."
23. Contractor agrees to comply with Section's 1777.5, 1777.6 and 1777.7 (as amended) of the California Labor Code relating to the employment of apprentices. The responsibility for compliance with these provisions is fixed with the prime contractor for all apprentice-able occupations. Under these sections of the law, contractors and sub-contractors must employ apprentices in apprentice-able occupations, where journeymen in the craft are employed on the public work, in a ration of not less than one hour of apprentice work for every five hours of labor performed by a journeyman (unless an exemption is granted in accordance with Section 1777.5) and contractors and subcontractors shall not discriminate among otherwise qualified employees as indentured apprentices on any public work solely on the ground of race, religious creed, color, national origin, ancestry, sex, sexual orientation, or age, except as provided in Section 3077 of the Labor Code. Only apprentices, as defined in Section 3077, who are in training under apprenticeship standards and who have signed written apprentice agreements will be employed on public works in apprentice-able occupations.

24. In accordance with Section 1771.1 of the California Labor Code, a contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded. No contractor or subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to California Labor Code section 1725.5.

25. In accordance with Section 1771.4 of the California Labor Code, this Project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

26. Attention is specifically directed to all provisions of the Labor Code of the State of California and the federal Davis-Beacon Act with regard to workmen and wages. Wages shall not be less than the prevailing wage rates determined for the County of Contra Costa at the time of the bid, pursuant to said provisions and as listed in the "Wage Scales." Contractors must comply with provision of the Work Hours and Safety Standards Act (40 U.S.C. 327 ET SEQ.) and the regulations issued there-under.

As required by Section 1773.8 of the California Labor Code, the Contractor shall pay travel and subsistence payments to each worker 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.

To establish such travel and subsistence payments, the representative of any craft, classification, or type of workman needed to execute the contracts shall file with the Department of Industrial Relations fully executed copies of collective bargaining agreements for the particular craft, classification or type or work involved. Such agreements shall be filed with ten (10) days after their execution and thereafter shall establish such travel and subsistence payments whenever filed thirty (30) days prior to the call for bids.

27. The Bidders' attention is directed to Part III of the Specifications, "Special Conditions," associated with this project. The bidders shall review and understand these special requirements of the project as described under this section.

28. In accordance with Sections 20800, et. Seq, of the California Public Contract Code, the following safety qualification guidelines shall be used to determine the responsible BIDDER. For a BIDDER to be considered responsible with regards to their safety record and for the BIDDER's bid to be considered, both the BIDDER and their first tier subcontractors listed on the bidders list of subcontractors shall each meet at least two of the three minimum safety standards as specified in paragraphs 26.1 through 26.3 hereinafter. BIDDER shall submit the appropriate proposal forms on pages BP.23 through BP.25 as part of the bid to demonstrate the BIDDER's and their first tier subcontractor's safety qualifications. If either BIDDER or first tier subcontractor cannot satisfy two of the three minimum safety standards, BIDDER's will be allowed the option of meeting only one of the minimum safety standards, but in doing so, the BIDDER will be required to provide the services of a third-party safety consultant specializing in the type of work to be performed that is acceptable to the Agency.

The third party safety consultant will be used in the capacity of reviewing the Contractor's Site Safety and Project Safety Plans, providing periodic monitoring of site safety at a frequency to be determined by the Agency, reviewing special safety hazards not addressed in the Contractor's safety plans and reviewing and evaluating the safety incidents that occur during the project.

28.1 Experience Modification Rate (EMR or Exmod): Experience modification rates are calculated by the insurance industry as a way to determine equitable workers' compensation insurance premiums. It is calculated as a three-year moving average. Due to the particular safety hazards inherited in working in a wastewater collection, handling, treatment and/or disposal environment, the OWNER has deemed it necessary that a BIDDER shall have a current three-year average EMR of **1.0** or lower to be considered a responsible bidder.

- 28.2 Recordable Incident Rate (RIR): The RIR is a measure of the frequency of injuries and is a measure of all occupational injuries and illnesses that occur within an organization. It is calculated from the OSHA Log 300 form. Due to the particular safety hazards inherited in working in a wastewater collection, handling, treatment and/or disposal environment, the OWNER has deemed it necessary that a BIDDER shall have a current three-year average RIR of **5.1** or lower to be considered a responsible bidder.
- 28.3 Lost Time Incident Rate (LTIR): The LTIR is an indicator of the severity of a company's occupational injuries. The LTIR deals only with incidents that result in lost work time. Like the RIR, the information needed to calculate the LTIR is derived OSHA Log 300 form. Due to the particular safety hazards inherited in working in a wastewater collection, handling, treatment and/or disposal environment, the OWNER has deemed it necessary that a BIDDER shall have a current three-year average RIR of **2.2** or lower to be considered a responsible bidder.

The **Contractor Safety Orientation** and **Contractor Self Certification Worksheet**, provided during the Pre-Bid meeting, are also to be completed and signed by the successful bidder upon instructions by the Owner prior to award.

29. Bid Protest Procedures.

Any protest of the proposed award of bid to the bidder deemed the lowest responsible bidder must be submitted in writing to Owner, no later than 4:00 pm of the second (2nd) business day following the date of the bid opening. If a bidder protests more than one bid, the bidder shall file a separate protest as to each bid being protested, complying with this Section.

The initial protest must contain a complete written statement of the basis for the protest. The protest must state the facts and refer to the specific portion of the document or the specific statute that form the basis for the protest. The protest must include the name, address, telephone number, and email address of the person representing the protesting party. The protest must be signed and submitted under penalty of perjury.

The protestor shall also submit a non-refundable fee of one thousand dollars (\$1,000.00) per protest via certified or cashier's check made payable to "Stege Sanitary District" to reimburse its costs in reviewing and investigating the bid protest.

The protestor must concurrently transmit a copy of the initial protest to the bidder whose bid is being protested. Faxed or emailed copies are acceptable, with confirmation of receipt by the bidder whose bid is being protested.

The protestor must have actually submitted a bid on the Project or have been specifically excluded from filing a bid due to an action by Owner. A subcontractor of a party filing a bid on this Project may not submit a bid protest. A party may not rely on the bid protest submitted by another bidder, but must timely pursue its own protest.

The procedure and time limits set forth in this Section 27 are mandatory and are the bidder's sole and exclusive remedy in the event of a bid protest. The bidder's failure to fully comply with these procedures shall constitute a waiver of any right to further pursue the bid protest, including filing a claim pursuant to the California Government Code, challenging the award of contract pursuant to the California Public Contract Code, or other legal proceedings.

Owner shall review the bid protest and shall issue its determination within a reasonable amount of time prior to bid award. The District Manager has the authority to issue a final determination on all bid protests. Owner shall not be required to hold an administrative hearing to consider any protest.

30. Instructions to Bidders are hereby made a part of the contract documents.

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# **BID PROPOSAL**

STEGE SANITARY DISTRICT  
PROJECT NO. 23202  
JULY 2023

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**PROPOSAL FORM  
STEGE SANITARY DISTRICT  
CONTRA COSTA COUNTY, CALIFORNIA**

**CANON PUMP STATION REHABILITATION PROJECT  
PROJECT NO. 23202 – JULY 2023**

To the Honorable Board of Directors  
Stege Sanitary District  
7500 Schmidt Lane  
El Cerrito, California 94530-0530

Attention: Mr. Rex Delizo, District Manager

Gentlepersons:

Pursuant to the contract plans and specifications, the undersigned, as bidder declares that he has carefully examined the location of the proposed work as evidenced by the attached executed statement of inspection of sites, and the specifications pertaining thereto, and he proposes and agrees if this proposal is accepted that he will contract with the Stege Sanitary District (“Owner” or “District”) to provide all the labor, materials, necessary machinery tools, apparatus, and other means of construction and do all the work specified in the contract in the manner and time herein set forth required for the completion construction of:

**STEGE SANITARY DISTRICT  
CANON PUMP STATION REHABILITATION PROJECT  
PROJECT NO. 23202 – JULY 2023**

Construction shall be in strict conformity with the plans and specifications dated, **JULY 2023** prepared by the Stege Sanitary District and on file at the District offices at 7500 Schmidt Lane, El Cerrito, CA. Said plans and specifications are hereby made a part hereof.

**NO PRE-BID MEETING** will be offered. Attendance at the pre-bid meeting is NOT a requirement for submitting a bid for the work.

The bidder proposes to contract with the Stege Sanitary District to perform all of the above work, including subsidiary obligations as defined in said specifications, for the following price, to wit:

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## **BID ITEM DESCRIPTIONS**

### **1.0 GENERAL**

#### **1.1 CONDITIONS**

- A. Bid Items shall be bid and paid based on the Bid Item descriptions as listed below. The Bid Items are presented to indicate major categories of the work for purposes of comparative bid analyses and payment breakdown for monthly progress payments. Bid Items are not intended to be exclusive descriptions for work categories and the CONTRACTOR shall determine and include in its pricing all materials, labor, and equipment necessary to complete each Bid Item as shown and specified.
  
- B. CONTRACTOR shall perform all work depicted in the Contract Documents whether it is specifically mentioned in the Bid Schedule and Bid Item descriptions or not. The Bid Schedule and Bid Item descriptions below are not intended to cover any and all Work depicted in the Contract Documents. Not all elements of every part of the Work are explicitly listed. It is the intention of the District, and a provision of this Contract, that any and all of the Work depicted shall be included in the CONTRACTOR's bid and installed complete at a price included in a Bid Item submitted with the CONTRACTOR's bid. No adjustment will be made to unit, extended, or total price for an item that is depicted in the Contract Documents but is not specifically described or itemized. Such items may be included for payment in a Bid Item of the CONTRACTOR's choice, as long as the chosen Bid Item is closely related.
  
- C. Bid Items noted as "Revocable" in this Specification Section may be deleted entirely or in part or added to at the sole discretion of the City.

### **2.0 BID ITEM DESCRIPTION**

- 2.1 Bid Item No. 1 – Mobilization and Demobilization (Not to exceed 5% of Base Bid)
  - A. This Bid Item shall include preparatory work and operations, including but not limited to, those necessary for movement of personnel, equipment, supplies, and incidentals to the project sites; for the establishment of all field offices, fencing and other facilities necessary for work on the Project; pre and post construction survey and photographic and video surveys to establish pre and post condition property and structure assessments; preparing, submitting, and paying for all required permits by other agencies if applicable; removal of equipment and project closeout; furnishing temporary construction utilities, installing construction signs; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various contract items on the project sites and following the conclusion of work to remove all such items from the site. Payment for this Bid Item shall be on a lump sum basis. 10% of this Bid Item shall be reserved for payment at job close. This Bid Item shall not exceed ten percent (5%) of the base bid price.
  
- 2.2 Bid Item No. 2 – Site Preparation, Clearing, and Grubbing
  - A. This bid item shall include all labor, materials, tools, and equipment necessary for preparation of the site. Payment for this Bid Item shall be on a lump sum basis.
  
- 2.3 Bid Item No. 3 – Tree Removal and Permitting
  - A. This bid item shall include all labor, materials, tools, and equipment necessary for permitting and demolition of the existing trees designated for removal as shown on the project drawings. Payment for this Bid Item shall be on a lump sum basis.

- 2.4 Bid Item No. 4 – Pump Station Demolition
- A. This bid item shall include all labor, materials, tools, and equipment necessary for the demolition, removal, and disposal of the existing structures, equipment, panels, and appurtenances as shown on the project drawings. Work includes, but is not limited to, demolition of existing pump station mechanical and electrical equipment including PG&E service pole, demolition for portions of the existing drywell and wetwell, abandonment of the existing drywell, demolition of existing fence and access gate. This bid item shall include all labor, materials, tools, sampling, testing, and equipment necessary to comply with hazardous materials removal and disposal requirements and permit requirements. Payment for this Bid Item shall be on a lump sum basis.
- 2.5 Bid Item No. 5 – Excavation, Shoring, and Bracing
- A. This bid item shall include necessary materials, equipment, and labor necessary to provide excavations and shoring of open excavations, environmental testing, dewatering, removal, transportation, and disposal of materials excavated for the Project, complying with requirements outlined in Section 31 00 00 “Earthwork”, as required to demolish and construct the at-grade and below-grade facilities as required by the Contract Documents. Payment for this item shall be on a lump sum basis.
- 2.6 Bid Item No. 6 – Bypass Pumping
- A. This bid item shall include materials, equipment, and labor necessary to protect the work from sanitary sewer flows by providing bypass pumping equipment, facilities, and proper disposal of water as required by the Contract Documents and Section 01 53 00. Payment for this item shall be on a lump sum basis.
- 2.7 Bid Item No. 7 – Wetwell and Valve Cans
- A. This bid item shall include all labor, materials, and equipment necessary to furnish and install the proposed wetwell riser, top slab, concrete collar, valve cans/lids, and valve stem extensions as shown on the project drawings. Payment for this Bid Item shall be on a lump sum basis.
- 2.8 Bid Item No. 8 – Submersible Pumps and Accessories
- A. This bid item shall include all labor, materials, and equipment necessary to furnish and install three (3) submersible pumps along with appurtenances as needed to provide a complete and fully functioning pump station. One pump shall be provided as a redundant/backup pump for the District. Installation, operation, and maintenance manuals specific to this project shall be included in this bid item. Payment for this Bid Item shall be on lump sum basis.
- 2.9 Bid Item No. 9 – Piping, Valves, and Accessories
- A. This bid item shall include all labor, materials, and equipment necessary to furnish and install all piping, valves and appurtenances as shown on the project plans and specifications, including but not limited to, Sections 33 12 01, 33 31 00, 33 31 13, 33 31 14, and 33 31 15. Work includes, but is not limited to, 14-inch and 6-inch piping, fittings, valves, supports, coatings, and appurtenances. Payment for this Bid Item shall be on a lump sum basis.
- 2.10 Bid Item No. 10 – Electrical Panels
- A. This bid item shall include all necessary materials, equipment, and labor necessary to furnish, install, and test new electrical panels and appurtenances as shown on the project

drawings. Payment for this Bid Item shall be on a lump sum basis.

- 2.11 Bid Item No. 11 – Miscellaneous Electrical Work
- A. This bid item shall include all labor, materials, and equipment necessary to furnish and install all electrical conduits, conductors, fittings, floats, controls, lighting and all associated appurtenances as shown on the project plans. This bid item shall include all trenching, backfill, potholing, and coordination with PG&E for the installation of secondary conduit and conductor, pullboxes and appurtenances to PG&E standards. Payment for this Bid Item shall be on a lump sum basis.
- 2.12 Bid Item No. 12 – Access Hatches
- A. This bid item shall include all labor, materials, and equipment necessary to furnish and install all access hatches and associated appurtenances as shown on the project drawings. Payment for this Bid Item shall be on a lump sum basis.
- 2.13 Bid Item No. 13 – Site Improvements
- A. This bid item shall include all labor, materials, tools, equipment, and appurtenances for all work necessary to complete site improvements as shown on the project plans. Work includes, but is not limited to, site grading, surfacing, access gates, retaining walls and fencing. Payment for this item shall be on a lump sum basis.
- 2.14 Bid Item No. 14 – Concrete Foundations
- A. This bid item shall include all labor, materials including but not limited to required rebar, concrete and formwork, and equipment necessary to construct the equipment pads on site. Work includes but is not limited to the MCC / shade structure equipment pad and service pedestal equipment pad. Payment for this item shall be on a lump sum basis.
- 2.15 Bid Item No. 15 – Startup, Testing and Commissioning
- A. Startup, testing, and commissioning shall be measured and paid on a Lump Sum (LS) basis. The contract price shall include full compensation for providing all items necessary for the execution and completion of this work including, but not limited to, performing startup services as well as testing for all electrical, mechanical and piping systems in accordance with the Standard Specifications, Standard Plans, the Plans, the Special Provisions and the Technical Specifications, and as directed by the Engineer. Payment for this item shall be on a lump sum basis.
- 2.16 Bid Item No. 16 – As-built Redlines
- A. The contract Lump Sum (LS) paid for as-built redlines is a \$1,000 allowance and shall be paid for preparation of redlines for record drawings in accordance with the standard provisions. Final contract payment and retention will not be made until the redlines have been submitted and reviewed by the City.
- 2.17 Bid Item No. 17 – Standby Generator, ATS, foundation Pad and Appurtenances (Revocable)
- A. This bid item shall include all labor, materials, tools, equipment, instrumentation, and appurtenances for all work necessary to install the generator particulate filter and filter supports. Work includes, but is not limited to, installation of the generator particulate filter and filter supports. Payment for this item shall be on a lump sum basis. This Bid Item is revocable as defined Section 1.1 C. of this specification.

**3.0 PRODUCTS**

NOT USED

**4.0 EXECUTION**

NOT USED

**5.0 MEASUREMENT AND PAYMENT**

Full compensation for conforming to these requirements shall be included in the contract prices for various items of work involved in accordance with the project Plans, General and Special Provisions, these Technical Specifications, and as directed by the Engineer, and no additional compensation will be made therefor.

**BID SCHEDULE**  
**CANON PUMP STATION REHABILITATION PROJECT**  
**PROJECT NO. 23202**

A. BID SCHEDULE

ITEM	QTY	UNIT	DESCRIPTION	TOTAL AMOUNT
1.	1	LS	MOBILIZATION/DEMOBILIZATION, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
2.	1	LS	SITE PREPARATION, CLEARING AND GRUBBING, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
3.	1	LS	TREE REMOVAL AND PERMITTING, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
4.	1	LS	PUMP STATION DEMOLITION, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
5.	1	LS	EXCAVATION, SHORING AND BRACING, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
6.	1	LS	BYPASS PUMPING, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
7.	1	LS	WETWELL AND VALVE CANS, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
8.	1	LS	SUBMERSIBLE PUMPS AND ACCESSORIES, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
9.	1	LS	PIPING, VALVES AND ACCESSORIES, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
10.	1	LS	ELECTRICAL PANELS, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
11.	1	LS	MISCELLANEOUS ELECTRICAL WORK, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
12.	1	LS	ACCESS HATCHES, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____

13.	1	LS	SITE IMPROVEMENTS, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
14.	1	LS	CONCRETE EQUIPMENT PADS, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
15.	1	LS	STARTUP, TESTING AND COMMISSIONING, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
16.	1	LS	AS-BUILT REDLINES, COMPLETE IN PLACE, FOR THE LUMP SUM OF	\$ _____
PF.	--	LS	PERMIT FEES (IF REQUIRED. Actual fees to be reimbursed by OWNER)	\$ <u>    N/A    </u>

**TOTAL AMOUNT BASE BID:**

_____	\$	_____
<b>(FIGURE IN WORDS)</b>		<b>(IN FIGURES)</b>

ADDITIVE BID ITEM #1.	1	LS	STANDBY GENERATOR, COMPLETE IN PLACE, FOR THE LUMP SUM OF <b><u>(ADDITIVE BID ITEM / REVOCABLE)</u></b>	\$ _____
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**TOTAL AMOUNT ADDITIVE BID:**

_____	\$	_____
<b>(FIGURE IN WORDS)</b>		<b>(IN FIGURES)</b>

**BASIS OF AWARD:** The basis of Award of Contract is the lowest Total Base Bid or lowest Total Base Bid and Additive Bid by a responsible Contractor at the discretion of the Owner. The Owner reserves the right to reject any and all proposals and to waive any informality in any proposal or bid. A Contractor's prior history of unsatisfactory performance on work for the Owner constitutes grounds for disqualifying the Contractor's bid for the work.

The undersigned understands the estimate of construction items hereinbefore set forth is approximate only, being given as a basis for the comparison of bids and the District does not expressly or by implication agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the extent of any item of the work or to omit items of the work as may be deemed necessary or expedient by the Engineer or required by funding limitations.

The undersigned understands all bids will be compared on the basis of the Engineer's Estimate of the items of the work to be done. The undersigned has checked carefully all of the above figures and understands that the District shall not be responsible for any errors or omissions on the part of the undersigned in making up this bid.

In accordance with Section 4552 of the California Public Contract Code, the bidder 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. Section 15) or under the Cartwright Act (Chapter 2 (commencing Section 16700) of Part 2 of Division 7 of the California Business and Professions Code), arising from purchase of goods, materials, or services by the bidder for sale to the Owner pursuant to the bid. Such assignment shall be made and become effective at the time the Owner tenders final payment to the bidder.

The undersigned understands that the District reserves the right to reject any or all bids and to waive any information or irregularities in bids received and may at its option make the award that in the judgment of the Owner is in the best interest of the Owner.

It is agreed that this bid may not be withdrawn for a period of one-hundred twenty (120) days from the opening thereof. The terms and conditions of the final contract when executed shall control and supersede anything herein to the contrary or inconsistent with such contract.

Attached is the proposal guaranty bond form bound herewith, duly executed in the amount of **Ten (10) percent** of the bid as described in the specifications; or alternately there is attached a certified or cashier's check payable to the Owner in the amount not less than **Ten (10) percent** of the amount bid. If we choose to attach a proposal bond, we understand and agree that the Owner may reject our proposal if the surety does not meet the requirements of Section G2.09, or if Owner has cause to believe the surety is likely to be incapable of fulfilling its obligations under the bond.

As part of this proposal the undersigned has filled out, executed and notarized where indicated the forms included herein and listed as follows:

1. List of Subcontractors
2. Receipt of Addenda.
3. Bidder's Experience Statement.
4. Personnel Experience Statement.
5. Contractor's License Statement.
6. Non-Collusion Affidavit (To be notarized)
7. Security for Compensation Certification.
8. Bid Bond.
9. Certification Concerning State Labor Standards and Prevailing Wages.
10. Non-Discrimination Clause.
11. Safety Program Qualification Criteria – Experience Modification Rate (EMR or Exmod).
12. Safety Program Qualification Criteria – Recordable Incident Rate (RIR).
13. Safety Program Qualification Criteria – Lost Time Incident Rate (LTIR).

Name under which business is conducted \_\_\_\_\_

Business Address: \_\_\_\_\_ ZIP: \_\_\_\_\_

Telephone No.: \_\_\_\_\_ Fax: \_\_\_\_\_

Contractor's License No.: \_\_\_\_\_ Exp. Date: \_\_\_\_\_

**NOTE:** If bidder, or other interested person is a corporation, the legal name of the corporation shall be set forth together with the names of the president, secretary, treasurer, and manager thereof; also, signature of the officer or officers authorized to sign contracts on behalf of the corporation.

If the bidder is a co-partnership, state true name of firm; also, names of all individual co-partners composing the firm and the signature of the partner or partners authorized to sign contracts in behalf of the co-partnership.

If the bidder is an individual, state first and last name in full, together with signature.

IF SOLE PROPRIETOR, sign here:

I sign as sole owner of the business named above.

\_\_\_\_\_ Date: \_\_\_\_\_

IF PARTNERSHIP, sign here:

The undersigned certify that they sign the contract proposal with full and proper authorization so to do.  
(One or more partners sign)

\_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_ Date: \_\_\_\_\_

IF CORPORATION, execute here:

The undersigned certify that they sign this contract proposal with full and proper authorization so to do:

Corporate Name: \_\_\_\_\_

By: \_\_\_\_\_ Title: \_\_\_\_\_

By: \_\_\_\_\_ Title: \_\_\_\_\_

Incorporated under the laws of the State of \_\_\_\_\_



**LIST OF SUBCONTRACTORS**

In compliance with the provisions of Sections 4100-4107 of the Public Contract Code of the State of California and any amendments thereof, the name and location of the mill, shop or office of each Subcontractor who will perform work or labor or render services to the Contractor in or about the construction of the work or improvement to be performed under these specifications and which work will be in excess of 1/2 of 1 percent of the total proposal and the portion of the work which will be done by each Subcontractor are set forth below.

NAME AND PLACE OF BUSINESS OF SUBCONTRACTOR	PORTION OF WORK TO BE DONE (%)	LICENSE #
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____

\_\_\_\_\_  
Signature of Bidder

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Date







**CONTRACTOR'S LICENSE STATEMENT**

Contractor: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone No. (\_\_\_\_\_) \_\_\_\_\_

License No.: \_\_\_\_\_

Classification: \_\_\_\_\_

License Expiration Date: \_\_\_\_\_

"I declare under the penalty of perjury under the laws of the State of California that the foregoing is true and correct."

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, at \_\_\_\_\_, California.

\_\_\_\_\_  
Signature of Contractor

**NON-COLLUSION DECLARATION**

**TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID**

**(Public Contract Code § 7106)**

The undersigned declares:

I am the \_\_\_\_\_ (title) of \_\_\_\_\_ (company/contractor) the party making the foregoing bid. The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. 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. All statements contained in the bid are true. 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, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose. Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on \_\_\_\_\_ [date], at \_\_\_\_\_ [city], California.

By \_\_\_\_\_  
(Signature)

Name \_\_\_\_\_  
(Printed Name)

Title \_\_\_\_\_

BP.14

**SECURITY FOR COMPENSATION CERTIFICATE**

TO: \_\_\_\_\_

\_\_\_\_\_

I am aware of the provisions of Section 3700 of the Labor Code of the State of California which require every employer to be insured against liability for workman's compensation or to undertake self insurance in accordance with the provisions of that Code, and I will comply with such provisions before commencing the performance of the work of this Contract.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(Signature of Bidder)

\_\_\_\_\_  
Business Address

\_\_\_\_\_  
Place of Residence

The successful bidder prior to the award of contract must execute this certificate. The bidder shall execute the certificate on this page at the time of submitting his bid proposal.

(This page left blank intentionally)



**BID BOND**  
**(10% of Bid Price)**

KNOW ALL MEN BY THESE PRESENTS:

THAT \_\_\_\_\_, hereinafter called the Principal, and \_\_\_\_\_, hereinafter called the Surety, are jointly and severally held and firmly bound unto Stege Sanitary District, hereinafter call the Oblige, each in the penal sum of **Ten (10) percent** of the total amount of the bid proposal of the Principal for the work, this sum not to exceed \_\_\_\_\_dollars of lawful money of the United States for the payment whereof unto the Oblige the Principal and Surety jointly and severally bind themselves forever by these presents.

WHEREAS the Principal is herewith submitting its offer for the fulfillment of the Stege Sanitary District contract for CANON PUMP STATION REHABILITATION PROJECT, PROJECT NO. 23202 – JULY 2023 as provided for in the Contract Documents.

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

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

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

SIGNED AND SEALED THIS \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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**CONTRACTOR'S/SUBCONTRACTOR'S CERTIFICATION  
CONCERNING STATE LABOR STANDARDS AND PREVAILING WAGES**

All contractors and subcontractors shall give the following certifications to the grantee and forward this certification to the grantee within ten (10) days after the execution of any contract or subcontract.

- A. "I am aware of the provisions of Section 1720 et seq. of the California Labor Code which requires that the State prevailing wage rate shall be paid to employees where this rate exceeds the federal wage rate."
  
- B. "I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that Code, and I will comply with such provisions before commencing the performance of the work of this contract."
  
- C. "Contractor stipulates and agrees to conform with all provisions of Labor Code, Sections 1810 through 1815, eight (8) hours labor shall constitute a legal day's work, and no worker shall be required or permitted to work more than eight (8) hours in any one (1) calendar day and forty (40) hours in any one (1) calendar week, except as provided for under Section 1815. Nothing in this provision shall be construed to relate to wage determination or in any way affect contractual provisions related to compensation.

Notwithstanding the Labor Code provision set forth above, pursuant to Labor Code, Section 1815, work performed by employees of Contractor in excess of eight (8) hours per day and forty (40) hours during any one (1) week shall be permitted provided that compensation shall be made for all hours worked in excess of eight (8) hours per day at not less than one and one-half (1-1/2) times the basic rate of pay.

\_\_\_\_\_  
(Contractor/Subcontractor)

By: \_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Typed Name and Title)

## NON-DISCRIMINATION CLAUSE

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

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, or national origin. The 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, 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. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

(2) The 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, or national origin.

(3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The 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.

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

(6) In the event of the contractor's non-compliance with the nondiscrimination clauses of this contract or with any of such 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 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.

(7) the contractor will include the provisions of paragraphs (1) through (7) 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. The contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

(b) Federally assisted construction contracts. (1) Except as otherwise provided, each administering agency shall require the inclusion of the following language as a condition of any grant, contract, loan, insurance, or guarantee involving federally assisted construction which is not exempt from the requirements of the equal opportunity clause: The applicant hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the following equal opportunity clause:

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

1. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, or national origin. The 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, 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. The 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. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, sexual orientation, or national origin.

3. The contractor will send to each labor union or representative of workers with which 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 the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. The 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.

5. The 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.

6. In the event of the 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.

7. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) 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. The 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 a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, that if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in

part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

(c) Subcontracts. Each nonexempt prime contractor or subcontractor shall include the equal opportunity clause in each of its nonexempt subcontracts.

(d) Incorporation by reference. The equal opportunity clause may be incorporated by reference in all Government contracts and subcontracts, including Government bills of lading, transportation requests, contracts for deposit of Government funds, and contracts for issuing and paying U.S. savings bonds and notes, and such other contracts and subcontracts as the Deputy Assistant Secretary may designate.

(e) Incorporation by operation of the order. By operation of the order, the equal opportunity clause shall be considered to be a part of every contract and subcontract required by the order and the regulations in this part to include such a clause whether or not it is physically incorporated in such contracts and whether or not the contract between the agency and the contractor is written.

(f) Adaptation of language. Such necessary changes in language may be made in the equal opportunity clause as shall be appropriate to identify properly the parties and their undertakings. [43 FR 49240, Oct. 20, 1978, as amended at 62 FR 66971, Dec. 22, 1997]

1. During the performance of this contract, contractor and its subcontractors shall not unlawfully discriminate against any employee or applicant for employment because of sex, sexual orientation, race, religion, color, national origin, ancestry, physical disability (including HIV and AIDS), mental disability, medical condition (cancer), marital status, age (over 40) or denial of family care leave. Contractors and subcontractors shall insure that the evaluation and treatment of their employees and applicants for employment are free of such discrimination and harassment. Contractors and subcontractors shall comply with the provisions of the Fair Employment and Housing Act (Government Code Section 12900 (a-f) et seq.) and the applicable regulations promulgated there under (California Administrative Code, Title 2, Section 7285.0 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code, Section 12900 (a-f), set forth in Chapter 5 of Division 4 of Title 2 or the California Administrative Code are incorporated into this contract by reference and made a part hereof as if set forth in full. Contractor and its subcontractor shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.

2. The contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the contract.

THE UNDERSIGNED CERTIFIES THAT THE CONTRACTOR WILL COMPLY WITH THE ABOVE REQUIREMENTS.

CONTRACTOR OR  
SUBCONTRACTOR NAME: \_\_\_\_\_

CERTIFIED BY:

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

**SAFETY PROGRAM QUALIFICATION CRITERIA  
Experience Modification Rate (EMR or Exmod)**

The following information will be used to determine if you meet the minimum safety requirements for this project. To qualify, you must not have a three-year average Workers' Compensation Experience Modification Rate greater than 1.0. This form shall be submitted by the primary contractor and first tier subcontractors.

Enter your Experience Modification Rate for the last three complete years (available from your insurance carrier).	
20_____	EMR = _____
20_____	EMR = _____
20_____	EMR = _____
Three Year Average EMR = _____	

Company Name \_\_\_\_\_

Contact Name \_\_\_\_\_ Telephone \_\_\_\_\_

To verify the above information, we will contact your workers' compensation insurance carrier. Please authorize your carrier to release this information. Failure to do so will result in automatic disqualification.

Workers' Compensation Insurance Company \_\_\_\_\_

Contact Person \_\_\_\_\_ Telephone \_\_\_\_\_

<b>Do not write in this space</b>		
Qualified [ ]	Not qualified [ ]	EMR information verified [ ]

**SAFETY PROGRAM QUALIFICATION CRITERIA  
Recordable Incident Rate (RIR)**

The following information will be used to determine if you meet the minimum safety requirements for this project. To qualify, you must not have a three-year average Recordable Incident Rate greater than **5.1**. Incident rate information is on your OSHA Log 300. Please calculate the RIR for the last three complete years as follows. This form shall be submitted by the primary contractor and first tier subcontractors.

$$\frac{\text{Total number of recordable incidents} \times 200,000}{\text{Total employees hours worked}} = \text{RIR}$$

Year	Number of Recordable Incidents	Total Employee Hours Worked	Recordable Incident Rate (RIR)
20 _____	_____	_____ hrs.	RIR = _____
20 _____	_____	_____ hrs.	RIR = _____
20 _____	_____	_____ hrs.	RIR = _____
Three Year Average RIR = _____			

Company Name \_\_\_\_\_

Contact Name \_\_\_\_\_ Telephone \_\_\_\_\_

To verify the above information, we will contact your workers' compensation insurance carrier. Please authorize your carrier to release this information. Failure to do so will result in automatic disqualification.

Workers' Compensation Insurance Company \_\_\_\_\_

Contact Person \_\_\_\_\_ Telephone \_\_\_\_\_

<b>Qualified [ ]</b>	<b>Do not write in this space</b> <b>Not qualified [ ]</b>	<b>RIR information verified [ ]</b>
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**SAFETY PROGRAM QUALIFICATION CRITERIA  
Lost Time Incident Rate (LTIR)**

The following information will be used to determine if you meet the minimum safety requirements for this project. To qualify, you must not have a three-year average Lost Time Incident Rate greater than 2.2. Incident rate information is on your OSHA Log 300. Please calculate the LTIR for the last three complete years as follows. This form shall be submitted by the primary contractor and first tier subcontractors.

$$\frac{\text{Total number of lost-time incidents} \times 200,000}{\text{Total employees hours worked}} = \text{LTIR}$$

Year	Number of Lost-time Incidents	Total Employee Hours Worked	Lost Time Incident Rate (LTIR)
20 _____	_____	_____ hrs.	LTIR = _____
20 _____	_____	_____ hrs.	LTIR = _____
20 _____	_____	_____ hrs.	LTIR = _____
Three Year Average			LTIR = _____

Company Name \_\_\_\_\_

Contact Name \_\_\_\_\_ Telephone \_\_\_\_\_

To verify the above information, we will contact your workers' compensation insurance carrier. Please authorize your carrier to release this information. Failure to do so will result in automatic disqualification.

Workers' Compensation Insurance Company \_\_\_\_\_

Contact Person \_\_\_\_\_ Telephone \_\_\_\_\_

<b>Do not write in this space</b>		
Qualified [ ]	Not qualified [ ]	LTIR information verified [ ]

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**BOND OF FAITHFUL PERFORMANCE**

(For Successful Bidder)

KNOW ALL MEN BY THESE PRESENTS, that, WHEREAS, Stege Sanitary District, 7500 Schmidt Lane, El Cerrito, California 94530-0530 has awarded to \_\_\_\_\_ hereinafter designated as the “Principal,” a contract for the CANON PUMP STATION REHABILITATION PROJECT, PROJECT NO. 23202 – JULY 2023.

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

NOW, THEREFORE, WE the principal, and \_\_\_\_\_ as Surety, are held and firmly bound unto the Stege Sanitary District, State of California, in the penal sum of **100 percent of the contract price, including additive bid (\$Bid price)** lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

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

As a condition precedent to the satisfactory completion of the said contract, the above obligation in said amount shall 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 shall fail to make full, complete and satisfactory repair and replacements or totally protect Stege Sanitary District from loss or damage made evident during said period of one (1) year from the date of acceptance of said work, and resulting from or caused by defective materials or faulty workmanships in the prosecution of the work done, the above obligation in the said sum shall remain in full force and effect. However, nothing in this paragraph to the contrary notwithstanding, the obligations of the Surety hereunder shall 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 there under or to the specifications accompanying the same, shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alternation or addition to the terms of the contract or to the work or to the specifications.

IN WITNESS WHEREOF the 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)

By:

\_\_\_\_\_

Principal

(Seal)

By:

\_\_\_\_\_

Surety

**LABOR AND MATERIAL BOND**

(For Successful Bidder)

KNOW ALL MEN BY THESE PRESENTS, that, WHEREAS, Stege Sanitary District, 7500 Schmidt Lane, El Cerrito, California 94530-0530, has awarded to \_\_\_\_\_ hereinafter designated as the "Principal," a contract for the CANON PUMP STATION REHABILITATION PROJECT PROJECT NO. 23202 – JULY 2023.

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, shall fail to pay for any materials provisions, provender, or other supplies or teams 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 Stege Sanitary District, State of California, in the penal sum of **100 percent of the contract price, including additive bid (\$Bid price)** 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, shall fail to pay for any materials, provisions, provender, or other supplies or teams 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 Employment Act with respect to such work or labor, as required by the provisions of Chapter 7, Title XV, Part 4, Division III of the Civil Code of the State of California, and provided that the persons, companies or corporations so furnishing said materials, provisions, provender or other supplies, teams, appliances or power used, in, upon, of or about the performance of the work contracted to be executed or performed, or any person who supplies both work and materials thereto, shall have complied with the provisions of said Civil 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 fee to Stege Sanitary District as shall be fixed by the court.

The bond shall inure to the benefit of any and all persons, companies, and corporations entitled to file claims under said Civil 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 to the terms of the contract or to the work to be performed there under or to the specifications accompanying the same shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extensions of time, alteration or addition to the terms of the contract or to the work or to the specifications.

IN WITNESS WHEREOF the 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)

By:

\_\_\_\_\_  
\_\_\_\_\_  
Principal

(Seal)

By:

\_\_\_\_\_  
\_\_\_\_\_  
Surety

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**AGREEMENT**  
(For Successful Bidder)

THIS AGREEMENT, made this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between the Stege Sanitary District, El Cerrito, California 94530, hereinafter called the "Owner" and \_\_\_\_\_ hereinafter called the "Contractor".

**WITNESSETH:**

WHEREAS the Owner has caused specifications, drawings and other contract documents to be prepared for certain work as described therein entitled

**STEGE SANITARY DISTRICT  
CANON PUMP STATION REHABILITATION PROJECT  
PROJECT NO. 23202 – JULY 2023**

WHEREAS the Contractor has offered to perform the proposed work in accordance with the terms of the contract documents.

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

The further terms, conditions and covenants of the contract are set forth in the following exhibit parts each of which is attached hereto or referenced and made a part hereof:

- Notice Inviting Sealed Proposals
- Instruction to Bidders
- Proposal
- General Conditions
- Special Conditions
- Technical Conditions
- Drawings
- Issued Addenda to the Contract Documents

IN WITNESS WHEREOF, this agreement has been executed in quadruplicate this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

Stege Sanitary District:

\_\_\_\_\_  
By: Rex Delizo, District Manager

Attest: \_\_\_\_\_

By: Rex Delizo, Secretary of the District

Approved as to Form:

\_\_\_\_\_  
By: Kristopher Kokotaylo, District Counsel

Contractor:

\_\_\_\_\_  
Signature

By: \_\_\_\_\_  
Print Name

Title \_\_\_\_\_



# **PART II**

# **GENERAL CONDITIONS**

STEGER SANITARY DISTRICT  
PROJECT NO 23202  
JULY 2023

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## SECTION 1

### DEFINITIONS AND TERMS

**G1.01 GENERAL.** Whenever the following abbreviations and terms, or pronouns in place of them, appear in the Contract Documents, the intent and meaning shall be interpreted as provided in this Section 1. Working titles having a masculine gender, such as "workman" and "flagman" and the pronoun "he," are utilized for the sake of brevity, and are intended to refer to persons of either sex.

**G1.02 DEFINITIONS.** As used herein, unless the context otherwise requires, the following terms have the following meaning:

**Acceptance:** The formal written acceptance by the Owner of an entire contract that has been completed in all respects in accordance with the Contract Documents.

**Addenda:** Written interpretations or revisions to any of the Contract Documents issued by the Owner before the bid opening.

**As Approved:** The words "as approved," unless otherwise qualified, shall be understood to be followed by the words "by the Engineer for conformance with the Contract Documents."

**As-Built Drawings:** Contract plans revised to reflect any modifications resulting during the construction phase.

**As Shown and As Indicated:** The words "as shown" and "as indicated" shall be understood to be followed by the words "Contract Documents" as appropriate.

**Bidder:** Any individual, firm, partnership, corporation or combination thereof, submitting a proposal for the work contemplated, acting directly or through a duly authorized representative.

**CalTrans:** The Department of Transportation, Business & Transportation Agency, State of California.

**Contract Change Order:** An order authorized by the Owner and issued to the contractor amending the Contract Documents. An "approved Contract Change Order" is an order signed by the Engineer and the General Manager. An "executed Contract Change Order" is an order signed by the Engineer, the General Manager and the Contractor.

**Contract:** The written agreement covering the performance of the work and the furnishing of labor, materials, tools and equipment in the construction of the work. The Contract shall include the Contract Documents, and any and all supplemental agreements. Supplemental agreements are written agreements covering alterations, amendments or extensions to the Contract and include contract change orders.

**Contract Completion:** The date the Owner accepts the entire work as being in compliance with the Contract Documents, or formally waives non-conforming work to the extent that non-conforming work does not adversely affect performance of the improvements, and issues the final payment in accordance with Section 9 of the General Conditions.

**Contract Documents:** The Contract Documents consist of the Notice to Contractors; Instruction to Bidders; Bid Proposal; Agreement; General Conditions; Special Conditions; Technical Conditions; Contract Drawings; Addenda; and Change Orders.

**Contractor:** The person or persons, firm, partnership, corporation or combination thereof, private or municipal, who enters into the Contract with the Owner.

**Contract Drawings:** The official plans, profiles, cross sections, elevations, details, and supplemental drawings furnished by the Engineer, which show the locations, character, dimensions and details of the work to be performed. Contract Plans may either be bound in the same book as the balance of the Contract Documents or bound in separate

sets, and are a part of the Contract Documents regardless of the method of binding. Also referred to as "Contract Plans," "Plans," and "Drawings."

**Days:** Unless otherwise designated, "days" will be understood to mean calendar days.

**Engineer:** The person or organization identified as such in the Contract Documents, acting directly for the Owner and within the scope of the particular duties delegated to him.

**Engineer's Estimate:** The list of estimated quantities of work to be performed as contained in the Proposal Form.

**Federal Agencies:** Whenever, in the Specifications, reference is made to any Federal agency or officer, such reference shall be deemed made to any agency or officer succeeding, in accordance with law, to the powers, duties, jurisdiction and authority of the agency or officer mentioned.

**Fixed Costs:** Any necessary labor, material and equipment costs directly expended on the item or items under consideration which remain constant regardless of the quantity of the work done.

**General Notes:** The written instructions, provisions, conditions or other requirements appearing on the Contract Drawings, and so identified thereon, which pertain to the performance of the work.

**Inspector/Construction Manager:** The engineering or technical inspector(s) duly authorized or appointed by the Engineer or Owner, limited to the particular duties entrusted to him or them.

**Legal Holidays:** Those days designated as State holidays by the Public Contract Code or declared by the Owner.

**Liquidated Damages:** The amount prescribed in the Contract Documents to be paid to the Owner or to be deducted from any payments due or to become due the Contractor.

**Notice to Proceed:** A written notice given by the Owner to the Contractor fixing the date on which the Contract time will commence to run and on which the Contractor shall start to perform his obligation under the Contract Documents.

**Or Equal:** The term "or equal" shall mean that the "equal" product is the same or better than the product named in function, performance, reliability, quality and general configuration. Determination of equality in reference to the project design requirements will be made by the Engineer. Such equal products shall not be purchased or installed by the Contractor without written acknowledgment of the Engineer.

**Owner:** As described in the Contract Documents, shall be the Stege Sanitary District or any person or persons to whom the power belonging to the Owner shall be duly delegated.

**Plans:** Refer to Contract Drawings.

**Professional Engineer:** An engineer licensed by the Board of Registration for Professional Engineers, State of California.

**Proposal:** The offer of the bidder for the work, when made out and submitted on the prescribed proposal form, properly signed and guaranteed.

**Proposal Form:** The approved form upon which the Owner requires formal bids be prepared and submitted for the work.

**Proposal Guaranty:** The cash, cashier's check, certified check or bid bond accompanying the proposal submitted by the bidder, as a guaranty that the bidder will enter into a contract with the Owner for the performance of the work, if the Contract is awarded to him.

**Provide:** The term "provide" shall be understood to mean "furnish and install, complete and in place."

**Record Drawings:** Contract plans revised to reflect any modifications resulting during the construction phase.

**Responsive:** A "responsive" Proposal is one that complies with the requirements prescribed herein for Proposals.

**Special Conditions:** The Special Conditions are specific clauses setting forth conditions or requirements of the work and supplementary to these General Conditions. Also referred to as "Supplementary Conditions."

**Specifications:** The term "Specifications" refers to those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards, and workmanship as applied to the work and certain administrative details applicable thereto. Where standard specifications, such as those of ASTM, AASHTO, etc., have been referred to, the applicable portions of such standard specifications shall become a part of these Contract Documents. If referenced specifications conflict with Specifications contained herein, the requirements contained herein shall prevail.

**Standard Specifications:** State of California Department of Transportation Standard Specifications dated July, 1995 or as superseded by newer editions.

**State:** The State of California.

**Work:** The word "work" includes all material, labor, tools, and all appliances, machinery, transportation, and appurtenances necessary to perform and complete the Contract, and such additional items not specifically indicated or described which can be reasonably inferred as belonging to the item described or indicated and as required by good practice to provide a complete and satisfactory system or structure.

**Work site:** The area of actual construction and the areas immediately adjacent thereto.

**G1.03 ABBREVIATIONS.** As used herein, unless the context otherwise requires, the following abbreviations have the following meanings:

<b>AAMA</b>	Architectural Aluminum Manufacturers' Association
<b>AAN</b>	American Association of Nurserymen
<b>AASHTO</b>	American Association of State Highway and Transportation Officials
<b>ACI</b>	American Concrete Institute
<b>AGA</b>	American Gas Association
<b>AIA</b>	American Institute of Architects
<b>AIEE</b>	American Institute of Electrical Engineers
<b>AISC</b>	American Institute of Steel Construction
<b>AISI</b>	American Iron and Steel Institute
<b>AITC</b>	American Institute of Timber Construction
<b>AMCA</b>	Air Movement and Control Association
<b>ANSI</b>	American National Standards Institute
<b>APA</b>	American Plywood Association
<b>APWA</b>	American Public Works Association
<b>API</b>	American Petroleum Institute
<b>AREA</b>	American Railway Engineering Association
<b>ARI</b>	American Refrigeration Institute
<b>ASA</b>	American Standards Association
<b>ASHRAE</b>	American Society of Heating, Refrigeration and Air Conditioning Engineers
<b>ASME</b>	American Society of Mechanical Engineers
<b>ASTM</b>	American Society for Testing and Materials
<b>AT&amp;T</b>	American Telephone and Telegraph
<b>AWG</b>	American Wire Gage
<b>AWPA</b>	American Wood Preservers' Association
<b>AWS</b>	American Welding Society
<b>AWWA</b>	American Water Works Association

<b>CS</b>	Commercial Standards (US Department of Commerce)
<b>CSI</b>	Construction Specifications Institute
<b>DOT</b>	United States Department of Transportation
<b>EIA</b>	Electronic Industries Association
<b>EPA</b>	Environmental Protection Agency
<b>FGMA</b>	Flat Glass Marketing Association
<b>FHwA</b>	Federal Highway Administration
<b>FM</b>	Factory Mutual
<b>FS</b>	Federal Specification
<b>IAMPO</b>	International Association of Mechanical and Plumbing Officials
<b>ICBO</b>	International Conference of Building Officials
<b>IEEE</b>	Institute of Electrical and Electronics Engineers
<b>NAAMM</b>	National Association of Architectural Metal Manufacturers
<b>NBFU</b>	National Board Fire Underwriters
<b>NEC</b>	National Electrical Code
<b>NEMA</b>	National Electrical Manufacturers' Association
<b>NFC</b>	National Fire Code
<b>NFPA</b>	National Fire Protection Association
<b>OSHA</b>	Occupational Safety and Health Administration
<b>PEI</b>	Porcelain Enamel Institute
<b>PG&amp;E</b>	Pacific Gas and Electric Company
<b>PS</b>	Product Standard (US Department of Commerce)
<b>PacBell</b>	Pacific Bell
<b>SAE</b>	Society of Automotive Engineers
<b>SCPO</b>	Structural Clay Products Institute
<b>SMACNA</b>	Sheet Metal and Air Conditioning Contractors' National Association
<b>SSPC</b>	Steel Structures Painting Council
<b>TCA</b>	Tile Council of America
<b>TPI</b>	Truss Plate Institute
<b>UBC</b>	Uniform Building Code
<b>UL</b>	Underwriters Laboratory
<b>UMC</b>	Uniform Mechanical Code
<b>UPC</b>	Uniform Plumbing Code
<b>WCLIB</b>	West Coast Lumber Inspection Bureau
<b>WIC</b>	Woodwork Institute of California
<b>WWPA</b>	Western Wood Products Association

## SECTION 2

### PROPOSAL REQUIREMENTS

**G2.01 OBTAINING PROPOSAL FORMS.** Proposal forms and other bid documents may be obtained from the Owner or Engineer.

**G2.02 ENGINEER'S ESTIMATE.** If an Engineer's Estimate of quantities is given in the Proposal, the quantities are approximate only, being given as a basis for the comparison of bids. The Owner does not, expressly or by implication, agree that the actual amount of work will correspond to the estimate. The Owner reserves the right to increase or decrease the amount of any class or portion of the work or to omit portions of the work.

**G2.03 EXAMINATION OF CONTRACT DOCUMENTS AND SITE OF WORK.** The bidder shall examine carefully the Contract Documents and the site of work and shall inform himself of the conditions relating to the execution of the work. Failure to do so will not relieve the successful bidder of his obligation to enter into a Contract and complete the work in strict accordance with the Contract Documents. "Conditions relating to the execution of the work" include the requirements of federal, state and local laws, statutes and ordinances relative to the execution of the work, including, but not limited to, applicable regulations concerning minimum wage rates, non-discrimination in the employment of labor, protection of public and employee health and safety, and environmental protection. The submission of a Proposal shall be conclusive evidence that the bidder has investigated and is satisfied as to the conditions to be encountered, the character, quality and scope of work to be performed, the quantities of materials to be furnished and the requirements of the Contract Documents.

**G2.04 SURFACE TOPOGRAPHY; SUBSURFACE CONDITIONS DATA.** Where an investigation of surface topography and/or subsurface conditions has been conducted in areas where work is to be performed, prospective bidders may inspect the records of such investigations at the Owner's office.

**G2.05 EXPLANATIONS.** Any explanation of the Contract Documents desired by a prospective bidder shall be requested in writing from the Engineer, and delivered to Owner no less than 14 calendar days prior to the date for opening of proposals. Any explanation, instruction, or change to Contract Documents will be made by written addendum, which will be mailed or delivered to each firm receiving a set of the Contract Documents. Upon mailing or delivery, such addendum will become a part of Contract Documents and binding on all bidders. The receipt of the addendum by the bidder shall be acknowledged and so noted in the space provided on the Proposal Form. All addenda shall be attached to the Proposal. Only written explanations, instructions or changes so given by the Owner will be effective. Verbal explanations or instructions will not be binding on the Owner.

**G2.06 PREPARATION OF PROPOSALS.** The form of Proposal in this book, when filled out and executed by the bidder, shall be submitted as his bid. Bids not presented on such forms will be rejected as non-responsive.

All blank spaces in the Proposal form must be filled in, as required, preferably in black ink. All price information shall be shown, clearly legible, in both words and figures, where required. No changes shall be made in the phraseology of the forms. Written amounts shall govern in the case of discrepancy between the amounts stated in writing and the amounts stated in figures. In case of discrepancy between unit prices and extended totals, unit prices shall prevail.

The bid submitted must not contain any erasure, interlineations, or other corrections unless each correction is suitably authenticated by affixing in the margin immediately opposite the correction the signature or signatures of the person or persons submitting the bid.

The bidder shall sign his Proposal in the blank space provided therefor. If bidder is the sole owner, the owner shall sign the Proposal. If bidder is a corporation, the legal name of the corporation and its State of incorporation shall be set forth above and the Proposal shall be signed by the officer or officers authorized to sign contracts on behalf of the corporation. If bidder is a partnership, the true name of the firm shall be set forth above, the names and addresses of all partners shall be given and a partner in the firm shall sign the Proposal authorized to sign contracts on behalf of the partnership. If the bidder is a joint venture, the Proposal shall be signed by each participating company by

officers or other individuals who have the full and proper authorization to do so. If the Proposal is signed by an agent of the bidder other than an officer of a corporation or a member of a partnership, a notarized power-of-attorney must be on file with the Owner prior to opening of Proposals or must be submitted with the Proposal. If requested by the Owner, the bidder shall promptly submit evidence satisfactory to the Owner of the authority of the person signing the Proposal.

**G2.07 SUBMISSION OF PROPOSALS.** All Proposals must be submitted not later than the time prescribed, at the place, and in the manner set forth in the Notice to Contractors. Proposals may be made on the separate Proposal forms provided herewith. Any Proposal received after the prescribed time shall be rejected, regardless of whether or not Proposals are opened exactly at the prescribed time.

Each Proposal must be submitted in a sealed envelope. The envelope must be clearly marked to show the bidder's name and the Contract name, without being opened, and be addressed in conformance with the instructions in the Notice to Contractors.

**G2.08 LIST OF SUBCONTRACTORS.** The bidder shall submit with his Proposal, on the List of Subcontractors provided, the names and business addresses of each subcontractor who will perform work under this Contract in excess of ½ of 1 percent of the amount of the total Proposal, and shall list the portion of the work which will be done by each such subcontractor. If the bidder fails to specify a subcontractor for any portion of the work, the bidder agrees to perform that portion of the work himself, and represents that he is qualified to perform that portion of the work himself.

**G2.09 PROPOSAL GUARANTY.** The proposal shall be accompanied by a proposal guaranty bond duly completed on the form bound herewith, by a corporation which is listed in the latest Form 356 of the United States Treasury Department as being acceptable as surety on Federal bonds and is duly licensed and admitted by the State of California to be a surety insurer in the State, in the sum of at least ten (10) percent of the total bid amount as described in the bidding schedule and/or other parts of the contract documents; 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 bid amount.

The amount payable to the Owner under the proposal guaranty bond, or the certified or the cashier's check and the amount thereof, as the case may be, shall 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 bond, labor and material bond, evidence of insurance, and to enter into, execute and deliver to the Owner the agreement on the form provided herewith within 10 days after being notified in writing by the Owner that the award has been made and the agreement is ready for execution.

**G2.10 WITHDRAWAL OF PROPOSALS.** A bidder may withdraw his Proposal at any time prior to the time fixed in the Notice to Contractors for the opening of bids only by filing a written notice with the Owner. The notice shall be executed by the bidder in conformance with Section G2.06. A telegraphic notice of withdrawal is not effective. Withdrawal of a Proposal does not prejudice the right of a bidder to submit a new Proposal. No Proposal may be withdrawn after the time for opening of Proposals, unless and until the time specified in Section G3.02, Time of Award has elapsed.

**G2.11 PUBLIC OPENING OF PROPOSALS.** Proposals will be opened and read aloud publicly at the date, time and place designated in the Notice to Contractors Inviting Sealed Proposals. Bidders and their authorized representatives are invited to be present.

**G2.12 REJECTION OF PROPOSALS,** The OWNER may make such investigations as deemed necessary to determine the ability of the Bidder to perform the work, and the Bidder shall furnish to the OWNER all such information and data for this purpose as the OWNER may request.

The OWNER reserves the right to reject any Bid if the evidence submitted by, or investigation of such Bidder fails to satisfy the OWNER that such Bidder is properly qualified to carry out the obligations of the Agreement and to complete the work contemplated therein.

The Owner reserves the right to reject any and all proposals and to waive any informality in any proposal or bid.



**G2.13 LICENSING OF BIDDERS.** Bidders and their proposed subcontractors shall hold such licenses as may be required by the laws of the State of California for the performance of the work specified in the Contract Documents.

**G2.14 ENGINEER OF WORK:** The Engineer for the project is Paul Soo, Jr. The Engineer can be reached via the District Office, whose address is 7500 Schmidt Lane, El Cerrito, CA 94530, telephone (510) 524-4668, fax: (510) 524-4697.

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## SECTION 3

### AWARD AND EXECUTION OF CONTRACT

**G3.01 AWARD OF CONTRACT.** The Owner reserves, in its sole discretion, the right to reject any or all Proposals and to waive any informalities and irregularities in Proposals received, other conditions in the Contract Documents notwithstanding.

The Proposals will be compared on the basis of Contract Total Bid Price. The Total Bid Price is the sum of the lump sum bid items and, for unit price items, the sum of the products of the Engineer's Estimate of quantities shown in the Proposal multiplied by the unit bid price. In the event of a discrepancy between the unit bid price and the extension price, the unit price shall govern. Or the Total Bid Price and Additive Bid Items, at the Owner's discretion.

The award of the Contract, if it were awarded, will be made to the lowest responsible, responsive bidder or bidders.

**G3.02 TIME OF AWARD.** Within one-hundred twenty (120) days after the opening of Proposals, the Owner will either reject all Proposals or award the Contract to the lowest responsible, responsive bidder. If the lowest responsible, responsive bidder refuses or fails to execute the Contract and provide an acceptable Performance Bond, Labor and Material Bond and insurance certificate(s), the Owner may award the Contract to the second lowest responsible, responsive bidder. Such award, if made, will be made within one-hundred twenty (120) days after the opening of Proposals. If the second lowest responsible, responsive bidder refuses or fails to execute the Contract and provide an acceptable Performance Bond, Labor and Material Bond and insurance certificate(s), the Owner may award the Contract to the third lowest responsible, responsive bidder. Such award, if made, will be made within one-hundred-twenty (120) days after the opening of Proposals. The periods of time specified above within which an award of Contract may be made shall be subject to extension for such further period as may be agreed upon in writing by the Owner and the bidder or bidders concerned.

**G3.03 EXECUTION OF CONTRACT.** The successful bidder shall, within ten (10) days after having received notice that the Contract has been awarded, sign and deliver to the Owner a Contract in the form hereto attached together with the Performance Bond, Labor and Material Bond and insurance certificate(s) executed as required in the Contract Documents. Within sixty (60) days after receiving the signed Contract with acceptable bonds and insurance certificates from the successful bidder, the Owner will sign the Contract.

**G3.04 CONTRACT BONDS.** The Contractor shall furnish two bonds each in the amount **specified in section 1.20 Instructions to Bidders**, as security for the faithful performance of the work, and the other as security for the faithful payment and satisfaction of all persons furnishing materials and performing labor on the work. The Contractor shall use the bond forms found at pages BP.21 and BP.23 of these contract specifications. However, the scope of the bonds or the bond forms prescribed in those pages shall in no way affect or alter the liabilities of the Contractor to the Owner under Section G7.21.

The bonds shall be issued by a corporation which is listed in the latest Form 356 of the United States Treasury Department as being acceptable as surety on Federal bonds and is duly licensed and admitted by the State of California to be a surety insurer in the State.

Notwithstanding the language of the preceding paragraph, Owner may disqualify the Contractor's proposed surety if the Owner has cause to believe the surety is likely to be incapable of fulfilling its obligations under the bonds.

The bonds shall remain in force throughout the period required to complete the work and thereafter for a period of three-hundred sixty-five (365) days after final completion and acceptance of the work by the Owner to cover any defects in workmanship, materials, or equipment which develop in that time.

**G3.05 FAILURE TO EXECUTE CONTRACT.** Failure of a bidder to whom the Contract is awarded to execute the Contract or furnish acceptable Performance Bond, Labor and Material Bond and insurance certificate(s) within ten (10) days of delivery of Notice of Award to bidder shall be just cause for the annulment of the award and

the forfeiture of such bidder's Proposal Guaranty. The Proposal Guaranty shall be retained by the Owner as liquidated damages and it is agreed that this sum is a fair estimate of the amount of damages the Owner will sustain in case the successful bidder fails to enter into a Contract.

**G3.06 RETURN OF PROPOSAL GUARANTY.** Upon inspection and comparison of Bid prices by the Owner, the Owner will return the Proposal Guaranties of all except the three lowest responsive, responsible Bidders for the Contract. Retained Proposal Guaranties will be held until one-hundred-twenty (120) days after opening of Proposals or until the Contract has been executed, whichever occurs first, after which all Proposal Guaranties other than those that have been forfeited shall be returned. The Proposal Guaranty of the successful Bidder will be retained until the performance bond and labor and material bond have been executed and approved, after which it will be returned.

## SECTION 4

### SCOPE OF WORK

**G4.01 INTENT OF CONTRACT DOCUMENTS.** The Contract Documents are complementary, and what is called for by one shall be as binding as if called for by all. The intent of the Contract Documents is to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. When the Contract Documents describe portions of the work in general terms, but not in complete detail, it is understood that the best general practice shall be followed and only materials and workmanship of the best standard quality shall be used. Any work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied, whether or not specifically called for. When words, which have a well-known technical or trade meaning are used to describe work, materials or equipment, such words shall be interpreted in accordance with that meaning.

Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or laws or regulations in effect on the first published date of the Notice to Contractors, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of Owner or Contractor, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to Owner, or any of Owner's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the work or any duty or authority to undertake responsibility contrary to the other conditions of the Contract Documents.

The Contract Documents are divided into parts, divisions and sections for convenient organization and reference. Generally, there has been no attempt to divide the specification sections into work performed by the various building trades, work by separate subcontractors, or work required for separate facilities in the project.

**G4.02 EXAMINATION AND VERIFICATION OF CONTRACT DOCUMENTS.** The Contractor shall thoroughly examine and become familiar with all of the various parts of these Contract Documents and determine the nature and location of the work, the general and local conditions, and all other matters that can in any way affect the work under this Contract. Failure to make an examination necessary for this determination shall not release the Contractor from the obligations of this Contract. No oral agreement or conversation with any officer, agent or employee of the Owner, or with the Engineer either before or after the execution of this Contract, shall affect or modify any of the terms or obligations herein contained.

**G4.03 CHANGES; CONTRACT CHANGE ORDER.** The Owner may, without notice to the sureties, and without invalidating the Contract, at any time make alterations, deviations, additions to or deletions from the Contract Documents, and may increase or decrease the quantity of any item or portion of the work, or delete any item or portion of the work, and may require extra work, as determined by the Owner to be necessary or advisable. All such work shall be performed under applicable conditions of the Contract Documents, unless specifically provided otherwise at the time the change is ordered.

Any such changes will be set forth in a written Contract Change Order issued by the Owner. The Contract Change Order will specify: (1) the work to be done in connection with the change to be made; (2) the amount of the adjustment of the Contract price, if any, and the basis for compensation for the work ordered; and (3) the extent of the adjustment in the Contract time, if any. A Contract Change Order shall not become effective until the Engineer and the Owner have signed it; when signed by both the Engineer and the Owner, it is an "approved Contract Change Order."

No changes or deviations from the Contract Documents shall be made without the authority of an approved Contract Change Order, except that in cases of emergency the Engineer may direct a change in writing. Upon receipt of such written directive, the Contractor shall proceed with the ordered work and the Engineer will prepare a written Contract Change Order for approval by the Owner and issuance to the Contractor as soon thereafter as practicable.

Compensation for Emergency Work shall be determined on a time and materials basis.

Upon receipt of an approved Contract Change Order, the Contractor shall sign approved Contract Change Order and promptly proceed with the ordered work, unless otherwise provided in the approved Contract Change Order.

When ordered by the Engineer, the Contractor shall halt work in the area affected by a proposed change. Whenever it appears to the Contractor that a change is necessary, the Contractor shall immediately notify the Engineer of the change he believes necessary and the reasons for such change; however, work in the area affected shall not be discontinued unless ordered by the Engineer.

**G4.04 REQUEST FOR QUOTATIONS FOR CHANGE IN WORK.** Owner may request Contractor to provide quotations for performing proposed changes to the work. Such requests for quotations shall not be considered authorization to proceed with the change prior to issuance of an approved Contract Change Order, nor shall such request justify any delay in executing existing work. Contractor shall, upon such a request, provide quotations for increases or decreases in the Contract Price and the Contract time associated with performing the proposed change. Quotations shall include substantiating documentation with an itemized breakdown of Contractor and Subcontractor costs, including labor, materials, rentals, services, overhead and profit. The cost of preparing such quotations is included in the Contract price and Contractor shall not be entitled to any additional compensation for preparing them.

**G4.05 PROPOSED CONTRACT CHANGE ORDER.** A Contract Change Order may be presented to the Contractor for his consideration prior to its having been signed by the Owner. If the Contractor accepts the terms and conditions of such proposed Contract Change Order, and if the Contract Change Order is thereafter signed by the Owner and issued to the Contractor, the Contract Change Order shall be considered to be an executed Contract Change Order for all purposes to the same extent as if the Contract Change Order had been initially issued to the Contractor as an approved Contract Change Order. The Owner need not present a proposed Contract Change Order to the Contractor for his review prior to issuing it as an approved Contract Change Order.

**G4.06 EXECUTED CONTRACT CHANGE ORDER.** An approved Contract Change Order, which has been signed by the Contractor, is an "executed Contract Change Order." Compensation paid pursuant to Contract Change Orders shall comprise the total compensation for the work described in the Contract Change Order. By signing the Contract Change Order, the Contractor agrees that the specified compensation constitutes full compensation for the work or change, including payment for interruption of schedules, extended overhead, delay or any other "impact" claim or "ripple effect" claim, and by signing, the Contractor specifically waives any reservation or claim for additional compensation in respect to the Contract Change Order.

**G4.07 CONTRACT PRICE ADJUSTMENT.** If a Contract Change Order provides for an adjustment to the Contract price, the increased payment to Contractor, or the deduction to the credit of the Owner, shall be determined by one of the following methods, or a combination thereof, as determined by the Owner and at its sole option:

A. Unit Prices. The unit prices set forth in the Proposal shall be utilized where they are applicable. If the Contract Change Order increases or decreases the quantity of an item of work by more than twenty-five percent (25%), such that the application of unit prices in the Proposal will cause substantial inequity to the Owner or Contractor, unit prices for quantities in excess of the original bid quantities will be adjusted by mutual agreement. Unit prices for new items included in the Contract Change Order shall be as mutually agreed upon.

Payment for any contract item of work which has a final total value of less than five percent of the total contract bid price will be made at the contract unit price regardless of increased or decreased quantities.

B. Lump Sum. A total lump sum addition or deduction from the Contract Price as mutually agreed upon.

Lump sum quotations for changes to the work shall include substantiating documentation with an itemized breakdown of Contractor and Subcontractor costs, including labor, materials, equipment rental, approved services, overhead and profit, all calculated as set forth in Section G9.03, "Force Account Payment."

C. Force Account Payment. Payment for the work will be made on a time and expense basis, that is, on an accounting of the Contractor's forces, materials, equipment and other items of cost as required to do the work.

If compensation for work done under a Contract Change Order is to be made on a force account basis, the compensation will be calculated as set forth in Section G9.03, "Force Account Payment." Contractor agrees that the markups provided in Section G9.03 are adequate.

In any case in which the method of payment cannot be agreed upon prior to the beginning of the work, the Owner may direct that the work be done on a force account basis.

**G4.08 PROTEST PROCEDURE.** If the Contractor disagrees with any terms or conditions set forth in an approved Contract Change Order, which he has not executed, he shall submit a written protest to the Engineer within fifteen (15) days after receipt of such approved Contract Change Order. The protest shall state the points of disagreement, Contract Document references, and quantities and costs involved and shall propose a modification of the items with which he does not agree. If a written protest is not submitted within this fifteen (15) day period, payment will be made as set forth in the approved Contract Change Order. Approved Contract Change Orders which are not protested within fifteen (15) days will be considered as executed Contract Change Orders and such payment will constitute full compensation for all work included therein or required thereby.

When the protest of an approved Contract Change Order relates to compensation, the Contractor shall keep full and complete records of such work and shall permit the Owner and the Engineer to have access to all records relating to the protested Contract Change Order to determine the compensation payable. The Contractor shall cooperate with the Engineer to reach agreement at the earliest practical date on the terms of compensation for the Contract Change Order. When agreement has been reached, a revised Contract Change Order may be approved by the Owner and issued to the Contractor for signature. Unless and until the Owner and Contractor agree upon other terms of compensation incorporated in a revised executed Contract Change Order, the compensation shall be as specified under the protested approved Contract Change Order.

When the protest of an approved Contract Change Order relates to the adjustment of Contract Time for the completion of the work, the time will be determined in accordance with the conditions of Section G8.12.

**G4.09 CONTINUANCE OF CONSTRUCTION.** Disagreement by the Contractor with the Owner's determination of the need for, or amount of, an adjustment in Contract price or Contract time associated with an approved Contract Change Order (or disagreement by the Contractor with the Owner's determination that a change has not occurred and no Contract Change Order is needed) shall not, under any circumstances, relieve the Contractor from its obligation to promptly begin and diligently prosecute the work, including the change, as described in the approved Contract Change Order.

**G4.10 DETOURS.** When required by the Special Conditions, Technical Conditions, or shown on the Contract Plans, or required by responsible public agencies, the Contractor shall construct, maintain and remove detours for the use of public traffic, without additional cost to the Owner, unless separate payment is specified in the Special Conditions or Technical Conditions.

The failure or refusal of the Contractor to construct and maintain detours at the proper time shall be sufficient cause for closing down the work until such detours are in satisfactory condition for use by public traffic.

**G4.11 ARCHAEOLOGICAL DISCOVERIES.** All articles of archaeological interest, which may be uncovered by the Contractor during the progress of the work, shall be reported immediately to the Engineer. Progress of the Work with respect to said find shall be in accordance with the requirements of the Special Conditions or Technical Conditions to this Contract.

**G4.12 PRESERVATION AND CLEANING.** The Contractor shall clean up the work at intervals with a minimum frequency of street sweeping of two (2) times per week and at other times as directed by the Engineer.

Before final inspection of the work, the Contractor shall clean the project site, material sites and all ground occupied by him in connection with the work, of all rubbish, excess materials, false work, temporary structures and equipment. All parts of the work shall be left in a neat and presentable condition. Full compensation for final cleaning up will be considered as included in the prices paid for the various Contract items of work and no separate payment will be made therefor.

**G4.13 GUARANTY OF WORK.** Notwithstanding inspections and acceptance by the Owner of work furnished under this Contract, the Contractor warrants to the Owner for a period of one (1) year from the date of CONTRACT COMPLETION that all materials and equipment furnished under the Contract, including that provided pursuant to Change Orders, will be of good quality and new, that the work will be free from defects in material or workmanship, and that the work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective.

This warranty by the Contractor is in addition to any warranties or guarantees required by the Special Conditions or Technical Conditions for specified items of equipment or materials. This warranty shall be in effect notwithstanding any disclaimers, or limiting or conditional terms contained in such separate warranties furnished by manufacturers or suppliers.

**G4.14 CORRECTION OF WORK DURING WARRANTY PERIOD.** If, within the warranty period stated in the Performance Bond after the date of final acceptance of the work by the Owner, any of the work is found not to be in accordance with the Contract Documents, specifically including Section G4.13 ("Guaranty of Work") the Contractor shall correct it promptly after written notice from the Owner to do so, and pay for any damage to other property resulting from such non-conforming work. If the Contractor fails to make the repairs or replacements promptly, or in an emergency when delay could cause risk of damage or loss, the Owner may have the non-conforming work removed, replaced or corrected at the expense of the Contractor and his surety. Non-conforming work which is remedied under this Section shall be subject to an extended warranty obligation, identical in terms to that provided by Section G4.13 and this Section after the non-conforming work has been remedied.

Nothing contained in this Section G4.14 shall be construed to establish a period of limitation with respect to other obligations the Contractor may have under the Contract Documents. Establishment of the warranty period stated in the Performance Bond as described in this Section relates only to the specific obligation of the Contractor to correct the work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the work.



## SECTION 5

### CONTROL OF WORK

**G5.01 AUTHORITY OF ENGINEER.** The Engineer shall decide all 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; all questions which may arise as to the interpretation of the Contract Documents; all questions as to the acceptable fulfillment of the Contract on the part of the Contractor; and all questions as to compensation. The Engineer shall have authority to reject work which does not conform to the Contract Documents. His decision shall be final and he shall have authority to enforce and make effective such decisions and orders which the Contractor fails to carry out promptly.

**G5.02 CONTRACT DRAWINGS.** Upon written request, the Owner will furnish to the Contractor for his use, at no expense to the Contractor, five (5) copies of all Contract Documents, including the Contract Drawings. Additional copies may be obtained at cost.

**G5.03 SHOP DRAWINGS.** The Contract Drawings shall be supplemented by shop drawings furnished by the Contractor. The Engineer shall have reviewed shop drawings before any work involving such drawings is performed or equipment purchased. The Contractor shall make no change in any shop drawing after it has been reviewed by the Engineer and stamped "No Exceptions Taken."

Shop drawing submittals shall contain adequate information to permit the Engineer to evaluate each submission for conformance with the Contract Documents. Each submittal shall be complete; partial submittals will not be reviewed. All drawings shall include a graphical scale and indicate the amount of reduction used, if any. The quality of lettering and draftsmanship shall be such as to insure easily read reproductions by microfilming process.

Each shop drawing submitted by the Contractor shall bear the approval stamp of the Contractor, and shall be marked to indicate any deviation in the shop drawing from the requirements of the Contract Documents. By approving and submitting shop drawings, the Contractor thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data, and that he has checked and coordinated each shop drawing with the requirements of the work and the Contract Documents. Where applicable, shop drawings will be certified for construction by the manufacturer.

Each submittal shall be accompanied by a transmittal letter from the Contractor stating the name of the material or equipment items as shown on the Contract Documents, a specification reference consisting of a section number, and any proposed deviations from the Contract Documents requested or shown on the submittal.

Review of shop drawings is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Review of the Contractor's shop drawings shall not relieve Contractor of any of his responsibility for the successful completion of the work in conformity with the requirements of the Contract Documents. The Contractor is responsible for conformance with all requirements of the Contract Documents, including, but not limited to, dimensions which shall be conformed and correlated at the job site, fabrication processes and techniques of construction, coordination of work with that of all others, and satisfactory performance of all work. Review of shop drawings shall not waive any requirement of the Contract Documents and defective work may be rejected notwithstanding such review.

It is the Contractor's responsibilities to submit shop drawings and other submittals so as to allow sufficient time for review, and for possible revisions and resubmits. Normal review time by the Engineer shall be thirty (30) calendar days; complex submittals may require up to forty-five (45) days. Contractor shall submit all shop drawings to the Engineer within forty-five (45) days after date of Award of Contract.

Owner will make its best efforts to review submittals within the time period scheduled by the Contractor, provided it is consistent with the time period specified in the preceding paragraph, but the Owner's inability to do so shall not automatically entitle the Contractor to additional time to complete the Contract. If the Engineer fails to complete his review of shop drawing submittals within a reasonable time (not to be less than the time period specified in this

section), and if the Contractor's controlling operation is delayed by reason of the delay in review, an extension of time commensurate with the delay in completion of the work thus caused will be granted pursuant to Section G8.11, but no additional compensation will be allowed for such delay.

Shop drawings reviewed by the Engineer will be returned to the Contractor. The Engineer's action on each submittal will consist of one of the following: "No Exceptions Taken," "Exceptions Taken as Noted," "Revise and Resubmit" or "Rejected." If the Engineer takes exception to any drawings, the Contractor shall make the necessary revisions and resubmit them to the Engineer for review. When shop drawings are required to be resubmitted, the revisions are to be clearly defined on the revised drawings. Resubmits will be reviewed in accordance with the provisions applicable to initial submittals and the time period for the Engineer's review shall be equal to that for initial submittals.

Submittal and processing of shop drawings shall conform to the requirements of the Special Conditions and Technical Conditions.

Full compensation for furnishing all shop drawings shall be considered as included in the prices paid for the Contract items of work to which such drawings relate and no additional compensation will be allowed therefor.

When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in strict accordance therewith. Any further changes will require a resubmits of the drawings.

Contractor shall be charged for the review of submittals for items that have been previously rejected by the Engineer two or more times. Contractor shall be charged for the review of submittals as a result of a request for substitution by the Contractor. The basis for such charges shall be the cost actually incurred by the Owner for the review of the submittal.

**G5.04 CONFORMITY WITH CONTRACT DOCUMENTS.** Work and materials shall conform to the lines, grades, cross sections, dimensions and material requirements, including tolerances, shown on the Contract Drawings or indicated in the Specifications. Although measurement, sampling and testing may be considered evidence as to such conformity, the Engineer shall be the sole judge as to whether the work or materials deviate from the Contract Drawings and Specifications, and his decision as to any allowable deviations therefrom shall be final.

**G5.05 COORDINATION AND INTERPRETATION OF CONTRACT DOCUMENTS.** The General Conditions, Special Conditions, Technical Conditions, Contract Drawings, Contract Change Orders and all supplementary documents are essential parts of the Contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary, and to describe and provide for a complete work.

If there is a conflict between Contract Documents, the document highest in precedence shall control. The precedence shall be:

- A. Permit requirements of the other agencies.
- B. Special Conditions.
- C. Technical Conditions.
- D. Plans.
- E. General Conditions.
- F. Standard Specifications.
- G. East Bay Communities Regional Standards.

Change Orders, Supplemental Agreements and approved revisions to Plans and Specifications will take precedence over Items B through F above.

The Contract Documents of the highest precedence shall in no way nullify non-conflicting portions of the Contract Documents of lower precedence.

In the event of inconsistencies between requirements in the Special Conditions and requirements in the General Conditions, the Special Conditions shall govern.

In case of differences between small and large-scale drawings, the large-scale drawings shall govern. Schedules or drawings shall take precedence over conflicting notations on drawings. In the event of discrepancy between any drawing and the figures written thereon, the figures, unless otherwise directed, will govern over scaled dimensions.

Should it appear that the work to be done or any of the matters relative thereto is not sufficiently detailed or explained in the Contract Documents, the Contractor shall apply to the Engineer for such further written explanations as may be necessary and shall conform to them as part of the Contract. In the event of any doubt or question arising respecting the true meaning of the Contract Documents, clarification shall be sought from the Engineer, whose decision thereon shall be final.

**G5.06 ORDER OF WORK.** When required by the Special Conditions or Contract Drawings, the Contractor shall follow the sequence of operations as set forth therein.

Full compensation for conforming to such requirements will be considered as included in the prices paid for the various Contract items of work and no additional compensation will be allowed therefor.

**G5.07 SUPERINTENDENCE.** The Contractor shall supervise and direct the work using his best skill and attention and shall keep at the project site competent supervisory personnel at all times while work is in progress. The Contractor shall designate, in writing, before starting work, a project superintendent who shall be an employee of Contractor and shall have complete authority to represent and act for the Contractor. The Contractor shall notify the Engineer in writing prior to any change in superintendent assignment.

The Contractor shall be solely responsible for and have control over construction means, methods, techniques and procedures for providing adequate safety precautions and coordinating all portions of the work under the Contract, unless the Contract Documents give other specific instructions concerning these matters.

**G5.08 LINES AND GRADES.** Only such primary control lines, monuments and bench marks will be set by the Engineer as he determines to be necessary to control establishment of the lines and grades required for the completion of the work. In general, these will consist of the primary horizontal and vertical control points shown on the Contract Drawings. The Contractor shall notify Engineer a minimum of five (5) working days before such stakes or marks are needed.

The Contractor shall carefully preserve monuments, stakes and marks set by the Engineer. If such monuments, stakes or marks are destroyed or damaged, the Engineer at his earliest convenience will replace them. The Contractor shall be charged for the cost of replacing or restoring monuments, stakes and marks destroyed or damaged by reason of his operations. This charge will be deducted from any monies due or to become due the Contractor.

The Contractor shall temporarily suspend work at such points and for such reasonable times as the Engineer may require for transferring or setting monuments, stakes or marks, and the Contractor shall not be entitled to any additional compensation or extension of time therefor.

All other stakes or marks required to establish the lines and grades required for the completion of the work shall be the responsibility of the Contractor. Payment for such work shall be considered as included in the prices paid for the various Contract items of work and no additional compensation will be allowed therefor.

Contractor shall take field measurements and verify field conditions consistent with prudent construction industry standards and shall carefully compare such field measurements and conditions and other information known to Contractor with the Contract Documents before commencing construction activities on the work site. Errors, inconsistencies or omissions in the Contract Documents discovered by Contractor shall be reported to the Engineer at once.

**G5.09 INSPECTION.** The Engineer, and all authorized representatives of the Owner, shall at all times have safe access to the work during its construction, and shall be furnished with every reasonable facility for ascertaining that the materials and the workmanship are in accordance with the requirements and intentions of the Contract Documents. All work done and all materials furnished shall be subject to the Engineer's on-site and off-site

inspection.

The inspection and observation of the work or materials by the Engineer shall not relieve the Contractor of any obligations to fulfill his Contract as prescribed. Work and materials not meeting such requirements shall be corrected, and unsuitable work or material may be rejected, notwithstanding that such work or materials have been previously inspected by the Engineer, or that payment therefor has been included in a progress estimate.

The Engineer may order re-examination of questioned work at any time before final acceptance. If so ordered, the Contractor shall uncover the work. If such work is found to be in accordance with the Contract Documents, the Owner will pay for the cost of uncovering; removal, recovering and replacing of the parts removed; but if such work so exposed or examined is not in accordance with the Contract Documents, the uncovering, removal, recovering and replacement shall be at the Contractor's expense. Work which has been covered prior to observation by the Engineer does not qualify as re-examined work; the Owner may order it uncovered for observation without payment of costs.

The Contractor shall give due notice to the Engineer before backfilling so that the Engineer may observe the materials and installation.

The Contractor shall notify the Engineer in advance as to those times when no construction activities will take place. Absent such notification, all costs incurred by the Owner as a result of attending to the project site at times when no construction is taking place will be charged to the Contractor.

Whenever the Contractor intends to perform work on Saturday, Sunday, or a legal holiday, he shall give notice to the Engineer of such intention twenty-four (24) hours prior to performing such work, or such longer period as may be specified, so that the Engineer may make necessary arrangements.

The observations and inspections performed by the Engineer shall not relieve the Contractor of his responsibility to conduct comprehensive inspections of the work and to furnish materials and perform work in conformance with the Contract Documents.

**G5.10 DOCUMENTS ON JOB SITE.** The Contractor shall keep one copy of all Contract Documents (including Change Orders), approved Shop Drawings and approved progress payments on the job site, in good order, available to the Engineer and all authorized representatives of the Owner.

**G5.11 CORRECTION, REMOVAL OF REJECTED WORK.** The Contractor shall promptly correct work rejected by the Engineer as failing to conform to the requirements of the Contract Documents, whether or not fabricated, installed or completed, so that it does comply with the Contract Documents. The Contractor shall bear the costs of correcting such rejected work, including additional testing, inspections and compensation for the Engineer's services and expenses made necessary thereby.

The Contractor shall remove, at his cost, from the site portions of the work which are not in accordance with the Contract Documents or which are not corrected by the Contractor.

The Contractor shall correct, at his cost, damaged or destroyed construction, whether completed or partially completed.

Any work done beyond the lines shown on the Contract Drawings or established by the Engineer, and all extra work done without written authority, will be considered as unauthorized work. Upon order of the Engineer, unauthorized work shall be remedied, removed or replaced at the Contractor's cost.

If the Contractor fails to promptly correct non-conforming or rejected work, or to comply promptly with any order of the Engineer under this Section, the Owner may cause such work to be remedied, removed or replaced and the costs thereof will be deducted from any monies due or to become due the Contractor.

Failure on the part of the Engineer to reject non-conforming work shall not be construed to imply acceptance of such work.

**G5.12 EQUIPMENT AND PLANTS.** The Contractor shall use or permit only equipment and plants suitable to produce the quality of work and materials required, and meeting all State and Federal safety requirements.

Plants shall be designed and constructed in accordance with general practice for such equipment and shall be of sufficient capacity to insure the production of materials needed to complete the work in accordance with the Contractor's schedule and the Contract time.

When ordered by the Engineer, the Contractor shall remove unsuitable equipment from the work and discontinue the operations of unsafe or unsatisfactory plants.

All equipment used shall be selected such that construction loads do not exceed the bearing capacity of structures, highways, streets, and subsurface conduits. The Contractor's attention is directed to Section G7.08 of these General Conditions.

**G5.13 CHARACTER OF WORKERS.** The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons nor persons unskilled in tasks assigned to them. Engineer shall have the authority to require Contractor to remove undisciplined workers from the work.

**G5.14 FINAL INSPECTION.** When the work has been completed, the Engineer will make the final inspection. The Contractor shall notify the Engineer in writing when it considers the work complete and shall request a final inspection.

**G5.15 SUBMITTAL OF AS-BUILT DATA.** The Contractor shall submit to the Engineer all information required by the Engineer to verify as-built drawings for all permanent Contract work.

In order to provide for the timely submission of data, and avoid loss of information, the Contractor shall submit acceptable as-built data to the Engineer on a monthly basis.

**G5.16 EMERGENCIES.** In an emergency affecting the safety of life, the work, or adjoining property, the Contractor, without special instructions or authorization from the Engineer, shall act at his discretion to prevent such threatened loss or injury. In such an emergency, the Contractor shall perform such additional work as is required. Any compensation claimed by the Contractor on account of emergency work shall be determined in accordance with the conditions of Section 9.

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## SECTION 6

### CONTROL OF MATERIALS

**G6.01 SOURCE OF SUPPLY AND QUALITY OF MATERIALS.** The Contractor shall furnish all materials required to complete the work, except materials that are designated in the Specifications to be furnished by the Owner and materials furnished by the Owner in accordance with force account work as described in Section G9.03. As used in this Section, the term "materials" shall mean materials and equipment furnished for incorporation in the work.

Notwithstanding any prior inspection, only materials conforming to the requirements of the Contract Documents shall be incorporated in the work.

The materials furnished and used shall be new, except as may specifically be provided elsewhere in the Contract Documents. The materials shall be manufactured, handled, and used in a workmanlike manner to ensure completed work in accordance with the Contract Documents.

Whenever it is provided that the Contractor shall furnish materials or manufactured articles, or shall do work, for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable in the market from firms of established good reputation; or if not ordinarily carried in stock, shall conform to the usual standards for first-class materials of the kind required, with due consideration for the use they are to be put to.

The Contractor shall submit to the Engineer a list of his sources of materials and the locations at which such materials will be available for inspection. The list shall be submitted in sufficient time to permit proper inspection and testing of materials to be furnished from such listed sources in advance of their use. The Contractor shall assure that the Engineer or his authorized representative has free access at all times to the material to be inspected, sampled or tested. The Engineer may inspect, sample or test materials at the source of supply or other locations. It is understood that such inspections and tests in no way shall be considered as a guaranty of acceptance of such material nor of continued acceptance of material presumed to be similar to that upon which inspections and tests have been made, and that inspection and testing performed by the Owner shall not relieve the Contractor or his suppliers of responsibility for quality control.

Manufacturers' warranties, guaranties, instruction sheets and parts lists, which are furnished with certain materials incorporated in the work, shall be delivered to the Engineer before acceptance of the Contract.

Reports and records of inspections made and tests performed, when available at the site of the work, may be examined by the Contractor and the Engineer.

**G6.02 OWNER-FURNISHED MATERIALS.** Materials furnished by the Owner will be available at locations designated in the Specifications, or if not designated in the Specifications, they will be available at the Owner's Office. The Contractor, at his own expense, including any necessary loading and unloading that may be involved shall haul them to the site of the work. The cost of handling and placing Owner-furnished material shall be considered as included in the price paid for the Contract item involving such Owner-furnished material.

The Contractor shall be held responsible for all materials furnished to him, and he shall pay all demurrage and storage charges. Owner-furnished materials lost or damaged from any cause whatsoever shall be replaced by the Contractor, at his expense. The Contractor will be liable to the Owner for the cost of replacing Owner-furnished material, and such costs may be deducted from any monies due or to become due the Contractor. All Owner-furnished materials that are not used on the work shall remain the property of the Owner and will be delivered to the Owner's corporation yard.

**G6.03 STORAGE OF MATERIALS.** Materials shall be stored by the Contractor in such a manner as to ensure the preservation of their quality and fitness for the work and to facilitate inspection.

**G6.04 DEFECTIVE MATERIALS.** All Contractor-furnished materials not conforming to the requirements of the Contract Documents may be rejected, whether in place or not. They shall be removed immediately from the site of the work unless otherwise permitted by the Engineer. No rejected material, the defects of which have been subsequently corrected, shall be used in the work unless approval in writing has been given by the Engineer. Upon failure of the Contractor to comply promptly with any order of the Engineer made under the conditions of this Section, the Engineer may cause the removal and replacement of rejected material and deducts the cost thereof from any monies due or to become due the Contractor.

**G6.05 MATERIAL AND EQUIPMENT SPECIFIED BY NAME.** Whenever any material or equipment is specified by two patent or proprietary names or by the names of two manufacturers, such specifications shall be considered as used for the purpose of describing the material or equipment desired and shall be considered as if followed by the words "or acceptable equal", whether or not such words appear. The Contractor may offer material or equipment with equal or better qualities and performance in substitution for those specified which he considers would be in the District's interest to accept. No offers for substitution will be acknowledged or considered from suppliers, distributors, manufacturers or subcontractors. Any such offer shall be made in writing to the District Manager for his consideration within thirty-five days after award of the contract. The Contractor shall include with his offer sufficient data which, together with any other data the District may require, will enable the District to assess the acceptability of the material or equipment. When the substitute equipment or material necessitates changes to or coordination with any other portion of the work, the data submitted shall include drawings and details showing all such changes, and the Contractor shall perform these changes as part of any acceptance of substitute material or equipment. The use of any material or equipment so offered will be permitted only after written acceptance of his offer by the District. Such acceptance by the District shall not relieve the Contractor from full responsibility for the efficiency, sufficiency and quality and performance of the substitute material or equipment, in the same manner and degree as the material and equipment specified by name.

Whenever any material or equipment is specified by only one patent or proprietary name or by the name of only one manufacturer, such material or equipment shall be so specified for the purpose of standardization with existing equipment or materials or has no known equal.

**G6.06 PLANT INSPECTION.** The Engineer may inspect the production of material, or the manufacture of products, at the source of supply. Plant inspection, however, will not be undertaken until the Engineer is assured of the cooperation and assistance of both the Contractor and the material producer. The Engineer or his authorized representative shall have free entry at all times to such parts of the plant as concern the manufacture or production of the materials. Adequate facilities shall be furnished free of charge to make the necessary inspection. The Engineer assumes no obligation to inspect materials at the source of supply. The responsibility of incorporating satisfactory materials in the work rests entirely with the Contractor, notwithstanding any prior inspections or tests.

**G6.07 PRODUCT AND REFERENCE STANDARDS.** When descriptive catalog designations, including manufacturer's name, product brand name or model number are referred to in the Contract Documents, such designations shall be considered as being those found in industry publications in effect on the day the Notice to Contractors for the work is dated.

**G6.08 SAMPLES.** After the award of the Contract, the Contractor shall furnish to the Engineer samples indicated in the Specifications or requested by the Engineer. Samples shall be submitted without charge, with shipping charges prepaid. Materials for which samples are required shall not be used in the work until approved in writing by the Engineer.

Each sample shall be submitted in duplicate unless otherwise directed, and shall be labeled with the following data: name of project; name of Contractor; material represented and location in the project including specification reference; and producer information including brand, model, place of origin, and other pertinent information.

The Contractor shall forward a transmittal letter to the Engineer with each shipment of samples containing the information required in the previous paragraph. Approval of a sample shall be only for the characteristics and use named in the submittal and approval shall not be construed to change or modify any Contract requirement. Before submitting samples, the Contractor shall assure himself that the materials or equipment will be available in the quantities required in the project, as no change or substitution will be permitted after a sample has been approved



unless approved by the Engineer in writing.

Samples of material from local sources shall be taken by or in the presence of the Engineer if so required by the Engineer; otherwise the samples will not be considered for testing.

Approved samples not damaged in testing may be incorporated in the finished work if marked for identification and approved by the Engineer. Materials incorporated in the work shall match the approved samples.

Failure of any material to pass the specified tests will be sufficient cause for refusal to consider under this Contract any further samples of the same brand, make or source of that material. The Engineer reserves the right to disapprove any material which has previously proven unsatisfactory in service.

Samples of material delivered on the site or in place may be taken by the Engineer for testing. Failure of samples to meet Contract requirements will annul previous approvals of the item tested.

**G6.09 TESTING OF MATERIALS OR WORK.** Materials to be used in the work will be subject to inspection and tests by the Engineer or his designated representative. The Contractor shall furnish, without charge, such samples as may be required.

Materials and work shall be tested in accordance with the methods in use by the State of California, Department of Transportation, or by nationally recognized testing organizations or as specified in the Contract Documents. The Engineer will make or approve all testing. Unless otherwise noted in the Specifications, testing will be made at the expense of the Owner. In the event that any materials and work fail to pass tests, the cost of subsequent testing of similar materials and work as may be required by the Engineer shall be borne by the Contractor.

Test methods developed by the State of California, Department of Transportation are identified by the prefix Calif., followed by the serial number. Copies of individual test methods are available at the Transportation Laboratory, Sacramento, California.

Whenever a reference is made in the Specifications to a test method by California number, it shall mean the test method in effect on the date of the Notice to Contractors for the work. Whenever a reference is made in the Specifications to a specification or test designation of the American Society for Testing and Materials, the American Association of State Highway Officials, Underwriters' Laboratories, Inc., or any other recognized national organization, and the number accompanying the test designation representing the year of adoption of the test has been omitted, the reference shall mean the test method in effect on the date of the Notice to Contractors for the work.

Whenever the Contract Documents provide an option between two or more test methods, the Engineer will determine the test method to be used.

Whenever a specification, manual or test designation provides for test reports (such as certified mill test reports) from the manufacturer, copies of such reports, identified as to the lot of material, shall be furnished to the Engineer. The manufacturer's test report shall supplement the inspection, sampling and testing conditions of this Section and shall not constitute a waiver of the Owner's right to inspect. When material which cannot be identified with specific test reports is proposed for use, the Engineer may, at his discretion, select random samples from the lot for testing. Testing specimens from the random samples, including those required for retest, shall be prepared in accordance with the referenced specification and furnished by the Contractor at his expense. The number of such samples and test specimens shall be entirely at the discretion of the Engineer.

**G6.10 CERTIFICATE OF COMPLIANCE.** A Certificate of Compliance shall be furnished prior to the use of any materials for which the Special Conditions or Specifications require that such Certificate be furnished. In addition, the Engineer may permit the use of certain materials prior to sampling and testing if accompanied by a Certificate of Compliance stating that the materials involved comply in all respects with the requirements of the Specifications. The Certificate shall be signed by the manufacturer of the material. A Certificate of Compliance shall be furnished with each lot of material delivered to the work and the lots so certified shall be clearly identified in the Certificate.

All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the work which conforms to the requirements of the Contract Documents, and any such material not conforming to such requirements will be subject to rejection whether in place or not.

The Owner reserves the right to refuse to permit the use of material on the basis of a Certificate of Compliance.

The form of the Certificate of Compliance and its disposition shall be as approved by the Engineer.

## SECTION 7

### LEGAL RELATIONS AND RESPONSIBILITIES

**G7.01 LAWS TO BE OBSERVED.** The Contractor shall keep himself fully informed concerning all requirements of law, including but not limited to all State and Federal laws and county and municipal ordinances and regulations which in any manner affect those engaged or employed in the work, the materials used in the work, or which in any way affect the conduct of the work, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. The Contractor shall at all times observe, and shall cause all his agents and employees to observe, all such requirements of laws and shall protect, indemnify and hold harmless the Owner, the Engineer, and all of their respective officers, agents and employees against all claims and liabilities arising from or based on the violation of any such requirement of law whether by the Contractor or his employees. If any discrepancy or inconsistency is discovered in the Contract Documents for the work in relation to any such requirements of laws, the Contractor shall immediately report the same to the Engineer in writing. The Contract Documents shall be governed by the laws of the State of California.

**G7.02 LABOR CODE REQUIREMENTS.** Attention is directed to the following requirements of the Labor Code:

A. Hours of Labor. Eight hours labor constitutes a legal day's work. The Contractor shall forfeit, as penalty to the Owner, twenty-five (\$25.00) for each workman employed in the performance of the Contract by the Contractor or by any subcontractor under him for each calendar day during which such workman is required or permitted to work more than eight (8) hours in any one day and forty (40) hours in any one calendar week in violation of the provisions of the California Labor Code and in particular, Sections 1810 to 1815 thereof, inclusive, except that work performed by employees of the Contractor in excess of eight (8) hours per day and forty (40) hours during any one week shall be permitted upon compensation for all hours worked in excess of eight (8) hours per day at not less than one-and-one-half (1½) times the basic rate of pay, as provided in said Section 1815.

B. Labor Non-Discrimination. Attention is directed to Section 1735 of the Labor Code which provides the Contractor shall not discriminate against any employee who is employed on the work because of race, religious creed, color, national origin, ancestry, physical handicap, medical condition, marital status, sex or age of such persons, except as provided in Section 12940 of the Government Code.

C. Prevailing Wages. The Contractor shall comply with California Labor Code Sections 1770 to 1780, inclusive. In accordance with said Section 1775, the Contractor shall forfeit as a penalty to the Owner no more than two hundred dollars (\$200.00) for each calendar day or portion thereof for each workman paid less than stipulated prevailing wage rates for such work or craft in which such worker is employed for any work done under the Contract by him or by any subcontractor under him in violation of the provisions of the Labor Code and in particular, Labor Code Sections 1770 to 1780, inclusive. In addition to said penalty and pursuant to said Section 1775, the difference between such stipulated prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the stipulated prevailing wage rate shall be paid to each worker by the Contractor.

Pursuant to the provisions of Section 1773 of the Labor Code, the Owner has obtained the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work applicable to the work to be done from the Director of the Department of Industrial Relations. Copies of the prevailing rates are on file at the Owner Office and are available to any interested party on request. Such wage rates must be prominently posted at the construction site.

The Owner will not recognize any claim for additional compensation because of the payment by the Contractor of any wage rate in excess of the prevailing wage rate set forth in the Contract. The possibility of wage increases is one of the elements to be considered by the Contractor in determining his bid, and will not under any circumstances be considered as the basis of a claim against the Owner on the Contract.

Attention is directed to the requirements of Section 1773.8 of the Labor Code. The Contractor shall make travel and subsistence payments to each worker needed to execute the work in accordance with the requirements of said Section 1773.8.

D. Payroll Records. The Contractor's attention is directed to the following provisions of Labor Code Section 1776. The Contractor shall be responsible for the compliance with these provisions by his subcontractors.

(a) Each contractor and subcontractor shall keep an accurate payroll record, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by him or her in connection with the public work.

(b) The payroll records enumerated under subdivision (a) shall be certified and shall be available for inspection at all reasonable hours at the principal office of the Contractor on the following basis:

(1) A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request.

(2) A certified copy of all payroll records enumerated in subdivision (a) shall be made available for inspection or furnished upon request to the Owner, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations.

(3) A certified copy of all payroll records enumerated in subdivision (a) shall be made available upon request to the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through either the Owner, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested payroll records have not been provided pursuant to paragraph (b)(2), herein, the requesting party shall, prior to being provided the records, reimburse the costs of preparation by the Contractor, subcontractor and the entity through which the request was made. The public shall not be given access to such records at the principal office of the Contractor.

(c) Each contractor shall file a certified copy of the records enumerated in subdivision (a) with the entity that requested the records within ten (10) days after receipt of a written request.

(d) Any copy of records made available for inspection and copies furnished upon request to the public or any public agency by the Owner, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address, and social security number. The name and address of the Contractor awarded the contract or performing the contract, shall not be marked or obliterated.

(e) The Contractor shall inform the Owner of the location of records enumerated under subdivision (a), including the street address, city and county, and shall, within five (5) working days, provide a notice of a change of location and address.

(f) In the event of noncompliance with the requirements of this Section, the Contractor shall have ten (10) days in which to comply subsequent to receipt of written notice specifying in what respects the contractor must comply with this Section. Should noncompliance still be evident after the ten-day (10) period, the Contractor shall, as a penalty to the State or the Owner, forfeit twenty-five (\$25.00) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.

Responsibility for compliance with these Paragraphs (a) through (f) lies with the Contractor.

The penalties specified in subdivision (f) of Labor Code Section 1776 for noncompliance with the provisions of said Section 1776 may be deducted from any monies due or which may become due to the Contractor.

The Contractor and each subcontractor shall preserve their payroll records for a period of 3 years from the date of completion of the Contract.

E. Apprentices. The Contractor shall fully comply with the requirements of Sections 1777.5, 1777.6 and 1777.7 (as amended) of the California Labor Code and the regulations of the California Apprenticeship Council. In accordance with Section 1777.5, the Contractor shall secure the necessary certificates and shall contribute to the apprenticeship fund or funds, as provided for therein. The Contractor shall require each subcontractor who will perform work or labor or render service to the Contractor in or about the construction of the work to comply fully with Sections 1777.5 and 1777.6 of the Labor Code. Information relative to apprenticeship standards, wage schedules and other requirements may be obtained from the State Division of Apprenticeship Standards and its branch offices.

F. Worker's Compensation. Pursuant to the requirements of Section 1860 of the California Labor Code, the Contractor will be required to secure the payment of workers' compensation to his employees in accordance with the provisions of Section 3700 of the Labor code.

Prior to commencement of work, the Contractor shall sign and file with the Owner, a certification in the following form:

"I am aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for workers, compensation or to undertake self accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract."

Said certification is included in the Contract, and signature and return of the Contract as provided in Section G3.03, "Execution of Contract," of the General Conditions, shall constitute signing and filing of the said certificate.

**G7.03 CONTRACTORS' LICENSING LAWS.** Attention is directed to the provisions of Chapter 9 of Division 3 of the California Business and Professions Code concerning the licensing of contractors. All bidders and contractors shall be licensed in accordance with the laws of the State of California and any bidder or contractor not so licensed is subject to the penalties imposed by such laws.

**G7.04 AIR POLLUTION CONTROL.** The Contractor shall comply with all air pollution control rules, regulations, ordinances and statutes which apply to any work performed pursuant to the Contract, including any air pollution control rules, regulations, ordinances and statutes specified in Section 11017 of the Government Code.

Material to be disposed of shall not be burned, either inside or outside the work site.

**G7.05 WATER POLLUTION CONTROL.** The Contractor shall exercise every reasonable precaution to protect streams, lakes, reservoirs, bays and coastal waters from pollution with fuels, oils, bitumen, calcium chloride and other harmful materials and shall conduct and schedule his operations so as to avoid or minimize muddying and silting of said streams, lakes, reservoirs, bays and coastal waters. Care shall be exercised to preserve roadside vegetation beyond the limits of construction.

Water pollution control work is intended to provide prevention, control, and abatement of water pollution to streams, waterways and other bodies of water, and shall consist of constructing those facilities which may be shown on the plans, specified herein or in the Special Conditions, or directed by the Engineer.

In order to provide effective and continuous control of water pollution it may be necessary for the Contractor to perform the Contract work in small or multiple units, on an out of phase schedule, and with modified construction

procedures. The Contractor shall provide temporary water pollution control measures, including but not limited to, dikes, basins, ditches, and applying straw and seed, which become necessary as a result of his operations. The Contractor shall coordinate water pollution control work with all other work done on the Contract.

Before starting any work on the project, the Contractor shall submit, for acceptance by the Engineer, a program to control water pollution effectively during construction of the project. Such program shall show the schedule for the erosion control work and for all water pollution control measures which the Contractor proposes to take in connection with construction of the project to minimize the effects of his operations upon adjacent streams and other bodies of water. The Contractor shall not perform any clearing and grubbing or earthwork on the project, other than that specifically authorized in writing by the Engineer, until such program has been accepted.

If the measures being taken by the Contractor are inadequate to control water pollution effectively, the Engineer may direct the Contractor to revise his operations and his water pollution control program. Such directions will be in writing and will specify the items of work for which the Contractor's water pollution control measures are inadequate. No further work shall be performed on said items until the water pollution control measures are adequate and, if also required, a revised water pollution control program has been accepted.

The Engineer will notify the Contractor of the acceptance or rejection of any submitted or revised water pollution control program in not more than five (5) days.

The Owner will not be liable to the Contractor for failure to accept all or any portion of an originally submitted or revised water pollution control program, nor for any delays to the work due to the Contractor's failure to submit an acceptable water pollution control program.

The Contractor may request the Engineer to waive the requirement for submission of a written program for control of water pollution when the nature of the Contractor's operation is such that erosion is not likely to occur. Waiver of this requirement will not relieve the Contractor from responsibility for compliance with the other conditions of this Section. Waiver of the requirement for a written program for control of water pollution will not preclude requiring submittal of a written program at a later time if the Engineer deems it necessary because of the effect of the Contractor's operations.

Where erosion which will cause water pollution is probable due to the nature of the material or the season of the year, the Contractor's operations shall be so scheduled that permanent erosion control features will be installed concurrently with or immediately following grading operations.

Nothing in the terms of the Contract nor in the conditions in this Section shall relieve the Contractor of the responsibility for compliance with Sections 5650 and 12015 of the Fish and Game Code, or other applicable statutes relating to prevention or abatement of water pollution.

The Contractor shall also conform to the following conditions:

- A. Where working areas encroach on live streams, barriers adequate to prevent the flow of muddy water into streams shall be constructed and maintained between working areas and streams, and during construction of such barriers, muddying of streams shall be held to a minimum.
- B. Removal of material from beneath a flowing stream shall not be commenced until adequate means, such as a bypass channel, are provided to carry the stream free from mud or silt around the removal operations.
- C. Should the Contractor's operations require transportation of materials across live streams, such operations shall be conducted without muddying the stream. Mechanized equipment shall not be operated in the stream channels of such live streams except as may be necessary to construct crossings or barriers and fills at channel changes.
- D. Water containing mud or silt from aggregate washing or other operations shall be treated by filtration, or retention in a settling pond, or ponds, adequate to prevent muddy water from entering live

streams.

E. Oily or greasy substances originating from the Contractor's operations shall not be allowed to enter or be placed where they will later enter a live stream.

F. Portland cement or fresh portland cement concrete shall not be allowed to enter flowing water of streams.

G. When operations are completed, the flow of streams shall be returned as nearly as possible to a meandering thread without creating possible future bank erosion and settling, pond sites shall be graded so they will drain and will blend in with the surrounding terrain.

H. Material derived from roadway work shall not be deposited in a live stream channel where it could be washed away by high stream flows.

I. Where there is possible migration of anadromous fish in streams affected by construction on the project, the Contractor shall conduct his operations so as to allow free passage of such migratory fish.

Compliance with the requirements of this Section shall in no way relieve the Contractor from his responsibility to comply with the other conditions of the Contract, in particular his responsibility for damage and for preservation of property.

Full compensation for conforming to the requirements of this Section shall be considered as included in the prices paid for the various items of work and no additional compensation will be allowed therefor.

**G7.06 SOUND CONTROL REQUIREMENTS.** The Contractor shall comply with all local sound control and noise level rules, regulations and ordinances which apply to any work performed pursuant to the Contract.

Each internal combustion engine, used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without said muffler.

**G7.07 USE OF PESTICIDES.** The Contractor shall comply with all rules and regulations of the Department of Food and Agriculture, the Department of Health, the Department of Industrial Relations and all other agencies which govern the use of pesticides required in the performance of the work on the Contract.

Pesticides shall include but shall not be limited to herbicides, insecticides, fungicides, rodenticides, germicides, nematocides, bactericides, inhibitors, fumigants, defoliant, desiccants, soil sterilants, and repellents.

Any substance or mixture of substances intended for preventing, repelling, mitigating or destroying weeds, insects, diseases, rodents or nematodes and any substance or mixture of substances intended for use as a plant regulator, defoliant or desiccant shall be considered as pesticide.

**G7.08 WEIGHT LIMITATIONS.** Unless expressly permitted in the Technical Conditions, the Contractor shall not operate construction equipment or vehicles of any kind which, laden or unladen, exceed the maximum weight limits set forth in Division 15 of the Vehicle Code, over completed or existing base, surfacing, pavement or structures.

Contractor shall be responsible for any damage he may cause to bridges, culverts, and road structures. He shall determine in advance the allowable safe load for each structure and, if necessary, provide special shoring and support at his expense. Contractor shall seek approval from appropriate jurisdictions for use of designated routes for access to and from the project site.

**G7.09 PAYMENT OF TAXES.** The Contract prices paid for the work shall include full compensation for all taxes which the Contractor is required to pay, whether imposed by Federal, State or local government, including, without being limited to, Federal excise tax. No tax exemption certificate nor any document designed to exempt the

Contractor from payment of any tax will be furnished to the Contractor by the Owner, as to any tax on labor, services, materials, transportation, or any other items furnished pursuant to the Contract.

The Contractor shall withhold and pay any and all sales and use taxes, withholding taxes, whether State or Federal, Social Security taxes, State Unemployment Insurance charges and all other taxes which are now or hereafter may be required to be paid or withheld under any laws.

**G7.10 PERMITS AND LICENSES.** The Contractor shall procure all permits and licenses (except those procured or to be procured by the Owner which are listed in the Special Conditions or Specifications), pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work.

The Environmental Quality Act (Public Resources Code, Section 21000 to 21176) may be applicable to permits, licenses and other authorizations which the Contractor must obtain from State or local agencies in connection with performing the work of the Contract. The Contractor shall comply with the provisions of that Act in obtaining such permits, licenses and other authorizations and they shall be obtained in sufficient time to prevent delays to the work.

The Contractor shall comply with permits obtained by the Owner for the work which are listed in the Special Conditions or Specifications.

**G7.11 SUBSURFACE EXCAVATIONS, NOTIFICATION.** Attention is directed to Government Code Section 4216 which provides, in part:

"Except in an emergency, every person planning to conduct any excavation shall contact the appropriate regional notification center at least two working days prior to commencing that excavation, if the excavation will be conducted in an area which is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the excavator. The regional notification center shall provide an inquiry identification number to the person who contacts the center and shall notify any member, if known, who has a subsurface installation in the area of the proposed excavation."

The Contractor shall contact the regional notification center, "Underground Service Alert," and schedule the work to allow ample time for the center to notify its members and, if necessary, for any member to field locate and mark its facilities.

**G7.12 PATENTS.** The Contractor shall assume all costs arising from the use of patented materials, equipment, devices or processes, used on or incorporated in the work and shall indemnify and save harmless the Owner, the Engineer, and their duly authorized representatives from all suits at law, or actions of every nature for, or on account of, the use of patented materials, equipment, devices or processes. In case such materials, equipment, devices or processes are held to constitute an infringement and their use enjoined, the Contractor, at his expense, shall: (a) secure for the Owner the right to continue using said materials, equipment, devices or processes by suspension of the injunction or by procuring a license or licenses, or (b) replace such materials, equipment, devices or processes, or (c) modify them so that they become noninfringing or remove the enjoined materials, equipment, devices or processes and refund the sums paid therefor without prejudice to any other rights of the Owner or the Engineer.

The attention of the Contractor is directed to the following information:

- A. A portion of the pipe replacement work called for on this project will require the Contractor to use a trenchless method of construction.
- B. Some forms of trenchless pipe replacement construction are referred to as "pipe bursting" or "pipe cracking".
- C. The District has been notified by British Gas, 100 Thames Valley Park Drive, Reading, Berkshire, RG6 1PT, Great Britain, that it holds U.S. Patent No. 4738565, which British Gas contends covers pipe bursting or pipe cracking methodologies.



D. The District is unable to determine whether any form of trenchless pipe replacement which may be permitted by these project specifications would be covered by the British Gas patent or by any other patent or intellectual property right claim. However, pursuant to the conditions of this Section G7.12, it is the obligation of the Contractor to take whatever measures, including the acquisition of licenses or other rights of use, which are required with respect to any such patents or intellectual property right claims and to defend, indemnify and hold the District harmless from any such patents or claims without any cost or expense to the District.

**G7.13 SAFETY REQUIREMENTS.** The Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Contractor shall submit documentation that designated individuals have received competent person training. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

- A. All persons at the site and other persons and organizations who may be affected thereby;
- B. All the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and
- C. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

(a) Safety Measures: The Contractor shall promptly and fully comply with and carry out and shall, without separate charge to the Owner, enforce compliance with safety and health requirements stated herein, prescribed by all applicable Laws and Regulations (whether referred to herein or not) of any public body having jurisdiction or charged with the enforcement thereof, for the safety of persons or property or to protect them from damage, injury, or loss and shall erect and maintain all necessary safeguards for such safety and protection. Where any of these safety regulations are in conflict, the more stringent requirement shall be followed.

The Contractor shall notify Engineer of adjacent property and utilities when performance of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. The Contractor shall take such other measures as may be necessary to ensure that work is done in a safe manner and that the safety and health of the employees and people of the local communities is safeguarded.

Compliance with these by subcontractors shall be the sole responsibility of the Contractor.

(b) Personal Hygiene: Persons involved in the work may be exposed to wastewater microorganisms that could cause infections and diseases. The Contractor shall require his personnel to observe proper hygiene such as washing of hands and other exposed portions of the body with disinfecting soap and water before eating, smoking, applying lip balm, etc.

(c) Public Safety and Convenience: The Contractor shall conduct the work so as to ensure the least possible obstruction to traffic and inconvenience to the general public in the vicinity of the work and to ensure the protection of persons and property. No road or street shall be closed to the public except with the permission of the Owner and the proper governmental authorities. Fire hydrants on or adjacent to the work shall be accessible to fire-fighting equipment. Temporary provisions shall 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.

(d) Flammable, Hazardous and/or Toxic Materials: Solvents, gasoline, and other hazardous materials may be in the wastewater, and therefore, the work site may be hazardous to open flames, sparks, or unventilated occupancy. The Contractor shall take measures to ensure his personnel

observe proper safety precautions when working in these areas. Any flammable, hazardous or toxic materials brought into the work area must be pre-approved, in writing, by the Owner and must be accompanied by the most current MSD sheet. Any flammable, hazardous or toxic materials brought into the work area must be properly stored to prevent spontaneous combustion or dispersion, and must be stored using the appropriate level of secondary spill containment. Flammable, hazardous or toxic materials may never be placed into any sewer or drain piping nor buried on the Owner's property. The Contractor shall maintain a current and up-to-date copy of all laws, ordinances, codes, rules, regulations and lawful orders of any regulatory authority having jurisdiction or control over flammable, hazardous or toxic materials and, at Contractor's expense, shall comply with said laws, ordinances, codes, rules, regulations and lawful orders.

The Contractor must provide all certificates and registrations as required by the California Business and Professions Code, CCR Title 22, and other regulations governing the removal or remediation of hazardous substances.

(e) Excavation and Trenching. The Contractor shall promptly, and before the following conditions are disturbed, notify the Owner, in writing, of any:

- (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.
- (3) Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.

The Owner shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the work shall issue a change order under the procedures described in the contract.

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.

#### EMERGENCY WORK:

A. Corrective Action: The Contractor shall perform any and all operations and shall furnish any materials and equipment necessary during an emergency endangering life or property. In all cases, Contractor shall notify the Engineer of the emergency as soon as practicable, but shall not wait for instruction before proceeding to properly protect both life and property.

Adjustments to the contract: If as a result of an emergency, work is added to or deleted from the contract between the Owner and the Contractor, the contract shall be adjusted in terms of compensation, time for performance and/or other relevant contract conditions in accordance with the provisions of the contract governing such matters.

B. Emergency Contacts: The Contractor shall file with the Owner a written list giving the names, addresses, and telephone numbers of at least two of his representatives who can be contacted at any time in

case of emergencies. The representative shall be fully authorized and equipped to correct unsafe or inconvenient conditions on short notice. The Contractor shall promptly notify the Owner of all changes in the listing.

C. Special Corrective Actions: The Owner reserves the right, exercisable without advance notice to the Contractor, to take corrective action and to perform necessary repairs in an emergency if the Owner determines for any reason that the Contractor is or may be unable to respond to the emergency in as timely or effective a manner as the Owner could do so. Emergency work undertaken by the Owner under these circumstances may be performed by the Owner's own forces and resources, by contract with others, or both. The exercise of this right shall not terminate the contract between the Contractor and the Owner.

D. Stop Orders: In the event the Contractor fails to observe any of the necessary safety provisions, the Owner may stop the work and direct the Contractor to comply with the applicable provisions, or may order the necessary work be done by others. All impacts, both monetary and time-related, associated with stoppage of the work in order to comply with the contract specifications pertaining to safety requirements, and all costs of having the necessary work done by others shall be borne by and be the obligation of the Contractor.

**G7.14 TRENCH EXCAVATION SAFETY PLAN.** Attention is directed to California Labor Code Section 6705. At least five days in advance of excavation of any trench five feet or more in depth, the Contractor shall submit to the Engineer a detailed plan showing the design of shoring, bracing, sloping and other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system standards established by the State Construction Safety Orders, the plan shall be prepared and signed by a registered civil or structural engineer. 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 of the Division of Industrial Safety. Nothing in this Section shall be construed to impose liability on the Owner, the Engineer or any of their employees.

**G7.15 SANITARY PROVISIONS.** The Contractor shall conform to the rules and regulations pertaining to sanitary provisions established by the State, and to County, City and municipal laws and ordinances as may be applicable. Toilets for use of employees on the work shall be furnished where needed and shall be maintained by the Contractor. Their use shall be strictly enforced. Owner sanitary facilities will not be available for use by the Contractor's employees, except where specifically designated in writing by the Engineer.

**G7.16 PUBLIC CONVENIENCE.** The Contractor shall so conduct his operations as to offer the least possible obstruction and inconvenience to the public and he shall have under construction no greater length or amount of work than he can prosecute properly with due regard to the rights of the public.

All public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible. The Contractor shall obtain approval of his plans for the routing and control of traffic from the appropriate city, county or State agency. Where the temporary rerouting or closing to traffic of any public street or highway is necessary, the Contractor shall make all necessary arrangements with the appropriate city, county or State agency.

All trucks coming to the site or leaving the site with materials or loose debris shall be loaded in a manner which will prevent dropping of material or debris on public streets. Spillage resulting from hauling operations along or across any public traveled way shall be removed immediately at the Contractor's expense.

Construction operations shall be conducted in such a manner as to cause as little inconvenience as possible to owners of abutting property. Convenient access to driveways, houses and buildings along the line of work shall be maintained, and temporary approaches to roads or highways shall be provided and kept in good condition. Roadway excavations shall be conducted in such a manner as to provide a reasonably smooth and even surface satisfactory for use by public traffic at all times.

For work in public right-of-way, the Contractor shall comply with the rules and regulations of the State, County or local agency that owns the right-of-way.

All costs of complying with public convenience requirements of the Owner or other agencies shall be included in the Contract price.

The Engineer shall have the authority, but not the duty, to stop the Contractor from beginning new work until the conditions of this Section have been met and/or to assess liquidated damages.

**G7.17 PUBLIC SAFETY.** The Contractor shall assume all responsibility for public safety during construction, and all costs arising therefrom shall be included in the Contract amount. Whenever the Contractor's operations create a condition hazardous to traffic or to the public, he shall furnish, erect and maintain, at his expense, such fences, barricades, lights, signs and other devices and take such other protective measures as are necessary to prevent accidents or damage or injury to the public. The Contractor shall also furnish such flagmen as are necessary to give adequate warning to traffic or to the public of any dangerous conditions. For work in public right-of-way, the Contractor shall comply with the rules and regulations of the State, County or local agency that owns the right-of-way.

**G7.18 PRESERVATION OF PROPERTY.** Due care shall be exercised to avoid injury to existing improvements or facilities, utility facilities, adjacent property and trees, shrubs and other plants that are not to be removed.

Trees, shrubs and other plants that are not to be removed, and pole lines, fences, signs, survey markers and monuments, buildings and structures, conduits, pipe lines, sewer and waterlines, highway facilities, and any other improvements or facilities, under or above ground, that are within or adjacent to the work limit line shall be protected from injury or damage, and the Contractor shall provide and install suitable safeguards to protect such objects from injury or damage. If such objects are injured or damaged by reason of the Contractor's operations, they shall be replaced or restored at the Contractor's expense. The facilities shall be replaced or restored to a condition as good as when the Contractor entered upon the work, or as good as required by the Specifications if any such objects are a part of the work being performed under the Contract. The Engineer may make or cause to be made such temporary repairs as are necessary to restore to service any damaged facility. The cost of such repairs shall be borne by the Contractor and may be deducted from any monies due or to become due to the Contractor under the Contract.

The fact that any underground facility is not shown on the Contract Plans shall not relieve the Contractor of his responsibility under Section G8.15, "Existing Utilities," of the General Conditions. It shall be the Contractor's responsibility, pursuant thereto, to ascertain the location of such underground improvements or facilities which may be subject to damage by reason of his operations.

Full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in protecting or repairing property as specified in this Section, shall be considered as included in the prices paid for the various Contract items of work and no additional compensation will be allowed therefor.

**G7.19 RESPONSIBILITY FOR DAMAGE.** The Owner and all Members of the Owner's governing body, officers, employees and authorized agents thereof connected with the work, the Engineer shall not be answerable or accountable in any manner: for any loss or damage that may happen to the work or any part thereof; for any loss or damage to any of the materials or other things used or employed in performing the work; for injury to or death of any person (including but not limited to workers or the public) from any cause whatsoever; or damage to property from any cause whatsoever.

The Contractor shall be responsible for any liability imposed by law and for any injuries to or death of any person (including but not limited to workers and the public) and for damage to property resulting from defects or from obstructions or from any cause whatsoever during the progress of the work or at any time before its completion and final acceptance.

To the maximum extent permitted by law, the Contractor shall indemnify and save harmless the Owner and all members of the governing body, officers, employees and authorized agents thereof, the Engineer from all claims, suits or actions of every name, kind and description, brought for, or on account of, injuries to or death of any person (including but not limited to employees of Contractor, of subcontractors, or of any other person, firm or entity and the public) or damage to property arising from any cause whatsoever during the progress of the work or at any time

before its final completion and acceptance. The duty of the Contractor to indemnify and save harmless includes the duties to defend (by legal counsel satisfactory to the indemnities) as set forth in Section 2778 of the Civil Code and to pay attorney's fees and litigation costs required by such defense.

With respect to third party claims against Contractor, the Contractor waives any and all rights to any type of express or implied indemnity against the Owner, members of its governing body, officers, employees or authorized agents, and the Engineer. It is the intent of the parties that the Contractor shall indemnify and hold harmless the Owner, members of its governing body, officers, employees and authorized agents, the Engineer from any and all claims, suits, or actions arising from any cause whatsoever as set forth above regardless of the existence or degree of fault or negligence on the part of the Owner, the Engineer, the Contractor, a subcontractor or employee of any of these, other than the active negligence of the Owner or its Directors, officers, employees or authorized agents, and the Engineer.

The Contractor shall be responsible for any and all damage caused by the work within private property or within the public right-of-way, the Contractor is fully responsible for locating and reconnecting all sanitary sewer laterals as part of the sanitary sewer main replacement work. Further, the Contractor shall be solely responsible for any liability imposed from claims against the Contractor and/or the District for failure to complete this requirement (missed laterals). Note that some properties may have more than one lateral connection, and the District cannot guarantee the availability or accuracy of as-built drawings for properties within the service area.

**G7.20 RESPONSIBILITY FOR WORK AND MATERIALS.** Until the acceptance of the Contract, the Contractor shall have the charge and care of the work and of the materials to be used therein, including materials for which he has received partial payment, and shall bear the risk of injury, loss or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution or from the nonexecution of the work. The Owner will not grant relief from maintenance and responsibility for a portion of the total work. The Contractor shall rebuild, repair or restore all injuries, losses or damages to any portion of the work and materials occasioned by any cause before its completion and acceptance and shall bear the expense thereof. Where necessary, the Contractor shall, at his expense, provide suitable drainage and erect such temporary structures as are necessary to protect the work and materials from damage. The suspension of the work from any causes whatever shall not relieve the Contractor of his responsibility for the work and materials as herein specified. The Contractor shall properly store materials which have been partially paid for by the Owner. Such storage by the Contractor shall be on behalf of the Owner and the Owner shall at all times be entitled to the possession of such materials, and the Contractor shall promptly return the same to the site of the work when requested. The Contractor shall not dispose of any of the materials so stored except on written authorization from the Engineer.

**G7.21 GENERAL LIABILITY OF CONTRACTOR.** Contractor hereby agrees to indemnify and save harmless Owner and the Engineer and their respective Boards, officers, agents and employees of and from any and all claims, suits or actions of every name, kind and description which may be brought against their respective Boards, officers, agents or employees by reason of any injury to or death of any person or property damage suffered or sustained by any person or corporation caused by, or alleged to have been caused by, any act or omission, negligent or otherwise, of Contractor, his officers, agents or employees in the performance of any work required of the Contractor by this Agreement. The Owner shall not be deemed to have waived rights it may have against Contractor because of the acceptance by Owner of any of the insurance policies described in this Agreement.

The duty of Contractor to indemnify and save harmless, as set forth herein, shall include a duty to defend as set forth in Section 2778 of the California Civil Code; provided, however, that nothing herein shall be construed to require Contractor to indemnify Owner and the Engineer and their respective Boards, officers, agents and employees against any responsibility or liability in contravention of Section 2782 of the California Civil Code.

#### **G7.22 PREVAILING WAGE INDEMNITY AND WAIVER**

A. Contractor shall, and hereby agrees to, unconditionally indemnify, reimburse, defend, protect and hold harmless Owner and its elective and appointive boards, commissions, officers, agents, attorneys, consultants and employees, and all of their respective successors and assigns, from and against any and all claims, demands, suits and actions at law or in equity, and losses, liabilities, expenses, penalties, fines, orders, judgments, injunctive or other relief, and costs and damages of every kind, nature and description (including but not limited to attorneys' fees and court costs, with counsel reasonably acceptable to Owner), and administrative, enforcement or judicial proceedings, whether

known or unknown, and which directly or indirectly, in whole or in part, are caused by, arise from, or relate to, or are alleged to be caused by, arise from, or relate to, the payment or requirement of payment of prevailing wages, or any act or omission of Owner related to this Agreement with respect to the payment or requirement of payment of prevailing wages, whether or not any insurance policies shall have been determined to be applicable to any such claims, demands, suits, actions, losses, liabilities, expenses, penalties, fines, orders, judgments, injunctive or other relief, costs, damages, or administrative, enforcement or judicial proceedings. It is further agreed that Owner does not, and shall not, waive any rights against Contractor which it may have by reason of this indemnity and hold harmless agreement because of the acceptance by Owner, of any of the insurance policies described herein.

B. The Contractor acknowledges that it has been informed of the requirement to pay, at a minimum, prevailing wages in this project. As a result, the Contractor hereby waives any and all claims it might otherwise have against the public agency pursuant to Labor Code Sections 1726 and 1781.

**G7.23 PUBLIC LIABILITY INSURANCE.** The Contractor shall procure and maintain Broad Form Comprehensive General Liability or Commercial General Liability Insurance, and Code 1 or "Any Auto" Business Automobile Liability Insurance policies in amounts for each policy of not less than:

A. General Liability: One Million Dollars (\$1,000,000.00) per occurrence for bodily injury, personal injury and property damage, and subject to that limitation for the injury to or death of one person of not less than Two Million Dollars (\$2,000,000.00) for injury to or death of two or more persons as a result of any one accident or occurrence, with personal or bodily injury aggregate in an amount not less than Two Million Dollars (\$2,000,000.00). If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project or the general aggregate limit shall be three times the required occurrence limit.

B. Automobile Liability: One Million Dollar (\$1,000,000.00) per accident for bodily injury, personal injury and property damage, and subject to that limitation for the injury to or death of one person, not less than Two Million Dollars (\$2,000,000.00) for injury to or death of two or more persons as a result of any one accident or occurrence, with personal or bodily injury aggregate in an amount not less than Two Million Dollars (\$2,000,000.00).

Policies shall provide coverage for property damages, personal injuries, bodily injuries or death suffered or alleged to have been suffered by any person or persons by reason of or in the course of operations under the contract, whether occurring by reason of acts or omissions of the Contractor or any subcontractor or both. Coverage shall be at least as broad as Insurance Services Office Commercial General Liability coverage (occurrence form CG 0001) for general liability insurance and Insurance Services Office form number CA 0001 (Ed. 1/87) for automobile liability insurance. Such insurance shall be maintained until final acceptance of the work by the Owner and shall continue of a period of 365 days after acceptance of the work by the Owner. The general liability insurance policy required by this Section shall include explosion, collapse, underground excavation or removal of lateral support.

The general liability insurance policies shall also cover the Owner, its Board, officers, agents, employees, and servants of the Contractor, the Contractor's subcontractors, City of El Cerrito, the City of Richmond, County of Contra Costa, and the District's Engineer as insureds.

The general liability insurance policies required under this Section, shall contain, or be endorsed to contain, the following other conditions:

A. The Contractor's insurance coverage shall be primary insurance. Any insurance or self-insurance maintained by the Owner, its Board, officers, agents, employees and servants of the Contractor, the Contractor's subcontractor's, City of El Cerrito, the City of Richmond, County of Contra Costa, and the District's Engineer shall be excess of Contractor's insurance and shall not contribute with it.

B. The Contractor's insurance coverage shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the limits of the insurer's liability.

C. The Owner, its Board, officers, agents, employees and servants, the Contractor, the Contractor's

subcontractors, City of El Cerrito, the City of Richmond, County of Contra Costa, and the District's Engineer are to be covered as insureds with respect to liability arising out of automobiles owned, leased, hired or borrowed by or on behalf of the Contractor; and 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.

D. Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the Owner, its Board, officers, agents, employees, and servants of the Contractor, the Contractor's subcontractors, City of El Cerrito, the City of Richmond, County of Contra Costa, and the District's Engineer.

E. The Contractor's liability insurance coverage shall not be suspended, voided, canceled, reduced in coverage or in limits except after forty-five (45) days' prior written notice by certified mail, return receipt requested, has been given to the Owner.

The contractor shall require all subcontractors, whether primary or secondary, if any, to take out and maintain General Liability and Business Automobile Liability in the amounts set out in this Section.

At least ten (10) days prior to commencing work there under, Contractor shall furnish the Owner certificates of each policy of insurance required here under, in form and substance satisfactory to Owner. Such certificates shall show the type, amount, class of operations covered, effective dates and date of expiration of policies.

**G7.24 WORKER'S COMPENSATION INSURANCE.** The Contractor and all subcontractors shall cover or insure under the applicable laws relating to worker's compensation or employer's liability insurance, all of their employees working on or about the construction site, regardless of whether such coverage or insurance is mandatory or merely elective under the law, and the Contractor shall defend, protect and save harmless the Owner from and against all claims, suits and actions arising from any failure of the Contractor or any such subcontractor to maintain such insurance. The Contractor shall maintain Employer's Liability Insurance with minimum limits of One Million Dollars (\$1,000,000.00) per accident for bodily injury or disease.

**G7.25 PROPERTY INSURANCE.** Unless otherwise provided in the Special Conditions, the Contractor will purchase and maintain, in a company or companies lawfully authorized to do business in California, and acceptable to the Owner, property insurance upon the entire work, in the amount of fifty percent (50%) the Contract price. Such property insurance shall be maintained until final payment has been made.

Property insurance shall be on an all-risk policy form (commonly known as "Builder's Risk-All Risk") and shall insure against the perils of earthquake, landslide, flood, collapse, loss due to the result of faulty workmanship or design, and all other risks and shall cover reasonable compensation for Engineer's services and expenses required as a result of such insured loss. This insurance shall insure the interests of the Owner, the Contractor, and subcontractors in the work. Contractor and Owner will be named as additional insured on the policy.

The property insurance may contain deductibles not to exceed the amounts specified in the Special Conditions. If no amounts are specified, the insurance shall be written without deductibles. The Contractor shall pay costs not covered because of such deductibles.

Complete copies of each policy of insurance and certificates of each policy, in form and substance satisfactory to Owner, shall be filed with Owner prior to the commencement of work. The policies and certificates shall provide:

- A. That Owner is included as a named insured;
- B. That losses shall be payable to Contractor and Owner as their interests appear; and
- C. The policy will not be canceled, nor coverage materially altered, without thirty (30) days, prior written notice to Owner.

**G7.26 DEDUCTIBLES AND SELF-INSURED RETENTIONS.** Any deductibles or self-insured retentions must be declared to and approved by the District. At the option of the District, either: the insurer shall reduce or eliminate such deductibles or self-insured retention's as respects the District, its Board, officers, agents, employees

and servants, the City of El Cerrito, the City of Richmond, County of Contra Costa, and the District's Engineer, or the Contractor shall provide a financial guarantee satisfactory to the District guaranteeing payment of losses and related investigations, claim administration and defense expenses.

**G7.27 EVIDENCES AND CANCELLATION OF INSURANCE AND INSURER QUALIFICATIONS.**

Prior to execution of the contract, the Contractor shall file with the District evidences of insurance from the insurer certifying to the coverage of all insurance required herein. All evidences of insurance shall be certified by a properly authorized officer, agents, general agent or qualified representative of the insurer and shall certify the names of the insured, the type and amount of the insurance, the location and operations to which the insurance applies, the expiration date, and that the insurer will give, by registered mail, notice to the District at least forty-five (45) days prior to the effective date of any cancellation, lapse or material change in the policy.

The Contractor shall deliver to the Owner all such policy or policies of insurance, endorsements and the receipt for payment of premiums thereon; and should the Contractor neglect to obtain and maintain in force any such insurance or deliver such policy or policies, endorsements and receipts to the Owner, then it shall be lawful for the Owner to obtain and maintain such insurance, and the Contractor hereby appoints the Owner his true and lawful attorney to do all things necessary for this purpose. All money expended by the Owner for insurance premiums under the conditions of this Section shall be charged to the Contractor. The Contractor shall use the Owner approved endorsement forms provided in the proposal section of these specifications to comply with this Section.

All insurance required by this contract shall be placed with insurers qualified by the State of California to do business in California as insurers, and all of the insurers shall have a current A.M. Best's Rating of no less than A: VII.

Notwithstanding the language of the preceding paragraph, Owner may disqualify an insurer proposed to provide insurance coverage required by these contract specifications if the Owner has cause to believe the insurer is likely to be incapable of providing that insurance coverage.

**G7.28 DISPOSAL OF MATERIAL OUTSIDE THE WORK SITE.** Unless otherwise specified in the Specifications, the Contractor shall make his own arrangements for disposing of materials outside the work site and he shall pay all costs involved.

When any material is to be disposed of outside the work site, the Contractor shall first obtain a written permit from the property owner on whose property the disposal is to be made and he shall file with the Engineer said permit or a certified copy thereof, together with a written release from the property owner absolving the Owner from any and all responsibility in connection with the disposal of material on said property, and before any material is disposed of on said property, the Contractor shall obtain written permission from the Engineer to dispose of the material at the location designated in said permit.

When material is disposed of as above provided and the disposal location is visible from a highway, the Contractor shall dispose of the material in a neat and uniform manner to the satisfaction of the Engineer.

**G7.29 COOPERATION.** Should construction be under way by other forces or by other contractors within or adjacent to the limits of the work specified, or should work of any other nature be under way by other forces within or adjacent to said limits, the Contractor shall cooperate with all such other contractors or other forces to the end that any delay or hindrance to their work will be avoided. The right is reserved to perform other or additional work at or near the site at any time, by the use of other forces.

When two or more contractors are employed on related or adjacent Owner work, each shall conduct his operations in such a manner as not to cause any unnecessary delay or hindrance to the other. Each contractor shall be responsible to the other for all damage to work, to persons or property caused to the other by his operations, and for loss caused the other due to his unnecessary delays or failure to finish the work within the time specified for completion.

**G7.30 OCCUPANCY PRIOR TO ACCEPTANCE.** The Owner reserves the right to occupy all or any part of the project prior to completion of the entire Contract, upon written order therefor. In such event, the Contractor will be relieved of responsibility for any injury or damage to such part as results from such occupancy and use by the



Owner.

If the Contractor carries insurance against damage to such premises or against liability to third persons covering the premises so used and occupied by the Owner, and if such occupancy results in increased premiums for such insurance, the Owner will pay to the Contractor the added cost for such insurance during the period of occupancy. Such occupancy does not constitute acceptance by the Owner either of the complete work or of any portion thereof, nor will it relieve the Contractor of full responsibility for correcting defective work or materials found at any time before the formal written acceptance of the entire Contract by the Owner or during the full guarantee period after such acceptance.

**G7.31 ACCEPTANCE OF THE WORK.** When the Engineer has made the final inspection as provided in Section G5.14 and determines that the work has been completed in all respects in accordance with the Contract Documents, he will recommend that the Owner formally accept the work. Immediately upon and after such formal written acceptance by the Owner, the Contractor will be relieved of the duty of maintaining the work as a whole, and he will not be required to perform any further work thereon except as provided in Sections G4.13, "GUARANTY OF WORK" and G4.14, "CORRECTION OF WORK DURING WARRANTY PERIOD."

**G7.32 PROPERTY RIGHTS IN MATERIALS.** Nothing in the Contract shall be construed as vesting in the Contractor any right of property in the materials used after they have been attached or affixed to the work or soil or after partial payment has been made for material delivered on the ground or stored subject to or under the control of the Owner and unused. All such material shall become the property of the Owner upon being so attached or affixed or upon payment for materials delivered on the ground or stored subject to or under the control of the Owner and unused, as provided in Section 9.

**G7.33 RIGHTS IN LAND AND IMPROVEMENTS.** The Contractor shall make no arrangements with any person to permit occupancy or use of any land, structure or building within the limits of the work, for any purpose whatsoever, either with or without compensation, in conflict with any agreement between the Owner and any owner, former owner or tenant of such land, structure or buildings. The Contractor shall not occupy Owner-owned property outside the limit of the work as shown on the Contract Drawings unless he obtains prior approval.

**G7.34 ANTITRUST CLAIMS.** The Contractor's attention is directed to the following provision of Government Code Section 4551 which shall be applicable to the Contractor and his subcontractors:

"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 right, 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 shall be made and become effective at the time the awarding body tenders final payment to the Contractor, without further acknowledgment by the parties."

**G7.35 ACCESS TO THE WORK.** The Contractor shall satisfy himself that the jurisdictions through which his operations and haul routes pass will permit such operations with respect to type of vehicle, laden weights, frequency and dimensions of loads, hours of operation and required traffic control. All necessary permits, licenses or bonds shall be obtained and paid for by the Contractor.

**G7.36 PERSONAL LIABILITY.** Neither the Owner's governing body, its Officers, Agents, Representatives nor Employees nor Engineer shall be personally responsible for any liability arising under or by virtue of this Contract.

**G7.37 THIRD PARTY RIGHTS.** Nothing in the Contract is intended to create the public or any member thereof a third party beneficiary here under.

**G7.38 INDEPENDENT CONTRACTOR STATUS.** The Contractor shall independently perform all work under this Contract and shall not be considered as an agent or employee of the Owner, nor shall the Contractor's subcontractors or employees be considered as subagents of the Owner.

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## SECTION 8

### PROSECUTION AND PROGRESS

**G8.01 SUBCONTRACTING.** The Contractor shall give his personal attention to the fulfillment of the Contract and shall keep the work under his control.

No subcontractor will be recognized as such and nothing in the Contract Documents shall create any contractual relationship between the Owner and any subcontractor. The Contractor is as fully responsible to the Owner for the acts and omissions of his subcontractors and of persons either directly or indirectly employed by them as he is for the acts and omissions of persons directly employed by him.

Attention is directed to the requirements of Sections 4100 to 4113, inclusive, of the California Public Contract Code which are applicable to this Contract. Each bidder shall list in his Bid the name and business address of each subcontractor to whom the bidder proposes to subcontract a portion of the work, and shall list each subcontractor, licensed by the State of California, proposed by the bidder to specially fabricate and install a portion of the work. Said list shall include a description of the portion of the work which shall be done by each subcontractor. The bidder shall execute and submit with his Bid the "List of Subcontractors" on the form included in this book. Additional forms may be obtained from the Engineer. The Contractor shall not, without the consent of the Owner, either substitute any person as subcontractor in place of the subcontractor designated in the original List of Subcontractors, or sublet or subcontract any portion of the work in excess of one-half of one percent of the total amount of his proposal for which he did not originally designate a subcontractor.

When a portion of the work which has been subcontracted by the Contractor is not being prosecuted in a manner satisfactory to the Owner, the subcontractor shall be removed immediately on the request of the Owner, and shall not again be employed on the work.

The on-site production of materials produced by other than the Contractor's forces shall be considered as subcontracted. The erection, establishment or reopening of on-site plants for production of materials and the operation thereof in the production of materials for use on the work, shall conform to the requirements relating to labor set forth in the Contract Documents.

The Contractor shall require, by written agreement, each subcontractor to be bound to the Contractor by terms of the Contract Documents and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by the Contract Documents, assumes toward the Owner, to the extent of the work to be performed by the subcontractor. Each subcontract agreement shall preserve and protect the rights of the Owner under the Contract Documents with respect to the work to be performed by the subcontractor, so that subcontracting will not prejudice such rights.

**G8.02 ASSIGNMENT.** The Owner and the Contractor, respectively, bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to the partners, successors, assigns, and legal representatives of such other party with respect to all covenants, agreements, and obligation contained in the Contract Documents. The performance of the Contract may not be assigned except upon the written consent of the Owner. Consent will not be given to any proposed assignment which would relieve the original Contractor or his surety of their responsibilities under the Contract nor will the Owner consent to any assignment of a part of the work under the Contract.

The Contractor may assign monies due or to become due him under the Contract and such assignment will be recognized by the Owner, if given proper notice thereof, to the extent permitted by law, but any assignment of monies shall be subject to all proper set-off in favor of the Owner and to all deductions provided for in the Contract, and particularly all money withheld, whether assigned or not, shall be subject to being used by the Owner for the completion of the work in the event that the Contractor should be in default therein.

**G8.03 NOTICE TO PROCEED.** As soon as practicable after execution of the Contract by the Owner, approval by the Owner of Contract Bonds and all other documents listed in the Contract, and after receipt of acceptable

insurance certificates by the Owner, a written Notice to Proceed will be mailed to the Contractor. The effective date of the Notice to Proceed will be the date stated as such in the Notice to Proceed, provided that the effective date will not be earlier than the day following the issuance of the Notice to Proceed.

**G8.04 BEGINNING OF WORK.** The Contractor is not authorized to perform any work until he has received a Notice to Proceed from the Owner. Within ten (10) days after the effective date of such Notice to Proceed, the Contractor shall commence work and shall diligently prosecute the same to completion within the time limit provided in the Special Conditions.

The Contractor shall notify the Engineer, in writing, of his intent to begin work at least seventy-two (72) hours before work is begun and shall specify the date the Contractor intends to start. If the project has more than one location of work, a separate notice shall be given for each location.

Should the Contractor begin work in advance of receiving the Notice to Proceed and providing notice to the Engineer, any work performed by him in advance of such notice shall be considered as having been done by him at his own risk and as a volunteer.

**G8.05 SCHEDULES AND PROGRESS REPORTS.** The Contractor shall, within ten (10) days after the effective date of the Notice to Proceed, submit to the Engineer three copies of a construction schedule covering his operations for the work. The construction schedule shall be in the form of a bar chart or arrow diagram, unless a critical path method analysis is required by the Special Conditions or Specifications. The schedule shall show the order in which the Contractor proposes to carry out the work and the dates on which he expects to start and finish each part or division of the work (including procurement of materials, plant and equipment). The construction schedule shall be consistent with the time and order of work requirements of the Contract Documents and shall provide for expeditious and practicable execution of the work. If the Contractor desires to revise his construction schedule, or if it becomes necessary to revise it due to major changes, he shall submit three copies of the revised schedule for review and comment by the Engineer.

The Contractor shall, within ten (10) days after the effective date of the Notice to Proceed, also submit to the Engineer three copies of a schedule of submittals which is coordinated with the Contractor's construction schedule and with the review time provided in the Contract Documents.

The Contractor shall submit to the Engineer, at the time of submittal of the invoice for work completed (See Section G9.08), a schedule summary report in a form and of sufficient detail and character as approved by the Engineer. The schedule summary report shall include the updated current construction schedule and shall specify whether the project is on schedule and, if not, the reasons therefor. The monthly schedule summary report shall also indicate the delivery status of major and critical items of purchased equipment and material, the status of shop drawings and field fabricated work.

**G8.06 SITE MEETINGS.** The Contractor shall schedule meetings with the Engineer and each active subcontractor at the work site weekly, or at such other frequency as is acceptable to Engineer. Each subcontractor shall have presented a competent representative to report the conditions of his work and to discuss problems.

**G8.07 TIME OF COMPLETION.** The Contractor shall complete all or any designated portion of the work called for under the Contract in all parts and requirements within the time set forth in the Special Conditions.

**G8.08 ADDITIONAL SHIFT WORK.** The time limits specified for the completion of the work contemplated may be insufficient to permit completion of the work by the Contractor working a normal number of hours per day or week on a single shift basis. Where additional shifts or premium time pay are necessary to ensure that the work will be completed within the time limits specified, any resulting additional costs will be considered to be included in the price paid for the various Contract items of work and no additional compensation will be allowed therefor.

If the Contractor desires to carry on work at night or outside regular working hours, he shall give timely notice to the Engineer to allow satisfactory arrangements to be made for observing the work in progress.

**G8.09 UNUSUAL MATERIALS IN EXCAVATIONS.** While digging trenches or excavating, the Contractor

pursuant to Public Contract Code Section 7104 shall promptly, and before the following conditions are disturbed, notify the District and the Engineer, in writing, of any:

- A. 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.
- B. Subsurface or latent physical conditions at the site differing from those indicated.
- C. Unknown physical conditions at the site, of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.

The Owner shall promptly investigate the conditions, and if he finds that the conditions do materially so differ, or do involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the work shall issue a change order under the procedures described in Section G4.03.

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 as described in Section G4.08.

**G8.10 OWNER'S RIGHT TO STOP THE WORK.** If the Contractor fails to promptly correct work which is not in accordance with the requirements of the Contract Documents or persistently fails to carry out work in accordance with the Contract Documents, the Engineer may, in writing, order the Contractor to stop the work, or any portion thereof, until the cause for such order has been eliminated. The Contractor shall immediately comply with a written order of the Engineer to stop the work. The work stopped shall be resumed as and when ordered by the Engineer.

**G8.11 LIQUIDATED DAMAGES.** The parties acknowledge that it would be impractical or extremely difficult, at the time of Contract formation, to ascertain the amount of damages for the injuries listed below. As a result, the parties agree that the Owner may collect liquidated damages, as set forth in this General Condition and in other provisions of the Contract. The assessment of liquidated damages under this provision shall not preclude recovery by the Owner of other damages subject to reasonable quantification, including consequential damages. Consequential and other damages not provided for by this liquidated damages provision may include, but are not limited to, first- and third-party claims for personal injuries and/or property damages, inverse condemnation, environmental claims, or regulatory fees or fines imposed in whole or in part due to Contractor's acts or failures to act.

Liquidated damages shall be deducted from the progress payments or from any other monies due to or to become due the Contractor. If the payments due the Contractor are less than the amount of such liquidated damages, the Contractor or its Surety shall pay the balance to the Owner.

A. Failure to Meet Completion Dates. 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 completed within the number of days as set forth in the Special Conditions, 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 such delay; and it is therefore agreed that the Contractor shall pay to the Owner (as liquidated damages for delay and not as a penalty) the sum set forth in the Special Conditions per day for each and every calendar day's delay in finishing the work in excess of the number of days prescribed; and the Contractor agrees to pay said liquidated damages herein provided for, and further agrees that the Owner may deduct the amount thereof from any monies due or that may become due the Contractor under the Contract.

In addition, the Owner shall have the right to charge to the Contractor and to deduct from the final payment for the

work the actual cost to the Owner of engineering, inspection, administration and other overhead expenses which are directly chargeable to the Contract and which accrue during the period of such delay, except that the cost of final surveys and preparation of the final estimate shall not be included in such charges.

B. Public Hardships or Community Impacts. The Owner may also collect liquidated damages in the event that the Contractor fails to comply with Contract requirements in the following areas:

1. Traffic Control
2. Work Hours
3. Public Notification
4. Environmental Compliance

It is recognized that it is and will be impractical to ascertain and determine the exact amount of damages that the Owner and the public will suffer as a result of the public hardships or negative impacts caused by the Contractor's failure to comply with Contract requirements in the aforementioned areas. The factors relating to the impracticability of ascertaining a monetary value for such hardships or negative impacts include, but are not limited to, the fact that: (i) it is difficult to calculate all actual time spent by Owner staff, management, consultants, and other public agencies in dealing with the public hardship or negative impact; (ii) such public hardships or negative impacts cause economic losses, inconvenience, anxiety, and frustration to individual members of the general public in varying degrees of intensity that bear on the Owner and that are incapable of measurement in precise monetary terms; and (iii) the public hardship or negative impact is cumulative with each occurrence. Therefore, the Contractor and the Owner mutually agree that the amounts set forth in the Special Conditions are reasonable as liquidated damage amounts for each situation creating public hardship or negative impact. These liquidated damages are separate and distinct from any other damages subject to quantification that result from the Contractor's activities.

**G8.12 DELAYS AND EXTENSIONS OF TIME.** The Contractor will be granted an extension of time and will not be assessed with liquidated damages or the cost of engineering and inspection for any portion of the delay in completion of the work beyond the time set forth in the Special Conditions caused by unforeseeable causes beyond the control and without the fault or negligence of the Contractor or subcontractor. Examples of such causes include acts of God or of the public enemy, fire, floods, storms, epidemics, quarantine restrictions, strikes and other work stoppages caused by a labor dispute, shortage of materials and freight embargoes, changes made under Section G4.03 ("Changes") or acts or neglect of the Owner or Engineer not contemplated by the Contract Documents. In all cases, any extension of time is conditional on the following: (1) that the cause is not due to the fault of the Contractor or subcontractor and the Contractor has taken reasonable precautions to prevent delays due to such cause and (2) that the Contractor notifies the Engineer in writing within fifteen (15) days from the beginning of such delay specifying the nature of the delay, the number of days actually delayed and the measures taken to prevent or minimize the delay. Failure to submit written notice within this time shall constitute an absolute waiver of any claim for a time extension; failure to submit the required information will be sufficient cause for denial of the request for a time extension.

No extension of time will be granted for a delay caused by a shortage of materials, unless the Contractor furnishes to the Engineer documentary proof that he has diligently made every effort to obtain such materials from all known sources within reasonable reach of the work and further proof, in the form of schedule data as required in Section G8.05, that the inability to obtain such materials when originally planned did in fact cause a delay in final completion of the entire work which could not be compensated for by revising the sequence of the Contractor's operations. Only the physical shortage of material will be considered as a cause for extension of time, and no consideration will be given to any claim that material could not be obtained at a reasonable, practical or economical cost or price, unless it is shown to the satisfaction of the Engineer that such material could have been obtained only at exorbitant prices entirely out of line with current rates, taking into account the quantities involved and the usual practices in obtaining such quantities.

The term "shortage of materials," as used in this Section, shall apply only to materials, articles, parts or equipment which are standard items and shall not apply to materials, parts, articles or equipment which are processed, made, constructed, fabricated or manufactured to meet the specific requirements of the contract.

No extension of time will be granted for storms or adverse weather conditions which may reasonably be anticipated for the area in which the work is being performed, based on official records of monthly precipitation and other historical data.

No extensions of time will be granted for delays which have no measurable impact on the completion of the total work under the Contract. When extensions of time are granted, they will be limited to the period equivalent to the actual number of days lost on the critical path or controlling operation of construction, taking into account the extent to which that delay could be decreased by reasonable mitigation measures by the Contractor or its subcontractor.

Within a reasonable period of time after the Contractor submits the notice and information required by this Section, the Engineer will present his written opinion to the Owner as to whether an extension of time is justified and, if so, his recommendation as to the number of days for the extension. The Owner will make the final decision on all requirements for extension of time.

The Contractor shall have no claim for damage or compensation for any delay or hindrance and shall be fully compensated by an extension of time provided as set forth in this Section. Notwithstanding the preceding sentence, the Contractor may submit a claim for delay caused by acts or omissions of the Owner but only if such acts or omissions (1) results in a project delay to the critical path which is unreasonable in the circumstances and (2) are not such as to be within the contemplation of the parties. It is expressly agreed that delays by the Owner in providing access to the work site are not within the contemplation of the parties but that delays by the Owner in reviewing shop drawings and submittals and the risk of delays due to errors or omissions in the Contract Drawings are within the contemplation of the parties as expectable events in the construction process.

**G8.13 TERMINATION OF RIGHT TO PROCEED.** If the Contractor should appear to the Engineer to be in default and the Contractor fails to remedy his default within ten (10) days after receipt from the Engineer of notice of such default, the Owner may terminate the Contractor's right to proceed with the work or that portion which the Engineer determines is most directly affected by the default.

The term "default" for purposes of this Section includes, but is not limited to, the performance of work in violation of the terms of the Contract; abandonment, assignment or subletting of the Contract without approval of the Owner; bankruptcy or appointment of a receiver for Contractor's property; refusal or failure properly to prosecute the work; use of materials, supplies, plant or equipment of improper quality or quantity; refusal or failure to use an adequate number of properly skilled workers; failure to provide proper workmanship; failure to take effective steps to end a prolonged labor dispute; and the performance of the Contract in bad faith.

Upon the Owner's termination of the Contractor's right to proceed with the work, or a portion of it, the Owner shall have the right to complete the work, or the portion involved, by whatever means and methods it deems expedient, including the hiring of others on such terms as the Owner deems advisable. The Owner shall have the right to take possession of the Contractor's materials, plant, tools, equipment and property of any kind provided by or on behalf of the Contractor for the purpose of the work, or a portion of them, without being responsible to the Contractor for fair wear and tear. The Contractor shall have no rights in such property during its use by the Owner. The Owner shall not be required to obtain the lowest prices for completing the work or a portion of it but shall make such expenditures as, in the Owner's sole judgment, best accomplish such completion.

The expense of completing such work or portion thereof, together with a reasonable charge for engineering, managerial and administrative services, as certified by the Owner, shall be charged to the Contractor, and the expense so charged shall be deducted by the Owner out of such monies as may be due or may at any time thereafter become due to the Contractor. In case such expense is more than the sum which otherwise would have been payable to the Contractor under the Contract, then the Contractor or his surety or sureties shall promptly pay the amount of such excess so due. The Owner may, in its sole discretion, withhold all or any part of any progress payments otherwise due the Contractor until completion and final settlement of the work covered by such notice of default.

**G8.14 TERMINATION OF CONTRACT.** The Owner may terminate the Contract if the Contractor:

- A. Persistently or repeatedly fails or refuses to supply enough properly skilled workers or proper

materials;

- B. Fails to make payment to subcontractors for materials or labor in accordance with the respective agreements between the Contractor and subcontractor;
- C. Persistently disregards laws, ordinances or rules, regulations or orders of a public authority having jurisdiction; or
- D. Otherwise is guilty of a substantial breach of a provision of the Contract Documents. A "default" as defined in Section G8.12 shall constitute a substantial breach of the Contract Documents.

When any of the above reasons exist, the Owner may, without prejudice to any other rights or remedies of the Owner under this Contract or otherwise, upon ten (10) days, written notice, terminate the Contract and may:

- A. Take possession of the site and of all materials, equipment, tools and construction equipment and machinery thereon owned by the Contractor;
- B. Finish the work by whatever means the Owner deems expedient.

When the Owner terminates the Contract under this Section, the Contractor shall not be entitled to receive any further payments until the work is completed and accepted by the Owner.

The conditions of the last two paragraphs of Section G8.13 shall apply if the Owner terminates the Contract.

The Owner will issue the Contractor a written notice specifying that the Contract is to be terminated. Upon receipt of said written notice and, except as otherwise directed in writing by the Engineer, the Contractor shall:

- A. Stop all work under the Contract except that specifically directed to be completed prior to acceptance;
- B. Perform work the Engineer deems necessary to secure the project for termination;
- C. Remove equipment from the site of work;
- D. Take such action as is necessary to protect materials from damage;
- E. Notify all subcontractors and suppliers that the Contract is being terminated and that their contracts or orders are not to be further performed unless otherwise authorized in writing by the Engineer;
- F. Provide the Engineer with an inventory list of all materials previously produced, purchased or ordered from suppliers for use in the work and not yet used in the work, including its storage location, and such other information as the Engineer may request;
- G. Dispose of materials not used in the work as directed by the Engineer. It shall be the Contractor's responsibility to provide the Owner with good title to all materials purchased by the Owner here under, including materials for which partial payment has been made as provided in Section G9.10, "Partial Payments," of these General Conditions and with bills of sale or other documents of title for such materials;
- H. Subject to the prior written approval of the Engineer, settle all outstanding liabilities and all claims arising out of subcontracts or orders for materials terminated here under. To the extent directed by the Engineer, the Contractor shall assign to the Owner all the right, title and interest of the Contractor under subcontracts or orders for materials terminated here under;
- I. Furnish the Engineer with the documentation required to be furnished by the Contractor under the conditions of the Contract including, on projects as to which federal funds are involved, all documentation required under the federal requirements included in the Contract;



J. Take such other actions as the Engineer may direct.

**G8.15 EXISTING UTILITIES.** The Owner does not guarantee the accuracy or completeness of the existing utility information shown on the plans and it is to be understood that the other aboveground or underground facilities not shown on the drawings may be encountered during the course of the work.

The Contractor shall call the Underground Services Alert Agency and notify the underground utility companies of his intention to work in the vicinity of their service and shall enlist their help to pinpoint the exact location, both in plan and elevation, of their utility. Except as otherwise provided in this Article any required relocation of existing underground utility or special construction techniques required in order to avoid existing utilities shall be performed by the Contractor at no increase in cost to the Owner.

Pursuant to California Government Code Section 4215 the Owner shall assume the responsibility for the timely removal, relocation, or protection of the existing main or trunkline utility facilities located on the construction site if such utilities are not identified by the Owner in the plans and specifications. The Owner shall compensate the Contractor for the costs of locating such utility facilities, repairing damage not due to the failure of the Contractor to exercise reasonable care, and removing or relocating such utility facilities not indicated in the plans and specifications with reasonable accuracy; and for the cost of equipment necessarily idled. However, the Contractor shall make all reasonable efforts to minimize and or mitigate the costs he or she incurs in locating utility facilities not identified by the Owner or for equipment necessarily idled. The Contractor shall not be assessed liquidated damages for delay in completion of the work when such delay was caused by the failure of the Owner or the owner of the utility to provide for removal or relocation of such utility facilities.

Owner is not responsible for indicating the presence of existing service laterals or appurtenances whenever the presence of such utilities can be inferred from the presence of visible facilities, such as buildings, meter and junction boxes, on or adjacent to the construction site.

If the Contractor discovers utility facilities not identified by the Owner in the contract plans or specifications, he shall immediately notify the Owner and the utility in writing.

Existing aboveground utilities, including but not limited to, power transmission and distribution, telegraph, telephone and traffic control systems, whether shown on the drawings or not, shall be maintained, relocated, rerouted, removed and restored as may be necessary by the Contractor with the least possible interference with the use of such facilities at no increase in cost to the Owner.

The right is reserved by the owners of utilities and franchises to enter upon any street, right-of-way or easement for the purpose of maintaining their property and for making necessary repairs or changes caused by the work. The Contractor shall pay all costs thus incurred.

**G8.16 TEMPORARY UTILITIES.** The Contractor shall make his own arrangements with utility companies for any services he may require in performance of the work of this Contract and shall pay all costs of these services directly to these utility organizations.

**G8.17 OFFICE OF CONTRACTOR AT SITE.** During the performance of the Contract, Contractor shall maintain a suitable office at the site of work which shall be the headquarters of a representative authorized to receive drawings, instructions or other communications from the Owner or Owner's agents; any such thing given to said representative or delivered at the Contractor's office at the site of work in his absence shall be deemed to have been given to the Contractor. Contractor shall maintain a complete set of plans and specifications at the site office whenever work is in progress.

**G8.18 PRESERVATION OF STAKES AND MARKS.** Contractor shall preserve carefully bench marks, reference points, and stakes; in case of willful or careless destruction, he will be charged with the resulting expense of replacement and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

**G8.19 SUGGESTIONS TO CONTRACTOR.** Any plan or method of work suggested by the Engineer to the Contractor, but not specified or required, if adopted or followed by the Contractor in whole or in part, shall be used at the risk and responsibility of the Contractor, and the Engineer and the Owner shall assume no responsibility thereof.

**G8.20 USE OF EXPLOSIVES.** When the use of explosives is necessary for the work, Contractor shall use the utmost care not to endanger life or property. Before blasting operations are undertaken, at least twenty-four (24) hours written notice must be given to the Owner and Engineer. Contractor will be responsible for obtaining permits from appropriate authority.

No explosive material shall be transported to, stored or utilized on the site without written permission of Engineer. Only qualified persons who possess a valid permit shall do all blasting work and handling of explosives on the site.

## SECTION 9

### MEASUREMENT AND PAYMENT

**G9.01 MEASUREMENT OF QUANTITIES.** All work to be paid for at a Contract price per unit of measurement will be measured by the Engineer in accordance with United States Standard Measures. Pipelines shall be measured horizontally.

**G9.02 SCOPE OF PAYMENT.** The Contractor shall accept the compensation provided in the Contract as full payment for furnishing all labor, materials, tools, equipment and incidentals necessary to the completed work and for performing all work contemplated and embraced under the Contract; also for loss or damage arising from the nature of the work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the acceptance by the Owner; and for all risks of every description connected with the prosecution of the work, also for all expense incurred in consequence of the suspension or discontinuance of the work as herein specified; and for completing the work according to the Contract Documents. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or materials.

No compensation will be made in any case for loss of anticipated profits.

Except as specifically provided otherwise, no separate payment will be made for work covered in any of these General Conditions and the cost thereof will be considered as included in the prices paid for the various Contract items included in the Bid.

If the "payment" clause in the Contract Documents relating to any unit price in the bid schedule requires that the said unit price cover and be considered compensation for certain work or material essential to the item, this same work or material will not also be measured nor paid for under any other pay item which may appear elsewhere in the Contract Documents.

**G9.03 FORCE ACCOUNT PAYMENT.** When extra work or other work done pursuant to a Change Order is to be paid for on a force account basis, materials and equipment used in the performance of such work shall be subject to the approval of the Engineer and compensation will be determined as set forth in Section 9-1.03 of the Standard Specifications.

Equipment idled or on standby during a compensable delay will have the right-of-way delay factor applied in accordance with the CalTrans publication, "Labor Surcharge and Equipment Rental Rates." Compensable delays include delays owing to differing site conditions, utility interferences, interferences by other contractors or utility companies, or other delays beyond the control of the Contractor. For equipment not included in the CalTrans publication, the standby rate will be determined by the Blue Book's monthly rental rates divided by 173 less any operating expenses.

**G9.04 RECORDS.** The Contractor shall maintain his records in such a manner as to provide a clear distinction between the direct costs of work paid for on a force account basis and the costs of other operations.

From the above records, the Contractor shall furnish the Engineer completed daily reports, on forms furnished by or acceptable to the Owner, for each day's work to be paid for on a force account basis. The daily reports shall itemize the materials used, and shall cover the direct cost of labor and the charges for equipment rental, whether furnished by the Contractor, subcontractor, or other forces, except for charges described in Section G9.03 "Force Account Payment," of the General Conditions. The daily reports shall provide names or identifications and classifications of workers, the hourly rate of pay and hours worked, and also the size, type and identification number of equipment, and hours operated. Before presenting the daily reports to the Engineer for payment, the Contractor shall compile the cost of the work to be paid for on a force account basis. The report number shall be left blank for completion by the Engineer.

Material charges shall be substantiated by valid copies of vendor's invoices. Such invoices shall be submitted with

the daily reports, or if not available, they shall be submitted with subsequent daily reports. Should vendor's invoices not be submitted within sixty (60) days after the date of delivery of the materials or within fifteen (15) days after the acceptance of the Contract, whichever occurs first, the Owner reserves the right to establish the cost of such materials at the lowest current wholesale prices at which said materials are available in the quantities concerned delivered to the location of the work, less any discounts provided in Section G9.03.

The daily reports shall be signed by the Contractor or his authorized representative.

The Engineer will compare his records with the completed daily reports furnished by the Contractor and make any necessary adjustments.

When the daily reports are agreed upon and signed by both parties, the reports shall become the basis of payment for the work performed, but shall not preclude subsequent adjustment based on the later audit by the Owner.

**G9.05 NOTICE OF POTENTIAL CLAIM.** The Contractor shall not be entitled to the payment of any additional compensation for any cause, including any act, or failure to act, by the Engineer (including the failure or refusal to issue a Change Order), or the happening of any event, thing or occurrence, unless he shall have given the Engineer due written notice of potential claim as hereinafter specified, provided, however, that compliance with this Section shall not be a prerequisite as to matters within the scope of the Contract Change Order protest conditions in Section G4.08, "Protest Procedure," or the notice conditions in Section G8.12, "Delays and Extension of Time," nor to any claim which is based on differences in measurement or errors of computation as to correct quantities.

The written notice of potential claim shall set forth the reasons for which the Contractor believes additional compensation will or may be due, the nature of the costs involved and, insofar as possible, the amount of the potential claim. If based on an act or failure to act by the Engineer or the Owner, such notice shall be given to the Engineer prior to the time that the Contractor has started performance of the work giving rise to the potential claim for additional compensation. In all other cases, notice shall be given within fifteen (15) days after the happening of the event or occurrence giving rise to the potential claim.

It is the intention of this Section that differences between the parties arising under and by virtue of the Contract shall be brought to the attention of the Engineer at the earliest possible time in order that such matters may be settled if possible, or other appropriate action promptly taken. The Contractor hereby agrees that he shall have no right to additional compensation for any claim that may be based on any such act, failure to act, event, thing or occurrence for which a written notice of potential claim as herein required was not timely filed.

**G9.06 STOP NOTICES.** The Owner 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 3081 et seq. of the California Civil Code.

**G9.07 PAYMENT SCHEDULES.** The Contractor shall submit a Schedule of Anticipated Contract Payments and a Schedule of Pay Items for review and approval by the Engineer prior to the initial partial payment to the Contractor. The Schedule of Pay Items shall be prepared by the Contractor in a format approved by the Engineer and shall include such detail as directed by the Engineer. The Schedule shall be sufficiently clear and detailed so as to facilitate an accurate and realistic appraisal of monthly progress for the purpose of making partial payments. The value for each bid item shall total the bid amount. The values in the Schedule will be used only for determining partial payments.

The Schedule of Anticipated Contract Payments shall be coordinated by the Contractor's construction schedule submitted pursuant to Section G8.05 and shall show the anticipated monthly Contract payments for each of the pay items covered in the Schedule for Pay Items, the total of monthly payments and cumulative total of payments for each month. If the construction schedule is revised, the Schedule of Anticipated Contract Payments shall also be revised and resubmitted for the Engineer's review and approval. No partial payment will be made until the Engineer has approved the Schedules required by this Section.

**G9.08 INVOICE FOR WORK COMPLETED.** Once each month, at a time, place and location mutually agreeable, the Contractor and Engineer shall meet to discuss the amount of work completed satisfactorily during the work period since the last invoice for partial payment was prepared. A draft invoice for work completed shall be

prepared; the Engineer's judgment will be final if disputes occur regarding the amount of work completed or its value. Following the meeting, the Contractor shall formally submit the invoice for work completed in a form acceptable to the Engineer. The invoice will certify, and be supported by evidence if required by the Engineer, that the work invoiced has been done and that the materials listed are at the storage places indicated. The invoice may include the amount and value of such acceptable material as has been furnished and delivered to the site or has been furnished and stored for use in the work, provided it is stored within the general work area and is designated for incorporation in the work.

**G9.09 RETENTION.** In addition to amounts, if any, withheld pursuant to any other provision of these General Conditions, including the Owner's right to withhold for the estimated or actual costs of correcting defective work and amounts claimed by the Owner as liquidated damages or other offsets, the Owner will retain an amount equal to 10 percent of the estimated value of the work done and Five (5) percent of the value of materials estimated to have been furnished and delivered and unused or furnished and stored as aforesaid as part security for the fulfillment of the Contract by the Contractor.

**G9.10 PARTIAL PAYMENTS.** Each acceptable Contractor's invoice will be paid within thirty (30) days of the Engineer's receipt of the invoice, after deducting all previous payments, retentions, and other sums as described in the Contract Documents. No such payment will be made when, in the judgment of the Engineer, the work is not proceeding in accordance with the conditions of the Contract, or when the total value of the work done as shown on the invoice does not exceed five hundred dollars.

No such invoice nor payment will be construed to be an acceptance of any work or materials.

**G9.11 PAYMENT OF WITHHELD FUNDS.** Upon the Contractor's request, the Owner will make payment of funds withheld from progress payments as described in Section G9.09, pursuant to the requirements of Public Contract Code Section 22300, if the Contractor deposits in escrow with the Owner or with a bank acceptable to the Owner, securities eligible for investment under Government Code Section 16430, bank or savings and loan certificates of deposit, interest bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by the Contractor and the Owner, upon the following conditions:

- A. The Contractor shall bear the expense of the Owner and the escrow agent in connection with the escrow deposit made.
- B. Securities or certificates of deposit to be placed in escrow shall be of a value at least equivalent to the amounts of retention to be paid to the Contractor pursuant to this section.
- C. The Contractor shall enter into an escrow agreement satisfactory to the Owner, which agreement shall be substantially similar to the form provided in Public Contract Code Section 22300.
- D. The Contractor shall obtain the written consent of the surety to such agreement.

**G9.12 FINAL PAYMENT AND CLAIMS.** After the work has been accepted by the Owner, as provided in Section G7.30, "Acceptance of Work," payment will be made to the Contractor in accordance with the conditions of this Section. Upon acceptance, the Owner will record a Notice of Completion covering the project.

Within thirty (30) days after acceptance by the Owner, the Contractor shall prepare and submit a proposed final invoice in writing, prepared in a form acceptable to the Engineer. The proposed final invoice will show the proposed total amount of compensation payable to the Contractor, including an itemization of that amount segregated as to Contract item quantities, extra work and other bases for payment. The proposed final invoice will also show all deductions made or to be made for prior payments and amounts to be kept or retained under the Contract.

The Contractor shall also submit, at the same time as the proposed final invoice is submitted, a statement of all claims he has arising under or by virtue of the Contract, or a statement that he does not intend to file any such claims. No claim for which a notice of potential claim or protest is required under Section G9.05, "Notice of Potential Claim," Section G4.08, "Protest Procedure," or Section G8.12, "Delays and Extension of Time," will be

considered unless the Contractor has fully complied with the notice or protest requirements in said sections.

Claims filed by the Contractor shall be in sufficient detail to enable the Engineer to ascertain the basis and amount of said claims. The Engineer will consider and determine the Contractor's claims and it will be the responsibility of the Contractor to furnish within a reasonable time such further information and details as may be required by the Engineer to determine the facts or contentions involved in the claims. Failure to submit such information and details will be sufficient cause for denying the claims. The procedure for the consideration of all claims is set forth below in Section G9.13 "Claims Procedures."

The Engineer will review the proposed final invoice and claims and will submit his recommendation to the Owner as to the final estimate of the amount due the Contractor and the disposition of all claims. All prior invoices and payments are subject to correction in connection with review of the proposed final invoice.

The Owner will submit any changes or corrections to the proposed final invoice to the Contractor for his consideration. Within ten (10) days thereafter, the Contractor shall submit a final invoice, in a form acceptable to the Engineer, incorporating any changes or corrections made by the Owner, together with any additional claims resulting therefrom. Upon approval by the Owner, this will become the approved final invoice. The Contractor shall submit with the final invoice, certificates of any insurance required to be maintained after acceptance of the work.

If the Contractor files no claims within thirty (30) days after acceptance of the work by the Owner, and agreement is reached on all questions regarding the final invoice, the Owner will pay the entire sum found due upon the final invoice, except that the Owner will withhold sums sufficient to pay all unsettled claims for which stop notices have been filed pursuant to Section 3081 et seq. of the California Civil Code, together with the costs of administering such claims.

If the Contractor does file claims within thirty (30) days after acceptance of the work by the Owner, then upon final determination of all the Contractor's claims, the Owner will pay the entire sum found due upon the final invoice, including the amount, if any, allowed on claims, except that the Owner will withhold sums sufficient to pay all unsettled claims for which stop notices have been filed pursuant to Section 3081 et seq. of the California Civil Code, together with the costs of administering such claims.

Final payment will be made within thirty (30) days after receipt of an approved final invoice and determination of all Contractor's claims, or sixty (60) days after acceptance of the work by the Owner, whichever is later, provided, however, that if an approved final invoice has not been submitted within sixty (60) days after acceptance of the work by the Owner, the Owner may elect to make payment of sums not in dispute without prejudice to the right of either the Owner or the Contractor in connection with such disputed sums.

The acceptance by the Contractor of final payment shall constitute a waiver and release of all claims by the Contractor against the Owner related to the work, except for claims previously made in writing and identified as unsettled by the Contractor at the time of submission of the final invoice. The making of final payment, however, shall not operate to release the Contractor or his sureties from obligations arising under this Contract, the Contract bonds and warranties as herein provided. Specifically, the making of final payment shall not constitute a waiver and release of claims by the Owner arising from (a) unsettled or future liens, (b) failure of the work to comply with the requirements of the Contract Documents, (c) the terms of any warranties required by or contained in the Contract Documents, (d) the right to any insurance proceeds or the right to make any insurance or bond claims, (e) any claims with respect to Contractor's obligation of indemnity provided for in the Contract Documents, or (f) any latent defects or fraud.

### **G9.13 CLAIMS PROCEDURES**

A. The Contractor's and subcontractors' attention is directed to Government Code Section 900 et seq. dealing with claims and actions against public entities and employees. Nothing contained in the Contract, including but not limited to, this General Condition, is intended to modify or remove the requirements set forth in these Government Code sections.

B. The presentation of any claim by the Contractor shall be accompanied by the following certification: :

"CONTRACT PROVISION REQUIRING PERSONAL CERTIFICATION OF ALL CLAIMS"

I, \_\_\_\_\_, BEING THE \_\_\_\_\_  
(MUST BE AN OFFICER) OF \_\_\_\_\_ (GENERAL CONTRACTOR), DECLARE UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE STATE OF CALIFORNIA, AND DO PERSONALLY CERTIFY AND ATTEST THAT: I HAVE THOROUGHLY REVIEWED THE ATTACHED CLAIM AND KNOW ITS CONTENTS, AND SAID CLAIM IS MADE IN GOOD FAITH; THE SUPPORTING DATA IS TRUTHFUL AND ACCURATE; THAT THE AMOUNT REQUESTED ACCURATELY REFLECTS THE CONTRACT ADJUSTMENT FOR WHICH THE CONTRACTOR BELIEVES THE OWNER IS LIABLE; AND, FURTHER THAT I AM FAMILIAR WITH CALIFORNIA GOVERNMENT CODE SECTION 12650, ET SEQ. PERTAINING TO FALSE CLAIMS, AND FURTHER KNOW AND UNDERSTAND THAT SUBMISSION OR CERTIFICATION OF A FALSE CLAIM MAY LEAD TO FINES, IMPRISONMENT AND/OR OTHER SEVERE LEGAL CONSEQUENCES."

Signed:

Date

C. Owner incorporates by reference Section 20104, et. seq, of the Cal. Public Contract Code as if fully set forth herein. For claims of less than fifty thousand dollars (\$50,000), the Owner will respond in writing within 45 days of its receipt of the claim, or may request, in writing, within 30 days of its receipt of the claim, submission of additional documentation supporting the claim or relating to defenses or claims the Owner may have against the Contractor.

1. If such additional documentation is requested by the Owner, it shall be provided by the Contractor within 20 days of its receipt of the request from the Owner or as otherwise mutually agreed upon by the Owner and the Contractor.
2. Following the Contractor's submission of all requested additional documentation, the Owner will respond to the claim within 15 days or within the period of time taken by the Contractor in producing the additional documentation, whichever is longer.

D. For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the Owner will respond in writing within 60 days of its receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, submission of additional documentation supporting the claim or relating to defenses or claims the Owner may have against the Contractor.

1. If such additional documentation is requested by the Owner, it shall be provided by the Contractor within 30 days of its receipt of the request or as otherwise mutually agreed upon by the Owner and the Contractor.
2. Following the Contractor's submission of all requested additional documentation, the Owner will respond to the claim within 30 days, or within the period of time taken by the Contractor in producing the additional documentation, whichever is longer.

E. If the Contractor disputes the Owner's written response, or if the Owner fails to respond within the time prescribed, the Contractor may so notify the Owner, in writing, either within fifteen (15) days of receipt of the Owner's response or within fifteen (15) days of the Owner's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon receiving such a demand, the Owner shall schedule a meet and confer conference within (thirty) 30 days.

F. If, following the meet and confer conference, the claim or any portion remains in dispute, the Contractor may file a claim pursuant to Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the Contractor submits its written claim pursuant to paragraph 2 above until the time said claim is denied pursuant to the procedures set forth herein, including any period of time utilized by the meet and confer conference.

G. For claims exceeding three hundred seventy-five thousand dollars (\$375,000), the Owner may request, in writing, within 60 days of receipt of the claim, submission of additional documentation supporting the claim or relating to defenses or claims the Owner may have against the Contractor.

1. If such additional documentation is requested by the Owner, it shall be provided by the Contractor within 45 days of its receipt of the request or as otherwise mutually agreed upon by the Owner and the Contractor.
2. Following the Contractor's submission of all requested additional documentation, the Owner will respond to the claim within 45 days, or within the period of time taken by the Contractor in producing the additional documentation, whichever is longer.

H. The Owner, at its exclusive discretion, may schedule a meet and confer conference within 60 days for settlement of the dispute of claims exceeding three hundred seventy-five thousand dollars (\$375,000).

I. Following the meet and confer conference, if the claim or any portion remains in dispute, the claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. The period of time within which to file a claim pursuant to Government Code Section 910 is not tolled for claims exceeding three hundred seventy-five thousand dollars (\$375,000), nor does this procedure change the period of time for filing claims pursuant to Government Code Section 910. .

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# **PART III**

# **SPECIAL CONDITIONS**

STEGE SANITARY DISTRICT  
PROJECT NO. 23202  
JULY 2023

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**SECTION 1A**  
**INSTRUCTIONS**

**1. DEFINITIONS:** Whenever any word or expression defined in this section, or pronoun used in its stead, occurs in these contract documents, it shall have and is mutually understood to have the meaning given:

- 1.1 Engineer: Engineer shall mean the Engineer of Work appointed by the District.
- 1.2 Construction Manager: Construction Manager shall mean the person appointed by the District to act as its representative at the construction site and to perform construction inspection services and administrative functions.
- 1.3 Standard Specifications: Standard Specifications shall mean the latest edition of the Standard Specifications of the California Department of Transportation.
- 1.4 Soils Consultant: The Geotechnical Engineer appointed by the District, acting either directly or through authorized agents for the preparation of the Geotechnical Report, field testing of the work and other particular duties entrusted to him.
- 1.5 District: District shall mean the Stege Sanitary District acting through the Board of Directors or any other board, body, official(s) to which or to whom the power belonging to the Board of Directors has been properly delegated.
- 1.6 Payment Bond: Payment Bond where used herein shall mean Labor and Material Bond.

**2. LICENSING OF BIDDERS:** Add the following paragraph to General Conditions, Section G2-13 Licensing of Bidders: “All Bidders shall hold an “A” (General), “C-34” (Pipeline), or “C-42” (Sanitation System) California Contractor’s License. Failure to hold required license shall be sufficient basis to consider Bidder’s Proposal unresponsive.”

**3. PERMITS:** Any costs for permits which the Contractor is required to obtain in connection with this project, shall be paid by the Contractor. The Contractor may include on each invoice the cost of the encroachment permit fee or any applicable paving restoration/moratorium fee for reimbursement. The Contractor shall not be reimbursed for any expenses above and beyond the actual cost of any permit such as travel time or administrative time. The Contractor shall comply with all requirements of all permits. Encroachment permits required for work in the public rights-of-way include but are not limited to the following:

- County of Contra Costa for work in Kensington, contact the Permit Engineer at the Department of Public Works, (925) 646-1607.
- City of El Cerrito for work in that jurisdiction, contact the City Engineer at (510) 215-4300.
- City of Richmond for work in the Richmond Annex, contact the Permit Department at (510) 620-6868.

**4. PROJECT SIGNS:** The District shall provide project identification signs to be posted by the contractor at prominent locations within the project area where the Contractor is currently working. All project identification signs shall be returned to the District at the end of the project.

**5. PUBLIC NOTIFICATION.** The Owner shall provide notice to affected homeowners of the impending construction activity.

At least forty-eight (48) hours prior to the start of work on any line segments located on private property the contractor’s representative and the Engineer or his delegate shall contact the individual homeowners to explain the construction activity, when it is to occur, where on the property the work is to occur, the materials and equipment to be used, and the obligation of the Contractor to protect, preserve and restore the property to its original condition

after construction. The homeowner will be presented with a business card and phone number of the Contractor and the Engineer or his delegate.

In easement areas, the Contractor shall provide special notice and arrangements with property owners whose property is to be used for pipe access or pulling pits.

Any area or private property accessed by the Contractor for his operations, shall first be videotaped with a station to station view all along the area of the easement and of any area where equipment, materials or workmen may traverse the private property. On completion of construction and surface restoration of easement and other areas disturbed by the Contractor's operations, the Contractor shall re-videotape the same areas of the property as originally taped for comparison pictures. Still photos shall also be taken along the same route of the video taping with copies to the homeowner and the District.

**6. WORK WITHIN EASEMENTS:** The right for the Contractor to enter within sewer easement areas will be granted by the District to the Contractor. Whenever the Contractor removes, cuts or otherwise opens an existing fence or gate in such manner that any domestic animals or livestock within the property then have access to the area of the Contractor's activities or to areas outside of the area formerly enclosed by the fence, the Contractor shall erect and maintain temporary fencing or gates to contain the domestic animals or livestock within the property until the Contractor has completed his activities and the original fencing or gates are repositioned.

**7. PRESERVATION OF PROPERTY AND CLEANING:** General Conditions, Section G4.12, Preservation and Cleaning. Each day and as directed by the Engineer or his delegate, the Contractor shall keep the project site and work areas clean and free of litter, rubbish, excess materials, false work, temporary structures, and equipment, not directly involved in the work.

All parts of the work shall be left in a neat and presentable condition at the completion of each workday. Barricades shall be placed around construction materials and equipment left on public rights-of-way. Loose backfill materials shall be removed from traveled areas.

The Contractor shall cleanup job site at the end of each workday, including covering of any open trenches. If cleanup is not satisfactory, the Engineer or his delegate will notify the Contractor who shall remedy the situation. If the Contractor fails to remedy the cleanup deficiencies immediately, the Owner, at its discretion, can arrange cleanup to be done by others at the Contractor's expense.

The Contractor shall be responsible for preserving all properties adjacent to or directly involved in the work.

Attention is directed to the following related sections of these Specifications:

General Conditions

- G5.13 Character of Workers
- G6.03 Storage of Materials
- G7.16 Public Convenience
- G7.17 Public Safety
- G7.18 Preservation of Property

Special Conditions

- All sections

Before final inspection of the work, the Contractor shall clean the project site, material sites, storage sites, and all other areas occupied by it and restore these sites or properties to their original condition. If requested by the District, the Contractor shall obtain written releases from private property owners stating they are satisfied with their property's restoration. Full compensation for cleanup and restoration will be considered as included in the prices paid for the various contract items of work and no separate payment will be made therefore.

**8. STORAGE OF MATERIALS:** Construction materials shall not be stored within the public right-of-ways

in such a manner as to impede the flow of public traffic nor create an unsafe condition, nor shall they be stored within fifteen (15) feet of a fire hydrant or in such a manner so as to impede access or visibility of any emergency facilities.

The Contractor shall be responsible for making whatever arrangements are necessary with private property owners to stockpile materials on private property if the Contractor desires storage outside of easements.

**9. DEBRIS REMOVAL FROM PIPELINE CONSTRUCTION OPERATIONS:** The Contractor shall provide adequate means to protect the sanitary sewer line from the entry of loose soil, rock, debris and broken bits of pipe disturbed during the repair, rehabilitation or reconnection work on the sanitary sewer lines.

The Contractor shall provide and install the mechanisms to trap all loose debris at the downstream manhole. On completion of the repair and/or reconnections on each line segment, the Contractor shall remove the accumulated debris, flush the upstream line segment with water; remove debris again, then remove the downstream trap. A detail of a successful trap installation is available at the District Office.

Upon completion of any pipe bursting activity, and prior to invoicing, the Contractor shall CCTV inspect at least one full section (manhole to manhole) of existing pipe downstream of the lowest pipe replaced to ensure that no broken pipe is introduced into the sanitary sewer system that may cause blockages. If remnants of burst pipe are found during the CCTV inspection the Contractor shall inspect at least one additional section downstream of where the burst pipe or debris is found. Any burst pipe or debris found during the CCTV inspection shall be removed by the Contractor. No invoices will be processed prior to submission of the post construction CCTV inspection.

**10. ARBITRATION:** Any dispute arising out of this contract or the interpretation or performance thereof may be subject to arbitration under the Construction Industry Arbitration Rules of the American Arbitration Association by mutual agreement by both parties to the contract.

**11. INSPECTION. General Conditions, Section G5.09, Inspection.** Add the following paragraph to this section of the General Conditions:

“Whenever the Contractor works any overtime, whether weekend, holiday or more than eight (8) hours a day and, in the opinion of the Construction Manager, requires inspection by the Construction Manager, all premium pay in addition to regular pay shall be paid by the Contractor. The District shall bill the Contractor monthly for the total amount of premium pay incurred and shall deduct the amount billed from the Contractor’s monthly payments.”

**12. WORK HOURS:** Work hours shall be from 8:00am to 5:00pm, except in Cal-Trans right-of-ways, where work hours shall be from 9:00am to 3:00pm. Contractors shall not work on weekends or District holidays.

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# **PART IV**

# **TECHNICAL CONDITIONS**

STEGE SANITARY DISTRICT  
PROJECT NO. 23202  
JULY 2023

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**STEGE SANITARY DISTRICT  
CALIFORNIA**



CONTRACT DOCUMENTS  
FOR THE  
CONSTRUCTION OF

**CANON SEWER LIFT STATION PROJECT**

**100% SUBMITTAL**

July 2023

**SPECIFICATIONS  
(Divisions 1 through 33)**



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Not Used

END OF SECTION

**SECTION 01 53 00  
SEWER BYPASSING**

**PART 1 - GENERAL**

**1.01 DEFINITION**

- A. Bypass Pumping: Temporary flow control accomplished by diverting flow away from the Work area using one or more pumps.
- B. Temporary Flow Control: Reducing, limiting, or excluding flow in or to a sanitary sewer, storm sewer, pump station, force main, or other facility as required for performing the Work under the Contract. Draining, handling, and disposal of sanitary sewage and stormwater from pipelines and other facilities as required for performing the Work under the Contract is also part of temporary flow control.
- C. Temporary Flow Control Plan: Plan prepared by Contractor containing complete information on how Contractor proposes to perform temporary flow control in accordance with specified requirements.
- D. Flow data provided in this section is for information only and were calculated based on the number homes the station serves. The flow estimates have not been field verified for accuracy. The Contractor shall be responsible for bypassing the flows present at the station for the duration bypass pumping is required.

**1.02 SYSTEM DESCRIPTION**

- A. Provide facilities and controls required to intercept, convey, and discharge sanitary sewer flows to the pump station and adjacent gravity sewer lines at all times during Construction.
- B. Include standby and emergency equipment as specified herein, and as necessary to adequately convey the inflows.
- C. The estimated flow rates at the Pump Station are listed below:
  - 1. Canon Lift Station Peak Wet Weather Flow (PWWF): 22 gpm
  - 2. Three contributing sewers flow into the wetwell as shown on the Contract Drawings. The flowing are estimates of peak flows from each incoming sewer and have not been field verified for accuracy. The Contractor shall be responsible for bypassing the flows present at the station for the duration bypass pumping is required. Estimates of Peak Wet Weather Flow for each incoming sewer:
    - a. Northern Sewer Flow Estimate (PWWF): 10 gpm
    - b. Southern Sewer Flow Estimate (PWWF): 10 gpm
    - c. Eastern Sewer Flow Estimate (PWWF): 2 gpm
  - 3. The Contractor shall not increase the operating pressure and flow rate within the existing force main beyond the existing pump station operating conditions. Increasing the pressure/flow rate may damage and/or a break the existing force main.

- a. Total Pump Station capacity is 120 gpm at 79 feet of total head. Contractor shall size pumps as need per the Contractor Temporary Flow Control and Bypassing Plan. Contractor shall submit pumps proposed and calculations support the size of the pumps.
- D. The new force main shall be fully installed, inspected, and tested prior to utilizing it for bypass pumping.
- E. Contractor shall assume responsibility for the pump station, all pump station equipment, and all pump station flows to the completion of the project once the contractor modifies any of the following:
  1. Existing force main or discharge piping
  2. Existing pump station equipment, including but not limited to, electrical equipment, power source, alarms, floats, guide rails, pumps, and backup generator.
- F. Conform to regulatory requirements.
- G. Protect water resources, wetlands, and other natural resources.
- H. Temporary flow control shall be done in a manner that will not damage private or public property, or create a nuisance or public menace. Flow shall be conveyed in enclosed pipes that are adequately protected from traffic or other hazards.
- I. Bypass systems that are left in place unsupervised (i.e. during non-working hours), shall be a completely redundant system, with alarms that will alert the Contractor and City if desired, of issues that occur on the system. **Minimum measures needed to be completely redundant including a backup pump (capable of conveying the entire design peak flow rate), backup power, automatic transfer switch to backup power, and backup water level monitor/floats.**

### 1.03 SITE CONDITIONS

- A. Obtain approval and secure permits for placement of temporary flow control facilities within public right-of-ways (City, Caltrans, and/or Caltrain).
- B. Existing facilities are shown on Drawings.

### 1.04 SUBMITTALS

- A. Informational Submittals:
  1. Temporary Flow Control and Bypass Plan.
  2. Emergency Cleanup Plan.
  3. Emergency Contact Information.
  4. Names and qualifications of industrial hygienist and standby cleanup Subcontractor, including but not limited to, certification by the Institute of Inspection, Cleaning, and Restoration Certification (IICRC).

5. Information describing equipment and materials to be used and showing conformance with specified requirements.

B. Notification Letter:

1. Provide notification letter to City with the date that the Contractor will be responsible for managing the existing pump station and flows associated with it.

## 1.05 QUALITY ASSURANCE

A. Qualifications:

1. Industrial Hygienist and Cleanup Subcontractor: Certified by the Institute of Inspection, Cleaning, and Restoration Certification (IICRC).
2. Temporary Flow Control System Designer: Professional engineer who has at least 5 years' experience in design of such systems and who is registered in the State of California.

## PART 2 - MATERIALS

### 2.01 GENERAL REQUIREMENTS

- A. Provide materials and equipment that will ensure continuous and successful operation of temporary flow control systems.
- B. Contractor shall regularly inspect the bypass system and repair or modify systems as necessary.
- C. Unless otherwise shown or specified, materials and equipment may be new or used at Contractor's option.

### 2.02 PLUGS

- A. Provide with taps for connection of pressure gauges and air hoses, and flow-through capability.
- B. Pipe Diameters 24 Inches and Smaller: Use mechanical plugs with rubber gaskets or pneumatic plugs with rubber boots.
- C. Pipe Diameters Larger than 24 Inches:
  1. Use inflatable bag stoppers made in two or more pieces.
  2. Manufacturers:
    - a. Lansas
    - b. Cherne Industries
    - c. Or approved equal

### 2.03 PUMPS

- A. Provide full pumping redundancy that will be automatically implemented immediately upon failure of primary pump.
- B. Pumps shall be fully automatic, self-priming units that do not require use of foot valves or vacuum pumps in priming system.
- C. Pumps shall be solids handling design with ability to pump minimum 3 inch diameter sphere.
- D. Pumps shall be able to run dry for long periods of time to accommodate cyclical nature of flows.
- E. Engine: Equipped to minimize noise. Noise levels shall not exceed 55 dBA at a distance of 50 feet from source.

#### **2.04 GENERATOR**

- A. Generator shall be able to simultaneously start and run electric powered pumps required for flow to be controlled.
- B. Equipped to minimize noise. Noise levels shall not exceed 55 dBA at a distance of 50 feet from source.
- C. Include automatic transfer switch if flow control system is to operate unattended.
- D. Contractor is responsible for providing all fuel required during bypass pumping.
- E. Temporary generators shall be registered with the California Air Resource Board (ARB) and shall meet all ARB and Bay Area Air Quality Management District (BAAQMD) requirements.

#### **2.05 LEVEL SENSORS, ALARM AND NOTIFICATION SYSTEM**

- A. Provide redundant backup level sensors that will automatically start and stop the pumps in the event of a primary level sensor failure.
- B. At a minimum, the Contractor shall maintain high level and power failure alarms at all times during bypass pumping.

#### **2.06 STANDBY EQUIPMENT**

- A. Standby equipment shall be on site during bypass pumping operations include:
  - 1. Standby Pump with capacity to meet the required flows if the primary pump failure.
  - 2. Power Generator: Backup power generator is required, capable, or starting and running the pumps in case primary power fails.



**PART 3 - EXECUTION****3.01 GENERAL REQUIREMENTS**

- A. Install temporary flow control facilities only within public right-of-way, Owner's property, temporary construction easement, permanent easement, or easement obtained by Contractor.
- B. Pothole, locate, inspect and determine the condition of connection pipes prior to installing bypass piping. Make changes to the Sewer Bypass plan as needed and submit to the City and Engineer for review and approval.
- C. Operate and maintain temporary flow control 24 hours per day, 7 days per week, including without limitation, holidays, as required to control flows.
- D. Bypass pumping equipment shall remain in place until the new pump station is fully functional and has passed all testing requirements. Promptly remove temporary flow control facilities as soon as they are no longer needed.
- E. Sewage shall not be conveyed within the soil in open trenches at any time during construction.

**3.02 TEMPORARY FLOW CONTROL PLAN**

- A. Prepare and submit Temporary Flow Control Plan at least 30 days before starting the Work requiring temporary flow control; include following information:
  1. Drawings indicating location of temporary sewer plugs and bypass discharge lines.
  2. Locations where flow will be intercepted and discharged.
  3. If trucks are to be employed include the following:
    - a. Numbers and sizes of trucks.
    - b. Configuration of facilities to be used to load trucks at each interception location.
    - c. Locations where trucks will unload.
    - d. Time for loading, unloading, and travel.
  4. Complete descriptions and performance characteristics of pumps, electric power generators, and standby equipment.
  5. Acoustical information for equipment to be used showing compliance with noise control requirements.
  6. Details of temporary force mains, including horizontal and vertical alignments, pipe materials, protection of existing buried and aboveground facilities and improvements, maintenance of traffic and access to properties.
  7. Design calculations proving adequacy of temporary system and selected equipment to convey all flows.
  8. Drawings showing layouts and configurations of temporary flow control facilities and also showing locations relative to right-of-way easement, and property boundaries.
  9. Drawings and design calculations of temporary bulkheads and plugs.

10. Drawings and design calculations for thrust restraint of temporary piping.
11. Details of system controls and control logic; include diagrams and narrative.
12. Anticipated schedule for the Work.
13. Other information to completely describe temporary flow control facilities and conformance to specified requirements.

### **3.03 BLOCKING FLOW**

- A. Flow control may consist of blocking flow with mechanical or pneumatic plugs if only small amount of flow needs to be controlled and adequate storage is available.
- B. Use primary and secondary plugs for each flow control location.
- C. When blocking flow is no longer needed for performance and acceptance of the Work, remove plugs in a manner that permits sewage flow to slowly return to normal without surcharging or causing other major disturbances downstream.
- D. Remove temporary plugs at end of each working day and restore normal flow. If downstream work is not or cannot be completed during workday provide, operate, and maintain bypass pumping system or other method of flow control to accommodate flows.

### **3.04 PIPING**

- A. Minimize disturbance of existing utilities.
- B. Where temporary flow control pipelines cross streets and private driveways, install pipeline in trench and cover with temporary pavement.
- C. Installation of bypass pipelines is prohibited in salt marsh/wetland areas.

### **3.05 FIELD QUALITY CONTROL**

- A. Hydrostatic Pressure Test for Pump Bypass Systems:
  1. Prior to operation, test each section of discharge piping with the maximum operating pressure of system.
  2. Notify Owner 24 hours prior to testing.
- B. Full Scale Test:
  1. At least 14 days prior to test, notify Engineer of date and time of test.
  2. Do not begin temporary flow control activities until successful test has been completed.
  3. Conduct test on proposed temporary flow control at least 14 days before scheduled date of actual proposed temporary flow control.
  4. Purpose of test is to demonstrate capability, function, and reliability of Contractor's proposed method of temporary flow control.
  5. Duration: Minimum of 4 hours.

6. Conduct between 8:00 a.m. and 4:00 p.m. Do not conduct test on Saturday, Sunday, or holiday.
7. If electric pumps are being used, provide standby generators to ensure continuity of pumping operation in event of power failure.
8. Demonstrate system controls and operation, reliability, and transfer to standby equipment during test.
9. Conduct until flow is accommodated for minimum specified test duration.
10. Failure:
  - a. Test shall be deemed to have failed if during test flows are not accommodated for whatever reason and for whatever length of time.
  - b. If test fails, determine and correct deficiencies that caused test to fail and conduct another Full Scale Test.
11. Determination by Engineer of a successful test, permission by Engineer to proceed with the Work requiring temporary flow control, or anything else shall not relieve Contractor from responsibility to provide temporary flow control.

**\*\*\*END OF SECTION\*\*\***

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**SECTION 01 53 20  
TREE CARE, PROTECTION, AND REMOVAL**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Requirements for protection of existing trees to remain during construction. These requirements apply to all trees that have a dripline within 5 feet of construction equipment or areas where the ground will be disturbed.
  - 2. Tree care work to be performed by a qualified Tree Surgeon or certified Arborist.
  - 3. Requirements for trees to be removed.
- B. Related Work Specified Elsewhere:
  - 1. General Demolition: Section 02 41 00
  - 2. Site Preparation: Section 31 10 00
  - 3. Earthwork: 31 00 00

**1.02 REFERENCES**

- A. Reference Data:
  - 1. If the year of the adoption or latest revision is omitted from the designation, it shall mean the specification, manual, or test designation in effect the date the Notice to Proceed with the Work is given.

**1.03 SUBMITTALS**

- A. Tree Protection Plan
- B. Statement of Qualification for Tree Care Work.
- C. List of materials to be used by Tree Surgeon/Arborist for Tree Care Work.
- D. Tree Surgeon's/Arborist's Field Reports.

**1.04 QUALITY ASSURANCE**

- A. Tree Surgeon or Arborist must have minimum supervisory experience of five (5) years, crew experience of two (2) years average in work similar to that required for this Project, and be listed by at least two (2) cities in Contra Costa or Alameda County as approved for tree care work.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Acceptable Manufacturers:
  - 1. Manufacturers of materials are listed to set a standard for product performance.
  - 2. Products of manufacturers not listed may be proposed for substitution, provided that they are equal in product performance. It is the responsibility of the contractor to provide supporting evidence that product is equal.

**2.02 FERTILIZER**

- A. Romeo 6-25-25, and 22-14-14

**PART 3 EXECUTION****3.01 OPERATIONS**

- A. The Contractor shall prepare and submit a tree protection plan. The Contractor shall receive a favorable review of the tree protection plan prior to construction.
- B. Notify District Arborist 48 hours before excavating within the driplines of trees scheduled to remain and to verify the Contractor has met all tree protection requirements.
- C. The Contractor shall utilize all means necessary to protect existing trees to remain. Trimming of trees shall not be performed without the presence and authorization of the District's Arborist.
- D. Continuously supervise excavating, grading, filling and subsequent construction operations of all construction areas to protect trees.
- E. Trenching within tree drip-line not permitted without approval from the District's Arborist.
- F. All excavation, including trenching for utilities within drip-lines of trees shall be by hand only. Tunnel under roots 2" and larger, cleanly cut roots 3/4" diameter to 2". No tree roots larger than 2" in diameter shall be cut without approval from the District Arborist.
- G. Operate no machinery, including trucks, etc., which may compact soils at planting areas to remain.
- H. Construct fills so as to prevent disturbance to root zones of existing trees.
- I. Store no materials, including topsoil, under tree canopies.

- J. Park no vehicles under trees; do not allow construction access or roads under tree canopies.
- K. Washing of equipment such as paint sprayers, concrete chutes or pumping equipment, hand tools for concrete work, paint brushes, etc. shall NOT be allowed within drip-lines of, or uphill from trees.
- L. The Contractor shall provide adequate protection for all existing trees to remain and is responsible for the maintenance of tree protection barriers during construction. Tree trunks' damage will result in fines based on square inches of damaged bark to be paid by the Contractor. Any repairable damage done to a tree shall be treated by a qualified tree surgeon at no cost to District. The death of a tree due to damage during construction shall result in fine of \$7,000 per tree charged to the Contractor.
- M. The Contractor shall not trim tree branches larger than 2 inches in diameter without approval from the District's Arborist.

### **3.02 TREE CARE**

- A. Arrange and pay for the following tree care work to be performed by a qualified tree surgeon/arborist on all trees impacted by construction.
  - 1. Under District Arborist's observation, trim and remove tree limbs to ISA standards to provide for continuing health, and to maintain adequate clearance for equipment during construction operations. Provide guy wire support to trees if needed.
  - 2. Prior to beginning of construction and weekly thereafter inspect field conditions, health of trees and note any adverse impact to trees by construction operations. Perform pesticide spraying when needed, and watering and foliar feeding as stated below. Submit report to District Arborist at each inspection.
  - 3. Spray water on all trees in construction area minimum once per week between start of work and onset of rainy season to remove dust from leaves.
  - 4. Foliar feed each protected tree in construction area as follows. Fall: Fertilize trees with spray of Romeo's or equal 6-25-25 fertilizer at five pounds per 100 gallons of water. Spring: Romeo's 22-14-14 at five pounds per 100 gallons.

### **3.03 TREE REMOVAL**

- A. Contractor shall obtain all permitting required by the City, County and District for removal of existing trees as shown on the Project Plans.
- B. All trees shown on the plans to be removed shall be safely removed and properly disposed of off site. Removal shall include tree stumps and roots two inches or larger in diameter to a minimum depth of two feet below grade. Portions of tree stumps and roots located within the excavation for improvements shall be removed. Portions of the tree stumps outside of the

excavation for improvements shall remain unless the Contractor is directed by the Engineer to remove the stump. Removed trees, stumps and roots shall become the property of the Contractor and shall be removed from the project site.

- C. All debris resulting from tree removal work, including broken branches, fallen leaves, wood chips, and sawdust produced from stump and root removal work, shall be promptly removed from the work site. If the tree to be removed is within the drip line of any other tree that is to remain, the tree removal work shall be done under the direction of a Certified Arborist. The holes resulting from tree stump and tree root removal activities shall be backfilled as provided in Section 31 00 00, "Earthwork", of these Specifications.
- D. Prior to construction the Contractor shall review and clearly mark all trees to be removed with the biological monitor/qualified biologist and a representative of the District.
- E. Burning of trees and debris on-site is not permitted.

END OF SECTION



**SECTION 02 41 00  
GENERAL DEMOLITION**

**PART 1: GENERAL**

**1.01 SUMMARY**

- A. The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor as required for the demolition and removal of structures and facilities as indicated on the Drawings and specified herein.
- B. The work of this section shall include, but shall not be limited to:
  - 1. Clearing, grubbing, stripping, removal and disposal of topsoil and vegetation.
  - 2. Demolition of asphalt pavement, concrete pads, curb and gutter, and other features as required and backfilling of resulting voids.
  - 3. Removal and salvage of existing facilities and equipment as indicated on the drawings and as specified.
  - 4. Demolition of existing structures or portions thereof, as specified.
- C. Related Sections:
  - 1. Section 03 30 00 - Cast-in-place Concrete
  - 2. Section 31 50 00 - Excavation Support and Protection
  - 3. Section 32 11 23 - Aggregate Base Course

**1.02 SUBMITTALS**

- A. Submit the following:
  - 1. Demolition plan and schedule.
  - 2. Disposal means and locations.

**1.03 DEMOLITION COORDINATION**

- A. The Contractor shall carefully coordinate the extent of demolition in areas where existing utility services shall be disconnected and reconnected to new facilities, where existing facilities shall remain operational, and where vegetation and curb and gutter shall be restored.
- B. In the case of existing utilities where only a portion is to be demolished, the Contractor shall cap, seal, or repair the utility at the point of disconnection such that the remainder of the system can remain in service.

- C. In the case of existing ductwork or piping where a portion will be demolished followed by future connection to new construction, the Contractor shall cleanly cut the duct or pipe and promptly cap it to protect it during construction.
- D. Environmental Requirements:
  - 1. Conform to existing environmental requirements and regulations regarding noise, dust, and vibration.
- E. Existing Conditions:
  - 1. Verify that utility services are disconnected.

#### **1.04 REPAIR OF DAMAGE**

- A. Any damage to personal property, and to other existing facilities to remain, as caused by the Contractor's operations shall be repaired at the Contractor's expense.
- B. Damaged items shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to or better than that existing prior to damage or start of work of this contract.

#### **1.05 BURNING**

- A. The use of burning for the disposal of refuse, debris, and waste materials resulting from demolition and site clearing operations will not be permitted.

### **PART 2: PRODUCTS**

Not Used.

### **PART 3: EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify existing conditions pertaining to demolition work.

#### **3.02 PREPARATION**

- A. Utilities:
  - 1. Disconnect any remaining utility services that will no longer be active.
  - 2. Remove all disconnected utilities within the site.

3. Repair utility mains as necessary in conformance with District Standards.
- B. Protection:
1. Provide berms and other means acceptable to ENGINEER to keep drainage from demolition areas.

### **3.03 DEMOLITION**

- A. Disposal of all materials shall be performed in compliance with all applicable local, state, and federal codes and requirements.
- B. Asphalt concrete pavement, concrete pavement, and concrete curb and gutter shall be removed as necessary to perform the specified work. The limits of removal shall be sawcut. When the required improvements have been constructed, new asphalt concrete pavement, concrete pavement, and concrete curb and gutter shall be constructed as specified and shown on contract drawings.
- C. Demolition debris shall be handled in conformance with all permits and in conformance with District Standards.

\*\*\*END OF SECTION\*\*\*

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## SECTION 03 00 00

### CONCRETE WORK - GENERAL

#### PART 1 GENERAL

##### 1.01 APPLICABLE SECTION

- A. Submit Shop Drawings, Product Data, Mill Certificates and Samples required by other portions of Contract Documents. The requirements/provisions of the General and Supplementary Conditions shall apply to this section.

##### 1.02 DESCRIPTION OF WORK

- A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing, and installing concrete work as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom, except as hereinafter specifically excluded.
- B. Work Included:
  - 1. All formwork, including any special forms necessary to produce architectural details and/or to accommodate the work of others and removal of forms.
  - 2. All concrete reinforcement, placement, bending and forming thereof.
  - 3. All concrete and cement finishing; all surface treatment and curing, including non-slip finishes and color work.
  - 4. Installation of all reglets, bolts, anchors, cans, sleeves, column anchor bolts, etc., whether furnished under this section or by others (except cans and sleeves required under the Electrical and Mechanical Divisions).
  - 5. The furnishing of all items required to be or shown on the drawings as embedded in concrete, which are not specifically required under other sections.
  - 6. Setting headers and screeds. Curing and protecting concrete.
  - 7. Inserts, sleeves, cans, etc. required under the Electrical and Mechanical Divisions.

#### PART 2 PRODUCTS – NOT USED

#### PART 3 EXECUTION

##### 3.01 DEFECTIVE WORK

- A. General: Work considered to be defective may be ordered by the ENGINEER to be replaced in which case the Contractor shall remove the defective work at his expense. Work considered to be defective shall include, but not be limited to, the following:

## Reinforcing:

1. Kinks and bends therein which are not scheduled or indicated on the drawings; reinforcing improperly placed, or previously heated, or excessively cold worked reinforcing.

## Concrete:

1. Concrete in which defective or inadequate reinforcing steel has been placed.
2. Concrete incorrectly formed or not conforming to details and dimensions on the drawings, with the intent of these documents, or concrete the surfaces of which are out of plumb or level.
3. Concrete below specified strength.
4. Concrete not meeting the maximum allowable drying shrinkage requirements.
5. Concrete containing wood, cloth, or other foreign matter, rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings.

**3.02 CORRECTION OF DEFECTIVE WORK**

- A. The Contractor shall, at his expense, make all such corrections and alleviation measures as directed by the Engineer.
- B. Concrete work containing rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings, shall be chipped out until all unconsolidated material is removed.
- C. Secure approval of chipped-out areas before patching. Patch per ACI 301-89.

**\*\*END OF SECTION\*\***

**SECTION 03 30 00**  
**CAST-IN-PLACE CONCRETE**

**PART 1: GENERAL**

**1.01 WORK INCLUDED**

- A. Furnish all labor and materials required and install all cast-in-place concrete complete as shown on the Drawings and as specified herein.

**1.02 RELATED WORK**

- A. Related Work Specified Elsewhere
1. Section 03 00 00 – Concrete Work General
  2. Section 03 60 00 – Grouts

**1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS**

- A. American Concrete Institute (ACI)
1. ACI 304R – Guide for Measuring, Mixing, Transporting, and Placing Concrete
  2. ACI 305R – Hot Weather Concreting
  3. ACI 306.1 – Standard Specification for Cold Weather Concreting
  4. ACI 315 – Details and Detailing of Concrete Reinforcement
  5. ACI 318 – Building Code Requirements for Structural Concrete
- B. American Society for Testing and Materials (ASTM)
1. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field
  2. ASTM C33 – Standard Specification for Concrete Aggregates
  3. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
  4. ASTM C42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
  5. ASTM C94 – Standard Specification for Ready-Mixed Concrete
  6. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete
  7. ASTM C150 – Standard Specification for Portland Cement

8. ASTM C157 – Standard Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete
  9. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete
  10. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
  11. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
  12. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete
  13. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
  14. ASTM C311 – Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
  15. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete
  16. ASTM C596 – Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement
  17. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete
  18. ASTM C1017 – Standard Specification for Chemical Admixtures for use in Producing Flowing Concrete
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

#### **1.04 SUBMITTALS**

- A. Submit to the ENGINEER, submittals including the following:
1. Sources of cement, pozzolan, and aggregates.
  2. Material Safety Data Sheets (SDS) for all concrete components and admixtures.
  3. Air-entraining admixture – Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, and conformity to ASTM standards.
  4. Water-reducing admixture – Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, and conformity to ASTM standards.



5. High range, water-reducing admixture – Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, retarding effect, slump range, and conformity to ASTM standards. Identify proposed locations for use.
6. Concrete mix design for each formulation of concrete proposed for use including constituent quantities per cubic yard, water-cementitious materials ratio, type, and manufacturer of cement, compressive strength, concrete slump, shrinkage, and air content. Provide with (a) or (b) below for each mix proposed.
  - a. Standard deviation data for each proposed concrete mix based on statistical records,  
  
OR
  - b. The curve of water-cementitious materials ratio versus concrete cylinder strength for each formulation of concrete proposed based on laboratory tests. The cylinder strength shall be the average of the 28-day cylinder strength test results for each mix. Provide results of 7- and 14-day tests if available.
7. Sheet curing material – Product data including catalogue cut, technical data, and conformity to ASTM standards.
8. Liquid curing compound – Product data including catalogue cut, technical data, storage requirements, product life, application rate, and conformity to ASTM standards. Identify proposed locations of use.
9. Samples – Fine and coarse aggregates if requested by the ENGINEER.
10. Test Reports - Submit test reports for each of the following items:
  - a. Fine aggregates – Sieve analysis, physical properties, and deleterious substances
  - b. Coarse aggregates – Sieve analysis, physical properties, and deleterious substances
  - c. Cements – Chemical analysis and physical properties for each type
  - d. Pozzolans – Chemical analysis and physical properties
11. Certifications:
  - a. Certify that admixtures used in the same concrete mix are compatible with each other and the aggregates.
  - b. Certify that the Contractor is not associated with the independent testing laboratory nor does the Contractor or its officers have a beneficial interest in the laboratory.

## 12. Work Plans:

- a. Hot weather concreting
- b. Cold weather concreting

**1.05 QUALITY ASSURANCE**

- A. Reinforced concrete shall comply with ACI 318, and other stated requirements, codes, and standards. The most stringent requirement of the codes, standards, and this Section shall apply when conflicts arise.
- B. Only one source of cement and aggregate shall be used on any one structure. Concrete shall be uniform in color and appearance.
- C. Well in advance of placing concrete, discuss with the ENGINEER the sources of individual materials and batched concrete proposed for use. Discuss placement methods and curing. Propose methods of hot and cold weather concreting as required.
- D. A meeting shall be held before placement of plasticized concrete. The plasticizer (high-range water-reducer) manufacturer's representative and the Contractor shall be available to discuss the properties and techniques of batching and placing plasticized concrete.
- E. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the ENGINEER may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the CONTRACTOR's expense.
- F. If, during the progress of work, the materials from the sources originally accepted change in characteristics, the CONTRACTOR shall, at their expense, make new acceptance tests of aggregates and establish new design mixes.
- G. Testing of the following materials shall be furnished by the CONTRACTOR to verify conformity with this Specification Section and the stated ASTM Standard(s).
  1. Fine aggregates for conformity to ASTM C33 – sieve analysis, physical properties, and deleterious substances
  2. Coarse aggregates for conformity to ASTM C33 – sieve analysis, physical properties, and deleterious substances
  3. Cements for conformity to ASTM C150 – chemical analysis and physical properties
  4. Pozzolans for conformity to ASTM C618 – chemical analysis and physical properties
  5. Proposed concrete mix design(s) – compressive strength, slump, shrinkage, and air content
- H. All materials incorporated in the work shall conform to accepted samples.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Cement – Store cement in weathertight buildings, bins, or silos to provide protection from dampness and contamination and to minimize warehouse set.
- B. Aggregate – Arrange and use stockpiles to avoid excessive segregation or contamination with other materials or with other sizes of like aggregates. Build stockpiles in successive horizontal layers not exceeding 3 feet in thickness. Complete each layer before the next is started. Do not use frozen or partially frozen aggregate.
- C. Sand – Arrange and use stockpiles to avoid contamination. Allow sand to drain to uniform moisture content before using. Do not use frozen or partially frozen sands.
- D. Admixtures – Store in closed containers to avoid contamination, evaporation, or damage. Provide suitable agitating equipment to assure uniform dispersion of ingredients in admixture solutions that tend to separate. Protect liquid admixtures from freezing and other temperature changes that could adversely affect their characteristics.
- E. Pozzolan – Store in weathertight buildings, bins, or silos to provide protection from dampness and contamination.
- F. Sheet Curing Materials – Store in weathertight buildings or off the ground and under cover.
- G. Liquid curing compounds – Store in closed containers.

**PART 2: PRODUCTS****2.01 GENERAL REQUIREMENTS**

- A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance, and manufacturer's services.

**2.02 MATERIALS**

- A. Materials shall comply with this Section and any applicable state or local requirements.
- B. Cement – Domestic Portland cement shall comply with ASTM C150 Type II. Air-entraining cement shall not be used. The cement brand shall be subject to approval by the ENGINEER and one brand shall be used throughout the work.
- C. Fine Aggregates – Fine aggregates shall be washed inert natural sand conforming to the requirements of ASTM C33.
- D. Coarse Aggregates – Coarse aggregates shall be well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33. Grading requirements shall be as listed in ASTM C33 Table 2 for the specified coarse aggregate size number. Limits of

deleterious substances and physical property requirements shall be as listed in ASTM C33 Table 3 for severe weathering regions. Size numbers for concrete mixes shall be as shown in Table 1 herein.

- E. Water – Water shall be potable and free from injurious amounts of oil, acids, alkalis, salts, organic matter, or other deleterious substances.
- F. Admixtures – Admixtures shall be free of chlorides and alkalis (except for those attributable to water). When it is required to use more than one admixture in a concrete mix, the admixtures shall be from the same manufacturer. Admixtures shall be compatible with the concrete mix including other admixtures [and shall be suitable for use in contact with potable water after 30 days of concrete curing].
  - 1. Air-Entraining Admixture – The admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
  - 2. Admixtures causing retarded or accelerated setting of concrete shall not be used without written approval from the ENGINEER. When allowed, the admixtures shall be retarding or accelerating water-reducing or high-range water-reducing admixtures.
  - 3. Water-Reducing Admixture – The admixture shall comply with ASTM C494, Type A. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
  - 4. High-Range Water-Reducer (Plasticizer) – The admixture shall comply with ASTM C494, Type F and shall result in nonsegregating plasticized concrete with little bleeding and with the physical properties of low water/cement ratio concrete. The treated concrete shall be capable of maintaining its plastic state in excess of 2 hours. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
- G. Pozzolan (Fly Ash) – Pozzolan shall be Class F fly ash complying with ASTM C618, except the Loss On Ignition (LOI) shall be limited to 3 percent maximum.
- H. Sheet Curing Material – Sheet curing material shall be waterproof paper, polyethylene film, or white burlap-polyethylene sheeting, all of which must comply with ASTM C171.
- I. Liquid Curing Compound – Liquid membrane-forming curing compound shall comply with the requirements of ASTM C309, Type 1-D (clear or translucent with fugitive dye) and shall contain no wax, paraffin, or oil.

### **2.03 CONCRETE MIXES**

- A. Development of mix designs and testing shall be by an independent testing laboratory acceptable to the ENGINEER but engaged by and at the expense of the CONTRACTOR.
- B. Select proportions of ingredients to meet the design strength and materials limits specified in Table 1 and to produce concrete having proper placability, durability, strength, appearance, and other required properties. Proportion ingredients to produce a homogenous mixture that will readily work into corners and angles of forms and around

reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.

1. The design mix shall be based on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if such data is not available, be developed by a testing laboratory, acceptable to the ENGINEER, engaged by and at the expense of the CONTRACTOR. Acceptance of mixes based on standard deviation shall be based on the modification factors for standard deviation tests contained in ACI 318. The water content of the concrete mix, determined by laboratory testing, shall be based on a curve showing the relation between the water-cementitious ratio and 7- and 28-day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing an average value of at least three test specimens at each age. The curves shall have a range of values sufficient to yield the desired data, including the specified design strengths as modified below, without extrapolation. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to strengths 16 percent greater than the specified design strengths. The resulting mix shall not conflict with the limiting values for maximum water-cementitious ratio and net minimum cementitious content as specified in Table 1.
- C. Compression Tests – Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the specified design strength requirements in conformity with the above paragraph.
- D. Entrained air, as measured by ASTM C231, shall be as shown in Table 1.
1. If the air-entraining agent proposed for use in the mix requires testing methods other than ASTM C231 to accurately determine air content, make special note of this requirement in the admixture submittal.
- E. Slump of the concrete as measured by ASTM C143, shall be as shown in Table 1. If a high-range water-reducer (plasticizer) is used, the slump indicated shall be that measured before plasticizer is added. Plasticized concrete shall have a slump ranging from 7 to 10 inches.
- F. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

**Table 1**  
**Concrete Mix Requirements**

<u>Class</u>	<u>Design</u>	<u>Cement</u>	<u>Fine</u>	<u>Coarse</u>	<u>Cementitious</u>
	<u>Strength</u>		<u>Aggregate</u>	<u>Aggregate</u>	<u>Content</u>
	<u>(1)</u>	<u>(2)</u>	<u>(2)</u>	<u>(3)</u>	<u>lbs./cu. yd.</u>
					<u>(min)</u>
	<u>(4)</u>				<u>(4)</u>
A	2500	C150 Type II	C33	57	440
B	3000	C150 Type II	C33	57	480
D	4500	C150 Type II	C33	57	560

  

<u>Class</u>	<u>W/C</u>	<u>Fly Ash</u>	<u>AE Range</u>	<u>WR</u>	<u>HRWR</u>	<u>Slump</u>
	<u>Ratio (Max.)</u>		<u>(6)</u>	<u>(7)</u>	<u>(8)</u>	<u>Range</u>
	<u>(5)</u>	<u>(6)</u>	<u>(7)</u>	<u>(8)</u>	<u>(9)</u>	<u>Inches</u>
A	0.62	--	3.5 to 5	Yes	No	1-4
B	0.54	--	3.5 to 5	Yes	No	1-3
D	0.42	15-25%	3.5 to 5	Yes	No	3-5

## NOTES:

- (1) Minimum compressive strength in pounds per square inch at 28 days
- (2) ASTM designation
- (3) Size Number in ASTM C33
- (4) Cementitious content in pounds per cubic yard
- (5) W/C is water-cementitious ratio by weight
- (6) Percent content of total cementitious material
- (7) AE is percent air entrainment
- (8) WR is water-reducer admixture
- (9) HRWR is high-range water-reducer admixture

**PART 3: EXECUTION****3.01 MEASURING MATERIALS**

- A. Concrete shall be composed of Portland cement, fine aggregate, coarse aggregate, water, and admixtures as specified and shall be produced by a plant acceptable to the ENGINEER. All constituents, including admixtures, shall be batched at the plant except a high-range water-reducer may be added in the field.
- B. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 except as otherwise specified. Scales shall have been certified by the local Sealer of Weights and Measures within one year of use.
- C. Measure the amount of free water in fine aggregates within 0.3 percent with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water as batched on printed batching tickets.

- D. Admixtures shall be dispensed either manually using calibrated containers or measuring tanks, or by means of an automatic dispenser approved by the manufacturer of the specific admixture.
1. Charge air-entraining and chemical admixtures into the mixer as a solution using an automatic dispenser or similar metering device.
  2. Inject multiple admixtures separately during the batching sequence.

### 3.02 MIXING AND TRANSPORTATION

- A. Concrete shall be ready-mixed concrete. No hand mixing will be permitted. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit-mix truck with a continuous, nonreversible, revolution counter showing the number of revolutions at mixing speeds.
- B. Ready-mix concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the nameplate.
- C. Keep the water tank valve on each transit truck locked at all times. Any addition of water must be approved by the ENGINEER. Added water shall be incorporated by additional mixing of at least 35 revolutions. All added water shall be metered and the amount of water added shall be shown on each delivery ticket.
- D. All central plant and rolling stock equipment and methods shall comply with ACI 318 and ASTM C94.
- E. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Metal or metal-lined non-aluminum discharge chutes shall be used and shall have slopes not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.
- F. Retempering (mixing with or without additional cement, aggregate, or water) of concrete or mortar that has reached initial set will not be permitted.
- G. Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Dispatch trucks from the batching plant so they arrive at the work site just before the concrete is required, thus avoiding excessive mixing of concrete while waiting, or delays in placing successive layers of concrete in the forms.
- H. Furnish a delivery ticket for ready-mixed concrete to the ENGINEER as each truck arrives. Each ticket shall provide a printed record of the weight of cement and each aggregate as batched individually. Use the type of indicator that returns for zero punch or returns to zero after a batch is discharged. Clearly indicate the weight of fine and coarse aggregate, cement, and water in each batch, the quantity delivered, the time any water is added, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of the truck mixer.

**3.03 TEMPERATURE AND MIXING TIME CONTROL**

- A. In cold weather, do not allow the as-mixed temperature of the concrete and concrete temperatures at the time of placement in the forms to drop below 40 degrees Fahrenheit (F).
- B. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90 degrees F.
- C. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90 degrees F. If necessary, substitute well-crushed ice for all or part of the mixing water.
- D. The maximum time interval between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms shall not exceed the values shown in Table 2.
- E. If an approved high-range water-reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 minutes.

**Table 2**  
**Maximum Time to Discharge of Concrete**

<u>Air or Concrete Temperature</u> <u>(Whichever is higher)</u>	<u>Maximum Time</u> <u>(Minutes)</u>
70 to 90 Degrees F (21 to 32 Degrees C)	60
40 to 69 Degrees F (5 to 20 Degrees C)	90

F = Fahrenheit, C = Celsius

**3.04 CONCRETE APPEARANCE**

- A. Concrete mix showing either poor cohesion or poor coating of the coarse aggregate with paste shall be remixed. If this does not correct the condition, the concrete shall be rejected. If the slump is within the allowable limit, but excessive bleeding, poor workability, or poor finishability are observed, changes in the concrete mix shall be obtained only by adjusting one or more of the following:
1. The gradation of the aggregate
  2. The proportion of fine and coarse aggregate
  3. The percentage of entrained air, within the allowable limits
- B. Concrete for the work shall provide a homogeneous structure that, when hardened, will have the required strength, durability, and appearance. Mixtures and workmanship shall be



such that concrete surfaces, when exposed, will require no finishing. After concrete surfaces are stripped, the concrete, when viewed in good lighting from 10 feet away, shall be pleasing in appearance, and at 20 feet shall show no visible defects.

### 3.05 PLACING AND COMPACTING

#### A. Placing:

1. Placing of all concrete shall be in accordance with the recommendations contained in ACI 304R.
2. Verify that all formwork completely encloses concrete to be placed and is securely braced before concrete placement. Remove ice, excess water, dirt, and other foreign materials from forms. Confirm that reinforcement and other embedded items are securely in place. Have a competent worker at the location of the placement that can assure that reinforcing steel and embedded items remain in designated locations while concrete is being placed. Sprinkle semi-porous sub grades or forms to eliminate suction of water from the mix. Seal extremely porous sub grades in an approved manner.
3. Deposit concrete as near to its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate that ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete that has partially hardened or has been contaminated by foreign materials or on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.
4. Pumping of concrete will be permitted. Use a mix design and aggregate sizes suitable for pumping and submit for approval.
5. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only when made of galvanized metal or concrete and if prior approval has been obtained.
6. Do not place concrete for supported elements until concrete previously placed in the supporting element (columns, slabs, and/or walls) has reached adequate strength.

#### B. Slabs:

1. After suitable bulkheads, screeds, and jointing materials have been positioned, the concrete shall be placed continuously between construction joints beginning at a bulkhead, edge form, or corner. Each batch shall be placed into the edge of the previously placed concrete to avoid stone pockets and segregation.
2. Avoid delays in casting. If there is a delay in casting, the concrete placed after the delay shall be thoroughly spaded and consolidated at the edge of that previously placed to avoid cold joints. Concrete shall then be brought to correct level and struck off with a straightedge. Bullfloats or darbies shall be used to smooth the surface, leaving it free of humps or hollows.

3. "Jitterbugs" shall not be used on slab surfaces to aid in finishing.
4. Where slabs are to be placed integrally with the walls below them, place the walls and compact as specified. Allow 1 hour to pass between placement of the wall and the overlying slab to permit consolidation of the wall concrete. Keep the top surface of the wall moist so as to prevent cold joints.

C. Formed Concrete:

1. Place concrete in forms using tremie tubes and taking care to prevent segregation. Bottom of tremie tubes shall preferably be in contact with the concrete already placed. Do not permit concrete to drop freely more than 4 feet. Place concrete for walls in 12- to 24-inch lifts, keeping the surface horizontal. If plasticized concrete is used, the maximum lift thickness may be increased to 7 feet and the maximum free fall of concrete shall not exceed 15 feet.

D. Compacting:

1. Consolidate concrete by vibration, puddling, spading, rodding, or forking so that concrete is thoroughly worked around reinforcement, embedded items, and openings, and into corners of forms. Puddling, spading, etc. shall be continuously performed along with vibration of the placement to eliminate air or stone pockets that may cause honeycombing, pitting, or planes of weakness.
2. All concrete shall be placed and compacted with mechanical vibrators. The number, type, and size of the units shall be approved by the ENGINEER in advance of placing operations. No concrete shall be ordered until sufficient approved vibrators (including standby units in working order) are on the job site.
3. A minimum frequency of 7,000 revolutions per minute is required for mechanical vibrators. Insert and withdraw vibrators vertically at points from 18 to 30 inches apart. At each insertion, vibrate sufficiently to consolidate concrete, generally from 5 to 15 seconds. Do not over-vibrate so as to segregate. Keep a spare vibrator on the site during concrete placing operations.
4. Concrete Slabs - Concrete for slabs less than 8 inches thick shall be consolidated with vibrating screeds; slabs 8 to 12 inches thick shall be compacted with internal vibrators and (optionally) with vibrating screeds. Vibrators shall always be placed into concrete vertically and shall not be laid horizontally or laid over.
5. Walls - Internal vibrators (rather than form vibrators) shall be used unless otherwise approved by the ENGINEER. In general, for each vibrator needed to melt down the batch at the point of discharge, one or more additional vibrators must be used to densify, homogenize, and perfect the surface. The vibrators shall be inserted vertically at regular intervals, through the fresh concrete and slightly into the previous lift, if any.
6. Amount of Vibration - Vibrators are to be used to consolidate properly placed concrete but shall not be used to move or transport concrete in the forms. Vibration shall continue until the following conditions are met:

- a. The frequency returns to normal.
- b. The surface appears liquefied, flattened, and glistening.
- c. Trapped air ceases to rise.
- d. Coarse aggregate has blended into the surface, but has not disappeared.

### **3.06 CURING AND PROTECTION**

A. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.

B. Curing Methods:

1. Curing Methods for Concrete Surfaces - Cure concrete to retain moisture and maintain specified temperature at the surface for a minimum of 7 days after placement. Curing methods to be used are as follows:

- a. Water Curing – Keep entire concrete surface wet by ponding, continuous sprinkling, or covering with saturated burlap. Begin wet cure as soon as concrete attains an initial set and maintain wet cure 24 hours a day.
- b. Sheet Material Curing – Cover entire surface with sheet material. Securely anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.
- c. Liquid Membrane Curing – Apply curing compound over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall NOT be placed on any concrete surface where additional concrete is to be placed, where concrete sealers or surface coatings are to be used, or where the concrete finish requires an integral floor product. Curing compound shall be applied as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can be absorbed into the concrete. Application shall be in compliance with the manufacturer's recommendations.

C. Specified Applications of Curing Methods:

1. Slabs on Grade and Footings – Water curing, sheet material curing, or liquid membrane curing shall be used.
2. Structural Slabs – Water curing or liquid membrane curing shall be used.
3. Horizontal Surfaces that will Receive Additional Concrete, Coatings, Grout or Other Material that Requires Bond to the substrate – Water curing shall be used.
4. Formed Surfaces – No curing shall be used if nonabsorbent forms are left in place 7 days. Water curing shall be used if absorbent forms are used. Sheet curing or liquid

membrane curing shall be used if forms are removed before 7 days. Exposed horizontal surfaces of formed walls or columns shall be water cured for 7 days or until next placement of concrete is made.

5. Concrete Joints – Water curing or sheet material curing shall be used.
- D. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

### **3.07 REMOVAL OF FORMS**

- A. Except as otherwise specifically approved by the ENGINEER, forms shall not be removed before the concrete has attained a strength of at least 30 percent of its specified design strength, nor before reaching 100 degree days of curing for walls and vertical surfaces, and 500 degree days of curing for beams and slabs, (whichever is the longer). Degree days are defined as the total number of 24-hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (e.g., 5 days at an average 70 degrees F = 350 degree days).
- B. Shores shall not be removed until the concrete has attained at least 60 percent of its specified design strength and also sufficient strength to support safely its own weight and construction live loads.

### **3.08 INSPECTION AND FIELD TESTING**

- A. The batching, mixing, transporting, placing, and curing of concrete shall be subject to the inspection of the ENGINEER at all times. The CONTRACTOR shall advise the ENGINEER of their readiness to proceed at least 24 hours before each concrete placement. The ENGINEER will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing steel and the alignment, and the cleanliness and tightness of formwork. No placement shall be made without the inspection and acceptance of the ENGINEER.
- B. Sets of field control cylinder specimens will be taken by an independent entity paid for by the DISTRICT during the progress of the work, in compliance with ASTM C31. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than one set per day, nor less than one set for each 150 cubic yards of concrete, nor less than one set for each 3,000 square feet of surface area for slabs or walls. If the total volume of concrete were such that the frequency of testing required for a given class of concrete would provide less than five strength tests, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are anticipated.
- C. A "set" of test cylinders consists of six 6"x12" cylinders: two to be tested at 7 days and two to be tested and their strengths averaged at 28 days. The final two may be used for a special test at 3 days or to verify strength after 28 days if 28-day test results are low. A copy of all concrete test results shall be provided to the DISTRICT for review.
- D. When the average 28-day compressive strength of the cylinders in any set falls below the specified design strength or below proportional minimum 7-day strengths (where the proper relationships between 7- and 28-day strengths have been established by tests),

proportions, water content, or temperature conditions shall be changed to achieve the required strengths.

- E. The CONTRACTOR shall cooperate in the making of tests by allowing free access to the work for the selection of samples; providing an insulated, closed curing box for specimens; affording protection to the specimens against injury or loss through the operations; and furnishing material and labor required for the purpose of taking concrete cylinder samples. All shipping of specimens will be paid for by the DISTRICT. Curing boxes shall be acceptable to the ENGINEER.
- F. Concrete Slump:
1. Slump tests will be made in the field immediately before placing the concrete by an independent entity paid for by the DISTRICT. Such tests shall be made in accordance with ASTM C143. If the slump is greater than the specified range, the concrete shall be rejected.
  2. At a minimum the first three trucks shall be tested to establish consistency. Additionally, testing will be performed with each strength test (cylinders) and each air content test.
  3. The ENGINEER reserves the right to increase the frequency of testing when deemed necessary.
- G. Air Content:
1. Testing for air content shall be performed on a fresh concrete sample by an independent entity paid for by the DISTRICT. Air content testing for concrete made of ordinary aggregates having low absorption shall be performed in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173. If lightweight aggregates or aggregates with high absorptions are used, the latter test method shall be used. If air content is below the specified air-entrainment range listed in Table 1, air-entraining admixture may be added on-site to bring the concrete within specifications. If air content is above the specified air-entrainment range, the concrete shall be rejected.
  2. At a minimum, the first three trucks shall be tested to establish consistency, then every third truck thereafter. Additionally, an air content test shall be performed with each strength test (cylinders). Concrete samples for the testing of air content shall be taken at the point of placement and not at the truck chute/hopper.
  3. The ENGINEER reserves the right to increase the frequency of testing when deemed necessary.
- H. The ENGINEER may have cores taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of concrete quality. The results of tests on such cores shall be the basis for acceptance, rejection, or determining the continuation of concrete work.

- I. The CONTRACTOR shall cooperate in obtaining cores by allowing free access to the work and permitting the use of ladders, scaffolding, and such incidental equipment as may be required. Repair all core holes. The work of cutting and testing the cores will be at the expense of the DISTRICT.

### **3.09 FAILURE TO MEET REQUIREMENTS**

- A. Should the strengths shown by test specimens made and tested in compliance with the previous provisions fall below the values given in Table 1, the ENGINEER shall have the right to require changes in proportions outlined to apply to the remainder of the work. Furthermore, the ENGINEER shall have the right to require additional curing on those portions of the structure represented by the test specimens that failed. The cost of such additional curing shall be at the CONTRACTOR's expense. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the ENGINEER shall have the right to require strengthening or replacement of those portions of the structure that fail to develop the required strength. The cost of all such core borings and/or load tests, and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at the expense of the CONTRACTOR. In such cases of failure to meet strength requirements, the CONTRACTOR and ENGINEER shall confer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in ASTM C94 is the CONTRACTOR in this Section.
- B. When the tests on field control specimens of concrete fall below the specified strength, the ENGINEER will permit check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In the case of cores not indicating adequate strength, the ENGINEER, in addition to other recourses, may require, at the CONTRACTOR's expense, load tests on any one of the elements in which such concrete was used. Tests need not be made until concrete has aged 60 days.
- C. Should the strength of test cylinders fall below 60 percent of the required minimum 28-day strength, the concrete shall be rejected and shall be removed and replaced.

### **3.10 PATCHING AND REPAIRING**

- A. It is the intent of this Section to require quality work including adequate forming, proper mixture and placement of concrete, and curing, so completed concrete surfaces will require no patching.
- B. Defective concrete and honeycombed areas shall be repaired as directed by the ENGINEER.
- C. As soon as forms have been removed and the concrete surfaces exposed, fins and other projections shall be removed. All exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the ENGINEER. In no case will extensive patching of honeycombed concrete be permitted.

Concrete containing minor voids, holes, honeycombing, or similar depression defects shall be repaired as specified herein. Concrete containing extensive voids, holes, honeycombing, or similar depression defects shall be completely removed and replaced. The CONTRACTOR, at their own expense, shall promptly execute all repairs and replacements herein specified.

- D. Defective surfaces to be repaired as specified in Paragraph C shall be cut back from true line a minimum depth of 1/2 inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of all laitance or soft material and not less than 1/32-inch depth of the surface film from all hard portions, by means of an efficient sandblast. After cutting and sandblasting, the surface shall be wetted sufficiently in advance of shooting with shotcrete or with cement mortar so that while the repair material is being applied, the surfaces under repair will remain moist, but not so wet as to overcome the suction upon which a good bond depends. The material used for the repair proposed shall contain such proportion of Atlas White Portland Cement as is required to make the color of the patch match the color of the surrounding concrete.
- E. Recesses left by the removal of form ties shall be filled. Immediately after removal of forms, remove plugs and break off metal ties as required. Promptly fill holes upon stripping as follows: moisten the hole with water, followed by a 1/16-inch brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1 to 1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense and an excess of paste appears on the surface in the form of a spider web. Trowel smooth with heavy pressure. Avoid burnishing.
- F. Surface defects that do not impair structural strength shall be repaired. When patching exposed surfaces the same source of cement and sand as used in the parent concrete shall be employed. Adjust color if necessary by addition of proper amounts of white cement. Rub lightly with fine Carborundum stone at an age of 1 to 5 days if necessary to bring the surface down to flush with the parent concrete. Exercise care to avoid damaging or staining the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.
- G. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete.

### **3.11 EMBEDMENT OF CONDUIT AND PIPES IN CONCRETE**

- A. Conduit, pipes, and sleeves of any material not harmful to concrete and within limitations of the Contract Drawings and Specifications and ACI 318 shall be permitted to be embedded in concrete with the prior approval of the ENGINEER, provided they are not considered by the ENGINEER to displace structural concrete, except as provided herein.
- B. Conduit and pipes of aluminum shall not be embedded in structural concrete.
- C. Conduit and pipes, with their fittings, embedded within a column shall not displace more than four percent of the area of the cross section on which the strength is calculated or

which is required for fire protection. The ENGINEER shall determine whether the strength of the construction has been significantly impaired.

- D. Conduits and pipes embedded within a slab, wall, or beam shall satisfy the following:
1. They shall not be larger in outside dimension than 2 inches.
  2. Minimum center-to-center spacing between conduit and/or pipe runs shall be 3 times outside diameter or width.
  3. They shall be located in such a manner as to maintain a minimum of 1 inch of clear space between the embedded item and primary reinforcing.
  4. They shall not significantly impair the strength of the construction. The ENGINEER shall determine whether the strength of the construction has been significantly impaired.
- E. No liquids, gas, or vapor, except water not exceeding 90 degrees Fahrenheit or 50-psi pressure, shall be placed in the pipes until the concrete has attained its design strength.
- F. In solid slabs, conduits and/or pipes shall be placed between the top and bottom reinforcement at the centerline of the slab. At a minimum, they shall be located in such a manner as to maintain a minimum of 1 inch of clear space between the embedded item and primary reinforcing.
- G. Concrete cover for pipes shall be not less than 1 1/2 inches for concrete exposed to earth or weather, nor less than 3/4 inch for concrete not exposed to weather or in contact with the ground.
- H. Additional reinforcement with an area not less than 0.002 times the area of concrete section shall be provided normal to the conduit and/or pipe.
- I. Conduits and/or piping shall be so fabricated and installed that cutting, bending, or displacement of reinforcement from its proper location will not be required.

### **3.12 SCHEDULE**

- A. Table 3 lists the general applications for the various concrete classes and design strengths.



**Table 3**  
**Concrete Schedule**

Class	Design Compressive Strength at 28 days (psi)	Description
A	2,500	Concrete fill and duct encasement
B	3,000	Concrete overlay slabs and pavements
C	N/A	Not used
D	4,500	Walls, slabs on grade, suspended slab and beam systems, columns, grade beams, pile caps and all other structural concrete

\*\*\*END OF SECTION\*\*\*

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## SECTION 03 40 00

### PRECAST CONCRETE

#### PART 1 GENERAL

##### 1.01 DOCUMENTS

The General Conditions and all other Contract Documents for this project are complementary and applicable to this Section of the Specifications.

##### 1.02 SCOPE OF WORK

- A. Provide all labor, materials, equipment, facilities, transportation and services necessary for the installation of precast concrete structures.
- B. **Work Included:** The work includes, but is not necessarily limited to the following:
  - 1. Pump Station structure
  - 2. Electrical pull/splice boxes.
  - 3. Concrete manholes
- C. **Related Work Specified Elsewhere**
  - 1. Cast-in-Place Concrete: Section 03 30 00.

##### 1.03 SUBMITTALS

- A. Concrete Design and Calculations
  - 1. Concrete Mix Design
  - 2. Design Calculations stamped and signed by a California licensed Civil or Structural Engineer.
  - 3. Load Calculations stamped and signed by a California licensed Civil or Structural Engineer.
  - 4. Shop drawings showing reinforcement, connections, embedded items, etc.

##### 1.04 QUALITY ASSURANCE

- A. *California Building Code*, latest edition.
- B. American Concrete Institute (ACI), *Building Code Requirements for Reinforced Concrete*.
- C. Caltrans (State) Standard Specifications, latest edition.

##### 1.05 REFERENCE STANDARDS

Standards listed below are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of listed standards, the requirements of this section shall prevail. Where two or more standards are at variance, the most restrictive requirement shall apply.

- A. ASTM C150                      *Portland Cement*
- B. ASTM C478                      *Precast Reinforced Concrete Manhole Sections*
- C. ASTM C858                      *Underground Precast Concrete Utility Structures*
- D. ASTM C913                      *Precast Concrete Water/Wastewater Structures*

## **PART 2 PRODUCTS**

### **2.01 PRECAST CONCRETE STRUCTURES**

- A. Where shown on the plans, the Contractor may use reinforced concrete structures that are cast at an off-site location. In general these structures include pump station structures, vaults and electrical pull boxes. Precast concrete structures shall conform to ASTM C478, C858 and C913.
- B. All precast concrete structures will be manufactured in a plant especially designed for that purpose. Standard products may be used wherever feasible.

### **2.02 MATERIALS**

Portland cement concrete and steel reinforcement shall conform to these specifications, although concrete compressive strength and reinforcement yield strength may be at the discretion of the manufacturer. Lightweight concrete shall not be used.

### **2.03 JOINT SEALERS**

- A. All joints between precast concrete sections shall be made water-tight by using a preformed plastic material that is permanently self-adhering and flexible. Compound shall be "Ram-Nek" as manufactured by K.T. Snyder Company, Houston, Texas or approved equal. ("Ram-Nek" is distributed locally by Hanson Concrete Products of Milpitas.) Follow manufacturer's recommended installation procedures.
- B. Where cast-in-place concrete is poured against an existing concrete structure, a preformed rubber hydrophilic water stop with adhesive back shall be installed on the precast side of the joint prior to the pour. Water stop shall be Adeka Ultra Seal MC-2010M (Gates Unlimited, Santa Clara) or equivalent. Follow manufacturer's recommended installation procedures.

### **2.04 NON-SHRINK GROUT**

Grout shall meet the requirements of Section 03 60 00.

## **PART 3 EXECUTION**

### **3.01 CASTING**

- A. No concrete shall be cast until all submittals have been favorably reviewed by the Engineer and returned to the Contractor.
- B. Precast concrete structures shall be cured at the plant following manufacturer's procedures. Structures shall not be shipped to the site until fully cured.

### **3.02 STORAGE, HANDLING AND DELIVERY**

- A. Precast structures shall be fully braced (with temporary struts if necessary) until the structures have been delivered to the project site, installed, leveled and anchored into place as shown on the plans.
- B. After cure, structures may be stored on the project site at the Contractor's own risk. Contractor is responsible for coordinating the delivery of precast concrete structures, and all trades required for their installation and anchorage.

### **3.03 INSTALLATION**

- A. Precast concrete structures shall be installed as shown on the plans, according to manufacturer's recommendations.
- B. Joint sealers shall be used as specified herein for a water-tight installation.

### **3.04 DEFECTIVE CONCRETE AND REPAIRS**

- A. Concrete shall be considered defective for the following reasons:
  - 1. Failure of finished concrete profiles to conform to the plans within tolerance.
  - 2. Failure to meet the specified cylinder strength requirements.
  - 3. Concrete showing cracks, rock pockets, voids, spalls, or defects that adversely affect the structural adequacy of the concrete.
- B. Defective concrete that results from improper casting or curing shall be repaired or replaced at the plant prior to shipment; damaged concrete that results from transportation, handling, or storage after the piece leaves the plant shall be repaired or replaced at no expense to the District.
- C. **Repairing and Patching:** Immediately after removing forms, all concrete surfaces shall be inspected and any pour joints, voids, rock pockets, tie holes, except as specified, etc., shall be patched at once. Defective areas shall be chipped away to a depth of about one inch with the edges perpendicular to the surface.

\*\* END OF SECTION \*\*

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**SECTION 03 60 00**  
**GROUTS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
1. Concrete mortar.
  2. Grout.
  3. Drypack mortar.
  4. Nonshrink grout.
  5. Epoxy grout.
  6. Non-shrink epoxy grout.

**1.02 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
1. C109 - Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2 inch or 50 millimeter cube specimens).
  2. C531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
  3. C579 - Test Method for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacing.
  4. C827 - Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
  5. C939 - Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
  6. C1090 - Test Method for Measuring Change in Height of Cylindrical Specimens from Hydraulic-Cement Grout.
  7. C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
  8. C1181 - Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts.

**1.03 SUBMITTALS**

- A. Nonshrink Grout and Non-shrink Epoxy Grout: Submit manufacturer's literature and certified test data prior to installation.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. All materials shall be delivered to the jobsite in their original, unopened packages or containers, clearly labeled with the manufacturer's product identification and printed instructions.
- B. All materials shall be stored in a cool dry place and in accordance with the manufacturer's recommendations.
- C. All materials shall be handled in accordance with the manufacturer's instructions.

**1.05 PROJECT/SITE CONDITIONS**

- A. Refer to manufacturer's literature or contact the manufacturer for any special physical or environmental limitations that may be required for use of products.

**1.06 WARRANTIES**

- A. Non-shrink Grout: The manufacturer shall warranty that the non-shrink grout will never go below its initial placement volume when tested in accordance with ASTM C1107.
- B. Non-shrink Epoxy Grout: The manufacturer shall warranty that non-shrink epoxy grout will show negligible shrinkage or expansion when tested in accordance with ASTM C531.

**PART 2 PRODUCTS****2.01 MATERIALS**

- A. Concrete Mortar:
  - 1. General: Consist of concrete mixture with coarse aggregate removed and water quantity adjusted as required.
  - 2. At Exposed Concrete Surfaces Not to Be Painted or Submerged in Water: White cement.
- B. Grout:
  - 1. Consist of mixture of Portland cement and sand.
- C. Dry-pack Mortar:
  - 1. Consist of mixture of Portland cement and sand.
- D. Non-shrink Grout:
  - 1. Non-shrink grout shall be a preportioned and prepackaged cement-based mixture. It shall contain no metallic particles such as aluminum powder and no metallic aggregate such as iron filings. It shall require only the addition of potable water.



2. Potable water for pre-soaking, mixing, and curing shall be clean and free of oils, acids, alkalies, organics, and any other deleterious matter.
  3. Bleeding: Non-shrink grout shall be free from the emergence of mixing water from within or the presence of water on its surface.
  4. Non-shrink grout shall be in accordance with ASTM C1107.
  5. Consistency: Non-shrink grout shall remain at a minimum flowable consistency for at least 45 minutes after mixing at 45 degrees Fahrenheit to 90 degrees Fahrenheit when tested in accordance with ASTM C230. If at a fluid consistency, it shall be verified in accordance with ASTM C939.
  6. Dimensional Stability (height change): Non-shrink grout shall be in accordance with ASTM C1107, volume-adjusting Grade B or C at 45 degrees to 90 degrees. It shall show 90 percent or greater bearing area under bases or baseplates.
  7. Compressive Strength: Non-shrink grout shall show minimum compressive strengths at 45 degrees Fahrenheit to 90 degrees Fahrenheit in accordance with ASTM C1107 for various periods from the time of placement, including 5,000 pounds per square inch at 28 days when tested in accordance with ASTM C109 as modified by C1107.
  8. Manufacturers: One of the following or equal:
    - a. Five Star Products, Inc., Fairfield, CT, Five Star Grout.
    - b. Master Builders, Inc., Cleveland, OH, Masterflow 928.
    - c. L&M Construction Chemicals, Inc., Omaha, NE, CRYSTEX.
- E. Epoxy Grout:
1. Consist of mixture of epoxy and sand.
  2. Sand: Clean, bagged, graded, and kiln dried silica sand.
- F. Non-shrink Epoxy Grout:
1. Non-shrink epoxy grout shall be a 100 percent solids, premeasured, prepackaged system containing a two-component thermosetting epoxy resin and inert aggregate.
  2. Consistency: Non-shrink epoxy grout shall maintain a flowable consistency for at least 45 minutes at 70 degrees Fahrenheit.
  3. Dimensional Stability (height change):
    - a. Non-shrink epoxy grout shall have negligible shrinkage or expansion (less than 0.0006 in/in) when tested in accordance with ASTM C531.
  4. Compressive Strength: Non-shrink epoxy grout shall show a minimum compressive strength of 10,000 pounds per square inch at 24 hours and 14,000 pounds per square inch at 7 days when tested in accordance with ASTM C579, Method B.
  5. Compressive Creep: The compressive creep for non-shrink epoxy grout shall not exceed 0.0027 in/in when tested under a 400 pounds per square

inch constant load at 140 degrees Fahrenheit in accordance with ASTM C1181.

6. Thermal Capability: The coefficient of thermal expansion for non-shrink epoxy grout shall not exceed 0.000018 inches per inch per degree Fahrenheit when tested under ASTM C531, Method B.
7. Manufacturers: One of the following or equal:
  - a. Five Star Products, Inc., Fairfield, CT, Five Star Epoxy Grout.
  - b. Master Builders, Inc., Cleveland, OH, Masterflow 648 CP Plus.
  - c. L&M Construction Chemicals, Inc., EPOGROUT.

## 2.02 MIXES

- A. Concrete Mortar Mix:
  1. Use water-cement ratio that is no more than that specified for concrete being repaired.
  2. At Exposed Concrete Surfaces Not to Be Painted or Submerged in Water: Use sufficient white cement to make color of finished patch match that of surrounding concrete.
- B. Grout Mix:
  1. For Concrete Repair: Mix in same proportions used for concrete being repaired, with only sufficient water to give required consistency for spreading.
  2. For Spreading over the Surfaces of Construction or Cold Joints: Mix with no more water used than allowed by water-cement ratio specified for concrete.
  3. For Other Applications: Mix in proportions by weight of one part cement to four parts of concrete sand.
- C. Dry-pack Mortar Mix: Use only enough water so that resulting mortar will crumble to touch after being formed into ball by hand.
- D. Non-shrink Grout: Mix in accordance with manufacturer's installation instructions such that resulting mix has fluid or flowable consistency and is suitable for placing by pouring.
- E. Epoxy Grout:
  1. Mix in accordance with manufacturer's installation instructions for mixing.
  2. Proportioning:
    - a. For horizontal work, consist of mixture of one part epoxy with not more than 2 parts sand.
    - b. For vertical or overhead work, consist of 1 part epoxy gel with not more than 2 parts sand.

- F. Non-shrink Epoxy Grout: Mix in accordance with manufacturer's installation instructions.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Inspect concrete surfaces to receive grout or mortar and verify that they are free of ice, frost, dirt, grease, oil, curing compounds, paints, impregnations and all loose material or foreign matter likely to affect the bond or performance of grout or mortar.
- B. Inspect baseplate and anchor systems for rust, oil, and other deleterious substances that may affect the bond or performance of grout.
- C. Confirm that newly placed concrete has been cured sufficiently to attain its design strength and limit further shrinkage.
- D. Verify that temperature of cementitious or epoxy grout does not exceed manufacturer's recommendations.

### **3.02 PREPARATION**

- A. Surface Preparation:
  - 1. Roughen all concrete surfaces by heavy sandblasting, chipping, or other mechanical means to assure bond. Loose or broken concrete shall be removed.
  - 2. All grease, oil, dirt, curing compounds, laitance, and other deleterious materials that may affect bond that were identified in the inspection process shall be completely removed from concrete and bottoms of baseplates. All metal surfaces should have a 2 to 3 mil peak-to-valley profile for epoxy grouts.
  - 3. For cementitious mortars and grouts, concrete surfaces shall be saturated surface dry. Any standing water shall be removed prior to placing grouts.
  - 4. For epoxy grouts, do not wet concrete surfaces with water. Instead, where required, wet surfaces with epoxy for horizontal work or epoxy gel for vertical or overhead work prior to placing epoxy grouts.
- B. Forms and Headboxes for Grouts (Cementitious or Epoxy):
  - 1. Forms for grouts shall be built of material with adequate strength to withstand the placement of grouts.
  - 2. Forms must be rigid and liquid tight. All cracks and joints shall be caulked with an elastomeric sealant. All forms shall be lined with polyethylene for easy grout release. Forms carefully waxed with two coats of heavy-duty paste wax shall also be acceptable.
  - 3. Forms shall be 4 to 6 inches higher than the baseplate on one side of the baseplate configuration when using head pressure for placement.

4. A sufficient number of headboxes shall be built to facilitate placement of grouts.
5. Air relief holes a minimum 1/8 inch in diameter shall be provided when required by a baseplate configuration to avoid entrapping air underneath.

### 3.03 APPLICATION

#### A. Cement Mortar and Grout:

1. For Defective Concrete Repair:
  - a. Filling: Filling of voids around items through the concrete.
  - b. Grout Spreading: Spread over construction joints, cold joints, and similar type items.
2. Concrete Surfaces:
  - a. Apply epoxy bonding agent to clean, roughened, and dry surfaces before placing mortar or grout.
3. Placing:
  - a. Exercise particular care in placing Portland cement mortar or grout since they are required to furnish structural strength or impermeable water seal or both.
  - b. Do not use cement mortar or grout that has not been placed within 30 minutes after mixing.

#### B. Epoxy Grout:

1. Apply in accordance with manufacturer's installation instructions.
2. Use where specified herein or where indicated on the Plans.

### 3.04 PLACEMENT

- #### A. The Contractor shall make arrangements to have a grout manufacturer's representative present for a preconstruction meeting and during initial grout placement. Grout shall only be installed after the final equipment alignment is correct and accepted by the Engineer.
1. Grouts shall be mixed in accordance with the manufacturer's recommendations.
  2. A mortar mixer with moving paddles shall be used for mixing grouts. For cementitious grouts, pre-wet the mixer and empty out excess water before beginning mixing.
  3. Cementitious Grouts:
    - a. Non-shrink cementitious grout shall be added to a premeasured amount of water that does not exceed the manufacturer's maximum recommended water content.
    - b. Mix cementitious grouts per manufacturer's instructions for uniform consistency.

- c. Grouts may be drypacked, flowed, or pumped into place. All baseplate grouting shall take place from one side of a baseplate to the other to avoid trapping air. Do not overwork grouts.
  - d. Do not retemper grout by adding more water after stiffening.
  - e. Hydrostatic head pressure shall be maintained by keeping the level of the grout in the headbox above the bottom of the baseplate. The headbox should be filled to the maximum level and the grout worked down to top of baseplate.
4. Epoxy Grouts:
- a. Epoxy grouts shall be mixed in complete units. Do not vary the ratio of components or add solvent to change the consistency of the mix.
  - b. Pour the hardener into the resin and mix for at least one minute and until each mixture is uniform in color. Pour the chemical components into the mortar mixer wheelbarrow and add the aggregate. Mix until aggregate is uniformly wetted. Overmixing will cause air entrapment in the mix.
  - c. All epoxy grout shall be flowed into place using a headbox. All grouting shall take place from one side of a baseplate to the other in a continuous flow to avoid trapping air.
  - d. Hydrostatic head pressure shall be maintained by keeping the level of grout in headboxes above the bottom of baseplates. Headboxes shall be filled to the maximum level and grout worked down to the bottom of baseplates.
  - e. Epoxy grouts shall not be cut back after setting. The final level of grout will be as installed with all chamfer edges built into the formwork.

### 3.05 CURING

#### A. Cementitious Grouts:

- 1. Grouts must be cut back to the lower edge of baseplates after reaching initial set. Provide a 45 degree angle cut back.
- 2. Clean equipment and tools as recommended by the grout manufacturer.
- 3. Cure Grouts in accordance with manufacturer's specifications and recommendations. Keep grout moist for a minimum of 3 days. The method needed to protect grouts will depend on temperature, humidity, and wind. Wet burlap, a soaker hose, sun shading, ponding and, in extreme conditions, a combination of methods shall be employed.
- 4. Grouts shall be maintained above 40 degrees Fahrenheit until they have attained a compressive strength of 3,000 pounds per square inch or above 70 degrees Fahrenheit for a minimum of 24 hours to avoid damage from subsequent freezing.

#### B. Epoxy Grouts:

- 1. Cure grouts in accordance with manufacturers' specifications and recommendations. Do not wet cure epoxy grouts.

2. Consult the manufacturer for appropriate cure schedule. In no case should any surface in contact with grout be allowed to fall below 50 degrees Fahrenheit for a minimum of 48 hours after placement.
3. Equipment and tools shall be cleaned immediately with a strong liquid detergent and water solution before grout hardens.

### **3.06 FIELD QUALITY CONTROL**

- A. Non-shrink cementitious grouts shall be tested for 24 hour compressive strength in accordance with ASTM C109.
- B. Non-shrink grouts shall be tested for 24 hour compressive strength in accordance with ASTM C579 (Method B).

**\*\*END OF SECTION\*\***

## **SECTION 08 31 00 ACCESS HATCHES**

### **PART 1 GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes: Access hatches.

#### **1.02 SUBMITTALS**

- A. Product Data.
- B. Shop Drawings: Show the following:
  - 1. Access door attachment to structure in each typical condition.
  - 2. Locations of access doors.
  - 3. Dimensions of all openings and doors.

#### **1.03 DELIVERY, STORAGE, AND HANDLING**

- A. Identify type and size of each door in way not to damage finish prior to delivery.
- B. Deliver products only after proper facilities are available.
- C. Deliver and store packaged products in original containers with seals unbroken and labels intact until time of use.
- D. Handle carefully to prevent damage and store on clean concrete surface or raised platform in safe, dry area. Do not dump onto ground.
- E. Protect access doors during shipment and storage to prevent warping, bending, and corrosion.

### **PART 2 PRODUCTS**

#### **2.01 FLOOR HATCHES FOR INSTALLATION IN NEW CONCRETE**

- A. Where plans call for construction of hatches in new concrete or where plans call for demolition of existing hatch and surrounding concrete, hatch shall be considered as being installed in new concrete.
- B. Door leaf shall be anodized aluminum diamond pattern; designed to withstand ASTM Load Level 4, unless otherwise specified.
- C. Channel frame shall be extruded aluminum, to match the hatch material. Where required, frames shall be supplied to concrete precaster so that they may be cast into the concrete. A continuous silicone gasket shall be mechanically attached to the aluminum frame to create a gastight barrier around the entire perimeter of the cover and eliminate dirt and debris that may enter the channel frame.

- D. **Fall Through Protection:** Hatches shall have integral fall through protection.
1. The Safety Grate shall be made of 6061-T6 aluminum and designed per the *Specifications for Aluminum Structures* by the Aluminum Association, Inc. 5th Edition, Dec. 1986 for "Bridge Type Structures".
  2. Design shall combine covering of the opening, fall through protection per OSHA Standard 1910.23 and controlled confine space entry per OSHA Standard 1910.146.
  3. The grating shall be designed to withstand a minimum live load of 300 pounds per square foot using 17,300 psi as the design stress for the aluminum. Deflection shall not exceed 1/150" of the span.
  4. Grate openings shall allow for visual inspection, limited maintenance and float adjustments while the safety grate fall through protection is left in place. Each grate shall be provided with a permanent hinging system, which will lock the grate in the 90° position once opened. Grates in the open position create a visual barrier around the opening, alerting passing pedestrians. Grate shall hinge such that in the open 90° position it blocks an additional side of the opening as the cover.
  5. Each aluminum safety grate shall be coated with a safety orange color, promoting visual awareness of the hazard, by a powder coat system, applied by the electrostatic spray process. The coating is a thermosetting powder coat finish with a minimum thickness of 2 mils-4 mils and shall be baked at 350°-375°F until cured.
- E. **Hinges:** Heavy forged aluminum hinges, each having a minimum 3/8" diameter Type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame. Shall be bolted to channel frame and hatch cover with type 316 stainless steel bolts and Ny-lock nuts
- F. **Drain Coupling:** Provide a 1-1/2" (38mm) drain coupling located in the right front corner of the channel frame (away from the hinges). Drain to wetwell.
- G. **Lifting Mechanisms:** Access hatch shall be equipped with heavy duty stainless steel pneu-spring. Access hatch shall be counterbalanced so that the access doors can be operated by one person.
- H. **Locking Mechanism:** Access hatch shall be equipped with a recessed padlock clip.
- I. A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug.
- J. Cover shall be equipped with a hold open arm which automatically locks the cover in the open position. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover.
- K. Hardware shall be anticorrosion throughout. Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.
- L. Manufacturer shall guarantee against defects in hatch material or workmanship for a period of ten years.



- M. Access Hatch shall be as manufactured by USF Fabrications, or approved equal.

## **2.02 FINISHES**

- A. Floor Access Doors:
  - 1. Aluminum: Manufacturer's standard mill finish.
  - 2. Aluminum in Contact with Dissimilar Metals and Concrete: Manufacturer's standard bituminous coating.
  - 3. Steel: Manufacturer's standard red oxide primer.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine construction to receive access door and verify correctness of dimensions and other supporting or adjoining conditions.
- B. Contractor shall replace any defective or damaged equipment at no additional cost to the District.

### **3.02 PREPARATION**

- A. Coordinate details with other work supporting, adjoining, or requiring access doors. Coordination shall include, but is not limited to, coordinating the opening with the pump supplier to ensure pumps have sufficient clearance when removed and all pump and control accessories can be maintained with ease.
- B. Verify dimensions, profiles, and fire-resistive rating for each opening.
- C. Verify that location will serve portion of work to which access is required. Where proposed functional location conflicts with other work, notify the Engineer before installation.

### **3.03 INSTALLATION**

- A. Install access doors in accordance with manufacturer's instructions.
- B. Ensure correct types and adequate sizes at proper locations.
- C. Securely attach frames to supporting work and ensure doors, frames and hardware operate smoothly and are free from warp, twist and distortion.

### **3.04 ADJUSTING**

- A. Adjust doors, frames and hardware to operate smoothly, freely, and properly, without binding.

**3.05 CLEANING**

- A. Thoroughly clean surfaces of grease, oil, or other impurities, touch-up abraded prime coat.

**END OF SECTION**

**SECTION 09 90 00  
COATING SYSTEMS**

**PART 1 - GENERAL**

**1.01 DOCUMENTS**

The General Conditions and all other Contract Documents for this project are complementary and applicable to this section of the Specifications.

**1.02 SCOPE OF WORK**

**A. Work Included**

Paint, protective coatings, and finishes for pipes, exposed metal, and equipment.

**B. Related Work Specified Elsewhere**

1. Piping and Fittings: Section 33 31 13.
2. Submersible Pumps: Section 22 14 29.

**1.03 REFERENCE STANDARDS**

Standards listed below are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of listed standards, the requirements of this section shall prevail. Where two or more standards are at variance, the most restrictive requirement shall apply.

- |    |           |  |
|----|-----------|--|
| A. | AWWA C105 | <i>Polyethylene Encasement for Ductile-Iron Pipe Systems</i>                               |
| B. | AWWA C210 | <i>Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines</i> |
| B. | AWWA C213 | <i>Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines</i>  |
| C. | SSPC PA2  | <i>Measurement of Dry Paint Thickness with Magnetic Gauges</i>                             |
| D. | SSPC SP1  | <i>Solvent Cleaning</i>  |
| E. | SSPC SP5  | <i>White Metal Blast Cleaning</i>  |
| F. | SSPC SP6  | <i>Commercial Blast Cleaning</i>   |
| G. | SSPC SP7  | <i>Brush-off Blast Cleaning</i>  |
| H. | SSPC SP8  | <i>Pickling</i>  |
| I. | SSPC SP10 | <i>Near-white Blast Cleaning</i>   |

## 1.04 SUBMITTALS

- A. Complete data on each type of paint and primer shall be submitted to the Engineer demonstrating the product's compliance with these specifications. This shall be done whether or not the product is named herein. Submittals shall also include manufacturer's published instructions and indicate where or for what use each product is intended. The Contractor shall be in receipt of the Engineer's written approval prior to delivery of any paint to the job-site.
- B. Paints not listed in the specifications shall be submitted with a certified ingredients analysis and with solids by volume so that a complete comparison between specified and proposed paint may be made. Certification of compliance with State of California Air Regulation Board standards shall be submitted.
- C. Contractor shall provide color chips for approval. The District will select all colors.

## PART 2 - PRODUCTS

### 2.01 GENERAL

The paints, primers, and coatings shall be the products of the Tnemec Company Inc., North Kansas County, MO, Koppers Company Inc., Pittsburgh, PA, or equal. The "or equal" clause refers to dry film thickness, generic type of primer, paint, or coating and ingredients in the coating. No request for substitution will be considered which decreases the film thickness designated, the number of coats to be applied, the general type of coating, paint, or primer; or the quantity, quality or type of ingredients in the coatings specified. Paints shall meet current State of California Air Regulation Board standards.

### 2.02 PIPE COATING SYSTEMS

- A. **Fittings and Valves:** All fittings and valves shall be fusion bonded epoxy lined and coated as specified herein unless otherwise specified. Additional ferrous metals for immersed service shall also be fusion bonded epoxy lined and coated.
- B. **Ductile Iron Pipe:** Ductile iron pipe shall be lined and coated as specified herein. Interior lined with Protecto 401 Ceramic Epoxy or Tnemec 431 Perma-Shield. The lining material shall be amine cured novalac epoxy containing at least 20 percent by volume of ceramic quartz pigment. The dry film thickness shall be no less than 40 mils. Exterior coating shall be:
  - Buried Pipe:** Buried pipe shall be coated with asphaltic material as specified in AWWA C151. A minimum thickness of 1-mil asphaltic coating shall be applied.
  - Exposed Pipe:** Exposed pipe within the wetwell and valve vault shall be prepared per the National Association of Pipe Fabricators Standard NAPF 500-03 and coated with an exterior protective pipe coating incorporating high solids amine cured epoxy for maximum protection of the exterior of ductile iron pipe. Coating shall be Tnemec Series 141 at a minimum of 16 mils dry film thickness, or US Pipe Ceramawrap at a minimum dry film thickness of 20 mils.

- C. **Buried Pipe and Fittings:** Ferric discharge piping and associated fittings for buried service shall be coated in conformance with these specifications and in addition, shall be wrapped with 8 mil polyethylene in conformance with AWWA C105. Prior to encasement, odd shaped items such as couplings, flange bolts, restraining glands, etc. shall be coated with a bitumastic material (e.g. Ramnek) to provide a uniform substrate that prevents film tearing during backfill.

### 2.03 FERROUS METAL COATINGS FOR NON-IMMERSION SERVICE

- A. **Ferrous Metals for Non-Immersion Service:** Exposed metals including steel bollards, steel air ducting, associated appurtenances and miscellaneous ferrous metal not called out elsewhere shall be lined and/or coated with the following system, following manufacturer's recommendations:
1. **Surface Preparation:** Sandblast to SSPC 6 (commercial blast cleaning).
  2. **Prime Coat:** Blasted surfaces shall be coated with a 2.5 to 3.5 mil d.f.t. coat of zinc-rich aromatic urethane, such as Tnemec Series 90-97 Tneme-Zinc, or approved equal.
  3. **Intermediate Coat:** Primed surfaces shall be coated with a 4 to 6 mil d.f.t. coat of polyamidoamine epoxy, such as Tnemec Series N69 High-Build Epoxoline II, or approved equal.
  4. **Top Coat:** A 2 to 3 mil d.f.t. coat of semi-gloss aliphatic acrylic polyurethane such as Tnemec Series 73 Endura-Shield shall be applied.
- B. All prime and intermediate coats shall be compatible. The District shall select finished top coat color from manufacturer's standard colors. Prime and intermediate coat colors shall be compatible as recommended by the manufacturer.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. All materials shall be delivered to the site in the manufacturer's sealed containers. Each container shall be labeled by the manufacturer, and the label shall be intact upon delivery. Labels shall give the manufacturer's name, brand, type of paint, batch number, color of paint and instructions for reducing. Materials shall not be delivered until the Engineer's written approval has been received.
- B. Each coat of paint shall be of the consistency as supplied by the manufacturer, or thinned if necessary, and applied in accordance with the manufacturer's written instructions. Work shall be free from "runs", "bridges", "shiners", or other imperfections due to faulty intervals. Care shall be taken to obtain a uniform, unbroken coating over all bolts, threads, nuts, welds, edges, and corners. Further, all weld splatter shall be removed and all welds neutralized with thinner.

- C. Care shall be exercised not to damage adjacent work during sandblasting operations. Stainless steel need not be sandblasted. Blasted surfaces shall be coated within four hours of being sandblasted. All dust shall be removed from the surfaces prior to painting.

### 3.02 ENVIRONMENTAL CONDITIONS

- A. Paint shall not be applied in extreme heat, nor in dust or smoke laden air, nor in damp or humid weather, nor when the air temperature and/or the temperature of the surface to be painted is below 50° F or within 10° F of the dew point. The Contractor shall provide temporary heat as required to maintain 50° F temperature and 10° F above the dew point day and night until painting is complete and the paint is dry.
- B. Paint shall not be applied to surfaces hotter than 120° F.

### 3.03 GENERAL SURFACE PREPARATION

All surfaces to be coated or painted shall be in the specified condition to receive the material before any coating or painting is performed. No more sandblasting or surface preparation than can be coated or painted in a normal working day will be permitted. All sharp edges, burrs and weld spatter shall be removed.

1. **White Metal Blast Cleaning (SSPC SP5):** Removal of all visible rust, mill scale, paint, and foreign matter by blast cleaning by wheel or nozzle using sand, grit, or shot.
2. **Near-White Blast Cleaning (SSPC SP10):** Blast cleaning nearly to White Metal Cleanliness, until at least 95% of each element of surface area is free of all visible residues.
3. **Commercial Blast (SSPC SP6):** Blast cleaning until at least 67% of each element of surface area is free of all visible residues.
4. **Brush-off Blast Cleaning (SSPC SP7):** Blast cleaning of all except tightly adhering residues of mill scale, rust and coatings, exposing numerous evenly distributed flecks of underlying metal.
5. **Solvent Cleaning (SSPC SP1):** Removal of all grease, oil and dirt.

### 3.04 INSPECTION AND GUARANTEE

- A. During and after final application of protective coatings, all metal surfaces shall be checked mechanically with an Elcometer, Mikrotest or other approved dry film thickness gage to verify that the specified dry film thickness has been attained.
- B. Coating testing and repair of damages, flawed areas, holidays, or mishaps shall conform to applicable AWWA standards.

- C. The Contractor shall guarantee all coating work for a period of one year following the date of final acceptance by the District and is hereby notified that the District will inspect the project prior to the expiration of the guarantee period. The Contractor will be notified of the eleventh month inspection by certified letter and asked to attend. Defects in workmanship and materials shall be repaired by the Contractor at no cost to the District.

### 3.05 PAINT SCHEDULE

- A. **Items for Coating:** Items shall be coated as specified herein.
- Valves
  - Ductile Iron Fittings
  - Pump Discharge Elbows
- B. **Factory Painted Equipment:** Except as otherwise noted in the specifications, the following shall receive final finish coats at the factory. Paint shall conform to these specifications for appropriate service. Any areas damaged during shipment, installation, or initial testing shall be refinished as the original at no extra cost to the District. Factory painted items shall be of a color approved by the District.
- Pump Station Electrical Service Pedestal
  - Electrical Control Cabinets
  - Pumps
  - Hatches
  - Bollards
  - Shade Structure
  - Fence Tube Steel Posts
- C. **Items Not Painted:** Unless otherwise specified, the following items shall not be painted:
- Aluminum, brass, bronze, copper, plastic, rubber, stainless steel, chrome or lead
  - Encased piping or conduit
  - Plastic pipe and conduit
  - Galvanized steel framing and plates
  - Nameplates
  - Serial numbers
  - Warning or operating instruction labels
  - Gages
  - Steel encased in concrete or masonry
  - Concrete

\*\* END OF SECTION \*\*

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**SECTION 09 96 56**  
**FUSION BONDED EPOXY COATING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Fusion bonded epoxy lining and coating for steel or ductile iron pipe and fittings.

**1.02 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. D 1002 - Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimen by Tension Loading (Metal-to-Metal).
  - 2. G 8 - Test Methods for Cathodic Disbonding of Pipeline Coatings.
- B. Steel Structures Painting Council Standards (SSPC):
  - 1. SSPC-SP10 - Surface Preparation Specification for Near-White Blast Cleaning.
- C. American Water Works Association
  - 1. AWWA C116 – Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
  - 2. AWWA C210 – Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
  - 3. AWWA C 213 – Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.

**1.03 SUBMITTALS**

- A. Product data.
- B. Test Reports: Include manufacturer's certification that lining passed tests.
- C. Manufacturer's application instructions.

**PART 2 PRODUCTS**

**2.01 EPOXY RESIN POWDER**

- A. Material: Thermosetting, fusion bonded dry powder epoxy, 100 percent solids, with following performance characteristics when applied:
  - 1. Cathodic Disbondment Resistance: Average maximum 48 millimeters when tested in accordance with ASTM G 8.
  - 2. Adhesion Shear Resistance: Minimum 4,700 pounds per square inches when tested in accordance with ASTM D 1002.

**2.02 FABRICATION**

- A. Blast interior and exterior surfaces of pipe and fittings in accordance with SSPC-SP10.
- B. Apply epoxy resin powder to blasted surfaces by fluidized bed method to obtain minimum 16 mil thick lining in accordance with manufacturer's instructions.
- C. Fuse coating and lining to piping in accordance with manufacturer's instructions.

**2.03 SOURCE QUALITY CONTROL**

- A. Test coating and lining with either 100 volt per mil thickness holiday detectors or low voltage wet sponge holiday detectors.
- B. Reject pipe and fitting with coatings and linings that contain pinholes, discontinuities or other defects.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Install pipe and fitting in accordance with Section 33 31 13.

**END OF SECTION**

**SECTION 09 97 00**  
**WETWELL AND MANHOLE COATING SYSTEMS**

**PART 1 GENERAL**

**1.01 DOCUMENTS**

- A. The General Conditions and all other Contract Documents for this project are complementary and applicable to this section of the Specifications.

**1.02 SCOPE OF WORK**

- A. Work Included
  - 1. Coating/lining of concrete wet well and manholes as indicated on the contract drawings.
- B. Related Work Specified Elsewhere
  - 1. Cast In Place Concrete: Section 03 30 00.
  - 2. Precast Concrete: Section 03 40 00.
  - 3. Grouts: Section 03 60 00.

**1.03 REFERENCE STANDARDS**

- A. American Society for Testing and Materials (ASTM)
  - 1. C109-Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
  - 2. C293-Standard Test Method for Flexural Strength of Concrete
  - 3. C496-tandard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens
  - 4. D570 - Standard Test Method for Water Absorption of Plastics
  - 5. C596-Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement
  - 6. D638 - Standard Test Method for Tensile Properties of Plastics
  - 7. C666-Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
  - 8. D695 - Standard Test Method for Compressive Properties of Rigid Plastics
  - 9. D790 - Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
  - 10. C882-Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear
  - 11. D4258 – Standard Practice for Surface Cleaning Concrete for Coating
  - 12. D4259 – Standard Practice for Abrading Concrete
  - 13. D7234 - Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
- B. American Concrete Institute (ACI)
  - 1. RAP-3 – Spall Repair by Low Pressure Spraying
  - 2. 546R – Concrete Repair Guide

- C. Occupational Safety and Health Administration (OSHA)
- D. The Society for Protective Coatings (SSPC)
  - 1. PA1 – Shop, Field, and Maintenance Painting of Steel
  - 2. SP1 – Solvent Cleaning
  - 3. SP13 – Surface Preparation of Concrete

#### **1.04 SUBMITTALS**

- A. Coatings Manufacturer shall submit for approval the following:
- B. Copies of manufacturer's technical information and application instructions for each material proposed for use. Specify exactly which product is being proposed for each coating type (as specified below). This may be accomplished through a reference table along with information on the various products, or by a separate, tabbed section with information on products being submitted for each system in a separate tab of a binder. Submittal of general manufacturer's literature without detailing which product is proposed for each paint system will be unacceptable.
- C. Letter from the Coatings Manufacturer certifying the Coatings Installer as factory trained and qualified.
- D. Furnish copies of the final, approved submittal to the coatings installer so that it is clear which product is to be used for which each system.
- E. Test reports from an independent testing laboratory confirming chemical resistance of coating for chemicals common to municipal wastewater treatment facilities.

#### **1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. Store products in accordance with manufacturer's directions.
- B. All materials shall be delivered to the site in the manufacturer's sealed containers. Each container shall be labeled by the manufacturer, and the label shall be intact upon delivery.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. Manhole and Wetwell Coating
  - 1. Coating material furnished under this specification shall be a prepackaged mortar mix, including all cement, aggregates, and required additives.
  - 2. The chemical composition of the cement portion as well as the aggregates of the mortar mix shall be as follows:

Al <sub>2</sub> O <sub>3</sub>	CaO	FeO+Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>
39-44%	34-38%	9-15%	6-8%

3. The design properties of the mortar mix shall be as follows:

Compressive Strength (ASTM C109)	>5,500 psi	24 hours
	>7,000 psi	28 days
Flexural Strength (ASTM C348)	>900 psi	24 hours
	>1,300 psi	28 days
Splitting Tensile Strength (ASTM C496)	> 550 psi	24 hours
Slant Shear Test (ASTM C882)	>2,000 psi	28 days
Shrinkage at 28days (ASTM C157)	<0.07% cured @ 90% relative humidity	
Freeze/Thaw after 100 Cycles(ASTM C666)	No visible damage after 100 cycles	

- B. Mortar mix shall have been successfully used on at least 25 similar projects over a minimum of five (5) years.
- C. Mortar mix shall be designed to withstand long-term exposure to hydrogen sulfide with pH values of 2 or lower.
- D. Water used in mixing shall be clean, potable water, free of oil, acid, alkali and other material that may be detrimental to the performance of the mortar mix.
- E. Mix shall be one of the following approved products:
  - 1. Mainstay ML-CA
  - 2. Or Approved Equal
- F. Hydraulic cement
  - 1. Hydraulic cement shall be used to plug voids, major cracks, and locations showing signs of infiltration.
  - 2. Hydraulic cement shall be one of the approved products:
    - a. Mainstay ML-10
    - b. Or Approved Equal

**PART 3 EXECUTION****3.01 GENERAL**

- A. All materials shall be delivered to the site in the manufacturer's sealed containers. Each container shall be labeled by the manufacturer, and the label shall be intact upon delivery. Materials shall not be delivered until the Engineer's written approval has been received.
- B. Installation shall be in conformance with the manufacturer's recommendations unless otherwise noted herein.
- C. Care shall be exercised not to damage adjacent work during surface preparations.
- D. All protective coating materials shall be used within the manufacturer's recommended shelf life.
- E. Storage: Coating materials shall be protected from exposure to inclement weather, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application.
- F. Mixing:
  - 1. Coatings of different manufacturers shall not be mixed together.
  - 2. Mixing of multi-component coating systems shall be performed in accordance with Manufacturer's recommendations. Components must be mixed in complete batches only and used immediately.

**3.02 SURFACE PREPARATION**

- A. Ensure sub-surfaces are clean and free of laitance, loose material, residue and all existing coating and lining materials.
- B. All oil, grease, and form release and curing compounds shall be removed by detergent cleaning in accordance with SSPC-SP1 before abrasive blast cleaning. Surface preparation shall be performed in accordance with the latest editions of the following standards:
  - 1. ASTM D - 4258: Standard Practice for Surface Cleaning Concrete for Coating
  - 2. ASTM D - 4259: Standard Practice for Abrading Concrete
- C. Concrete surfaces and deteriorated concrete surfaces to be coated or lined shall be abrasive blast cleaned in accordance with SSPC SP13 to remove existing coatings, laitance, deteriorated concrete, and to roughen the surface equivalent to the surface of the No. 60 grit flint sandpaper (surface profile of 2.5 to 4 mils).
- D. Concrete surfaces requiring repairs in excess of one-quarter inch ( $\frac{1}{4}$ " ) depth shall be repaired and brought flush with the surface, in accordance with the coating manufacturers' recommendations to provide a continuously smooth and even surface for application of top coat.

- E. Sub-surfaces shall be thoroughly saturated with water prior to the application of the lining materials. In no instance shall shotcrete be applied to an area where running water exists. It is the intent of this specification that the concrete surface be saturated and free of running water just prior to installation. To achieve this, it may be necessary to presoak the sub-surface for at least 24 hours.
- F. Unless required for proper adhesion, surfaces shall be dry prior to coating. The presence of moisture shall be determined with a moisture detection device such as Delmhorst Model DB, or equal.
- G. All surfaces to be coated shall be completely dry, clean, and contaminant-free prior to application.

### **3.03 APPLICATION OF MATERIALS**

- A. Coating shall be applied by a Manufacturer approved installer.
- B. Coating shall be applied by spray methods in accordance with the manufacturer requirements and as follows:
  - 1. Material shall not be applied to frozen surfaces or surfaces that may freeze within 24 hours of application
  - 2. Application shall be at an angle as near perpendicular to the sub-surface as practicable with the application nozzle held 1 foot from the sub-surface. If nozzle flow is non-uniform and slugs, sand spots and wet sloughs result, the nozzle shall be directed away from the work area until the faulty conditions are corrected.
  - 3. Application shall be suspended if:
    - a. Air velocity separates the cement from the aggregate at the nozzle.
    - b. Ambient temperature approaches freezing and the newly placed coating can not be protected and insulated.
  - 4. Allow sufficient time between coating layers to allow for the previous layer to become tacky. Do not allow the coating to achieve final set between layers. If final set occurs between layers, prepare the surface in accordance with the manufacturer's requirements.
- C. The minimum thickness of coating shall be 1-inch cover over all surfaces.
- D. Whether spray or trowel application is used, the application shall be according to the principles of good workmanship outlined in SSPC-PA1-82 and shall provide a finish which is continuous, uniform in thickness, and verified free of pores or other defects using electrical discontinuity testing (high voltage spark testing).
- E. Coatings shall be applied to all walls, benches, and inverts.

### **3.04 COATING EXISTING STRUCTURES**

- A. Coat existing wastewater structures as indicated on the Drawings and specified herein:

1. Prepare all interior surfaces in accordance with the product manufacturer's recommendations and these specifications.
2. Repair any cracks, voids, and leaks with hydraulic cement mortar, in conformance with the product manufacturer's recommendations.
3. Apply cement to all interior floor/bench, wall, and ceiling surfaces in conformance with manufacturer's recommendations.
4. The minimum thickness of coating shall be 1-inch cover over all surfaces.
5. Remove Ladder:
  - a. Remove ladder rungs by cutting off the ladder rungs flush with the interior surface of the manhole. Cement mortar shall be applied over remaining portion of the ladders.
6. Replace Frame & Cover, where indicated on the Plans:
  - a. Excavate around existing manhole and remove existing frame and cover.
  - b. Install new frame, cover, and concrete collar in conformance with project drawings. New cover shall be flush with existing grade in streets and pathways.

### 3.05 FIELD TESTING

- A. Proper, safe access shall be provided in locations where requested by the Engineer to facilitate inspection. Additional illumination shall be furnished when the Engineer requests. Proper ventilation and atmospheric monitoring shall be provided as well as all other safety equipment and precautions required by OSHA for a safe inspection in all areas.
- B. The Engineer will conduct wet-film thickness testing. Contractor shall recoat any areas found deficient in thickness.
- C. Holiday Testing:
  1. Engineer will visually inspect coverage for blisters, sags, and holidays. Contractor shall repair areas identified by this inspection prior to conducting holiday test.
  2. Contractor shall holiday test, in the presence of the Engineer.
    - a. Holiday testing equipment and procedures shall be done in strict accordance with the latest edition of the NACE "Standard Recommended Practice Discontinuity (Holiday) Testing of Protective Coatings."
    - b. Areas that contain holidays shall be marked and repaired or recoated in accordance with the coating manufacturer's printed instructions and then retested.
  3. Holiday detectors shall be of the following type:
    - a. High voltage pulse-type holiday detector such as Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20, or equal shall be used. The unit shall be adjusted to operate at a voltage of at least 110 volts/mil desired thickness.



- D. Contractor shall provide the District with material samples upon request for testing.

### **3.06 ADJUSTMENT AND CLEANING**

- A. At the completion of the Work, Contractor shall remove all material and debris associated with the Work of this Section.
- B. At the completion of the Work, Contractor shall clean all surfaces to which coatings were applied, as well as all adjacent, uncoated surfaces in a manner acceptable to the Engineer.
- C. Coatings shall be protected from damage until Final Acceptance of all Work in the area that was coated. Coatings damaged in any manner by Contractor prior to Final Acceptance of all Work in that area shall be repaired or replaced in a manner acceptable to the Engineer at no additional cost to the Owner.
- D. Just prior to Final Acceptance of all Work in the area that was coated, Contractor shall clean all coatings, as recommended by the manufacturer, to provide a finished product acceptable to the Owner.

**END OF SECTION**

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**SECTION 22 05 29  
HANGERS AND SUPPORTS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Supports for pipe, fittings, valves, and appurtenances.
- B. Related Sections:
  - 1. Painting and Coating: Section 09 90 00

**1.02 REFERENCES**

- A. American National Standard Institute or Manufacturer's Standardization Society (ANSI/MSS):
  - 1. SP-58 - Standard for Pipe Hangers and Supports - Materials, Design, and Manufacture.
  - 2. SP-69 - Standard for Pipe Hangers and Supports - Selection and Application.

**1.03 SUBMITTALS**

- A. Shop Drawings: Include schedule, indicating where supports will be installed, and drawings of pipe support system components.

**PART 2 PRODUCTS**

**2.01 PIPE SUPPORTS**

- A. Sway Strut Assembly.
  - 1. Manufacturers: One of the following or equal:
    - a. Anvil, Figure 222.
    - b. Piping Technology and Products, Figure 2120
    - c. AAA Technology & Specialties Co., Figure E305
- B. Adjustable Clevis Hanger: ANSI/MSS SP 69 Type 1.
  - 1. Manufacturers: One of the following or equal:
    - a. Anvil, Figure 260.
    - b. Bergen-Paterson, Part 6750.
    - c. B-Line Systems, Figure B3100.
    - d. Superstrut, C710.
- C. Pipe Clamps: ANSI/MSS SP 69 Type 4.
  - 1. Manufacturers: One of the following or equal:
    - a. Anvil, Figure 212.
    - b. Bergen-Paterson, Part 6100.
    - c. B-Line Systems, Figure B3140.
    - d. Superstrut, C725.

- D. Pipe Saddles: ANSI/MSS SP 69 Type 38
  - 1. Manufacturers: One of the following or approved equal
    - a. Standon, Model S92.
    - b. Anvil, Figure 264.
- E. Pipe Shoes:
  - 1. Manufactures: One of the following or approved equal
    - a. AAA Technology & Specialties Co., Model 5020

## 2.02 MATERIALS

- A. Pipe Supports:
  - 1. Stainless Steel (Type 316): Use in all submerged locations, above water level but below top of wall inside water bearing structures and where specifically indicated on the Drawings.
  - 2. Hot-dip Galvanized Steel: Use in areas other than above and where specifically indicated on the Drawings. Hot-dip galvanize pipe support after fabrication.
  - 3. Plastic, Aluminum, FRP and Other Miscellaneous Materials: Use where specifically indicated on the Drawings.

## 2.03 FASTENERS

- A. General: Furnish threaded fasteners, except high strength bolts, with flat washers, and self-locking nuts, or lock washers and nuts.
  - 1. Bolt Heads and Nuts: Hex-type.
  - 2. Bolts, Nuts, and Washers: Of domestic manufacture.
  - 3. Where bolts, including anchor bolts, nuts, washers, and similar fasteners are specified to be galvanized, galvanize in accordance with ASTM A 153.
- B. All Thread Rods:
  - 1. Type 316 stainless steel for use in wet and moist locations, including:
    - a. Water-Containing Structures:
      - 1) Below and at water level.
      - 2) Above water level.
        - a) Below top of walls of water-containing structures.
        - b) Under the roof, slab, beam, or walkway of enclosed water-containing structures.
      - 3) Dry side of walls of water-containing structures.
    - b. Pump bases.
  - 2. Type 316 stainless steel for aluminum assemblies.
  - 3. ASTM A 36 meeting the mechanical requirements of ASTM A 307. Hot-dip galvanize for galvanized assemblies and for applications other than those specified.
- C. Anchor Bolts:
  - 1. Anchor Bolts, Nuts, and Washers: Type 316 Stainless Steel for Use in Wet and Moist Locations, Including:
    - a. Water-containing Structures:
      - 1) Below and at water level.
      - 2) Above Water Level:

- a) Below top of walls of water-containing structures.
  - b) Under the roof, slab, beam, or walkway of enclosed water-containing structures.
  - 3) Dry side of walls of water-containing structures.
  - b. Pump bases.
  2. Anchor Bolts, Nuts, and Washers: Type 316 stainless steel for fastening aluminum to concrete or steel.
  3. Anchor Bolts, Nuts, and Washers: Hot-dip galvanized ASTM A 307 steel or hot-dip galvanized ASTM A 36 steel, for applications other than those specified.
- D. Assembly Bolts:
1. Bolts, nuts, and washers for wood baffles, collectors, and other field-assembled construction:
    - a. Type 316 stainless steel for use in wet and moist locations, including:
      - 1) Water-containing structures:
        - a) Below and at water level.
        - b) Above water level.
          - (1) Below top of walls of water-containing structures.
          - (2) Under the roof, slab, beam, or walkway of enclosed water-containing structures.
          - (3) Dry side of walls of water-containing structures.
      - 2) Pump bases.
    - b. Type 316 stainless steel for aluminum assemblies.
  2. Hot-dip galvanized ASTM A 307 steel for galvanized assemblies and for applications other than those specified.
- E. Eyebolts:
1. Welded or forged, when manufactured of materials other than carbon steel.
  2. Having geometric and strength characteristics of eyebolts specified in ASTM A 489, Type 1. The strength characteristics include proof load requirements, breaking strength requirements, tensile strength requirements, bend test, and impact strength.
- F. Flush Shells:
1. Manufacturers: One of the following or equal:
    - a. ITW Ramset/Redhead, Multi-Set II Drop-In.
    - b. Hilti Corporation, Hol-Hugger HDI Drop-In.
  2. Bolts, Flush Shells, Threaded Rods, Washers, and Nuts: Type 303 stainless steel.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Properly support, suspend or anchor exposed pipe, fittings, valves, and appurtenances to prevent sagging, overstressing, or movement of piping; and to prevent thrusts or loads on or against connected pumps, blowers, and other equipment.

- B. Carefully determine locations of inserts. Anchor to formwork prior to placing concrete.
- C. Use flush shells only where indicated on the Drawings.
- D. Do not use anchors relying on deformation of lead alloy.
- E. Do not use stud type powder actuated fasteners for securing metallic conduit or steel pipe larger than 1 inch to concrete, masonry, or wood.
- F. Suspend pipe hangers from hanger rods. Secured with double nuts.
- G. Install continuously threaded hanger rods only where indicated on the Drawings.
- H. Use adjustable ring hangers; or adjustable clevis hangers, for 6 inch and smaller diameter pipe.
- I. Use adjustable clevis hangers for pipe larger than 6 inches in diameter
- J. Secure pipes with galvanized double nutted U-bolts or suspend pipes from hanger rods and hangers.
- K. Support Spacing:
  - 1. Support 2 inch and smaller piping on horizontal and vertical runs at maximum 5 feet on center, unless otherwise specified.
  - 2. Support larger than 2 inch piping on horizontal and vertical runs at maximum 10 feet on center, unless otherwise specified.
  - 3. Support exposed polyvinyl chloride and other plastic pipes at maximum 5 feet on center, regardless of size.
  - 4. Support tubing, copper pipe and tubing, fiber-reinforced plastic pipe or duct, and rubber hose and tubing at intervals close enough to prevent sagging greater than 1/4 inch between supports.
- L. Install Supports at:
  - 1. Horizontal bends.
  - 2. Both sides of flexible pipe connections.
  - 3. Base of risers.
  - 4. Floor penetrations.
  - 5. Connections to pumps, blowers and other equipment.
  - 6. Valves and appurtenances.
- M. Securely anchor plastic pipe, valves, and headers to prevent movement during operation of valves.
- N. Anchor plastic pipe between expansion loops and direction changes to prevent axial movement through anchors.
- O. Support base fittings with metal supports or when indicated on the Drawings, concrete piers.
- P. Size hanger rods, supports, clamps, anchors, brackets, and guides in

accordance with ANSI/MSS SP 58 and SP 69.

- Q. Do not use chains, plumbers' straps, wire, or similar devices for permanently suspending, supporting, or restraining pipes.
- R. Support plumbing drainage and vents in accordance with Uniform Plumbing Code.
- S. Supports, Clamps, Brackets, and Portions of Support System Bearing Against Copper Pipe: Copper plated, copper throughout, or isolated with neoprene or polyvinyl chloride tape.
- T. Where pipe is insulated, install over-sized supports and hangers.
- U. Install insulation shield in accordance with ANSI/MSS SP 69, Type 40. Shield shall be galvanized steel unless specified elsewhere.
- V. Install riser clamps at floor penetrations and where indicated on the Drawings
- W. Provide dielectric protection whenever fastening dissimilar metals.
- X. Paint or Coat support system components as specified in Section 09 90 00.
- Y. Interface With Other Products:
  - 1. Where steel fasteners come in contact with aluminum or other dissimilar metals, bolt with stainless steel bolts and separate or isolate from dissimilar metals with sleeves and washers.
    - a. Sleeves: Mylar, 1/32 inch thick, of proper size to fit bolts. One sleeve required for each bolt.
      - 1) Manufacturers: One of the following or equal:
        - a) Central Plastics Company, Shawnee, Oklahoma.
    - b. Washers: 63 glass phenolic, 1/8 inch thick, of proper size to fit bolts. Two washers are required for each bolt.
  - 2. Prior to installing nuts, coat threads of stainless steel fasteners with following to prevent galling of threads.
    - a. Manufacturers: One of the following or equal:
      - 1) Never Seez Compound Corporation, Never-Seez.
      - 2) Oil Research, Inc., WLR No. 111.
- Z. Threaded Fasteners:
  - 1. General:
    - a. Install bolts, including anchor bolts and concrete anchors, to project 2 threads minimum, but 1/2-inch maximum beyond nut.
    - b. Unless otherwise specified, tighten bolts, including anchor bolts and concrete anchors, to the "snug-tight" condition, defined as tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.
  - 2. Anchor Bolts:
    - a. Cast-in-place when concrete is placed, wherever feasible.
    - b. Accurately locate anchor bolts embedded in concrete with bolts perpendicular to surface from which they project.

- c. Do not allow anchor bolts to touch reinforcing steel.
- d. Where anchor bolts are within 1/4 inch of reinforcing steel, isolate with a minimum of 4 wraps of 10 mil polyvinyl chloride tape in area adjacent to reinforcing steel.
- e. In anchoring machinery bases subject to heavy vibration, use 2 nuts, with 1 serving as a locknut.
- f. Where bolts are indicated on the Drawings for future use, first coat thoroughly with nonoxidizing wax, then turn nuts down full depth of thread and neatly wrap exposed thread with waterproof polyvinyl tape.
- g. Furnish anchor bolts with standard hex bolt head unless otherwise indicated on the Drawings. Where anchor bolts with 90 degree hooks are indicated on the Drawings, provide anchors with minimum 4 diameter hook length.
- h. Embed anchor bolts 10 diameters minimum.
- i. Where indicated on the Drawings, set anchor bolts in metal sleeves having inside diameter approximately 2 inches greater than bolt diameter and minimum 10 bolt diameters long. Fill sleeves with grout when a machine or other equipment is grouted in place.
- j. Anchor bolts may be cast in concrete in lieu of using concrete anchors.

3. Concrete Anchors:

- a. Concrete anchors shall mean drilled in place anchors with integral threaded studs.
- b. Do not use concrete anchors in lieu of anchor bolts.
- c. Accurately locate concrete anchors and set perpendicular to surfaces from which they project.
- d. Minimum embedment lengths:

Diameter Inches	Embedment Length Inches
1/4	1-3/4
3/8	1-7/8
1/2	2-1/4
5/8	2-3/4
3/4	3-1/4

- e. Drilling Holes:
  - 1) Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without acceptance by ENGINEER.
  - 2) Determine location of reinforcing bars, or other obstructions with a non-destructive indicator device.
- f. Hole Drilling Equipment:
  - 1) Electric or pneumatic rotary type with medium or light impact.
  - 2) Drill Bits: Carbide-tipped in accordance with ANSI B212-15.
  - 3) Hollow drills with flushing air systems are preferred. Air shall be free of oil, water, or other contaminants which will reduce bond.



- 4) Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.
4. Flush Shells:
    - a. Use only where specifically indicated on the Drawings.
    - b. Accurately locate and set perpendicular to surfaces from which they project.
    - c. Drilling Holes:
      - 1) Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without acceptance by ENGINEER.
      - 2) Determine location of reinforcing bars, or other obstructions with a non-destructive indicator device.
    - d. Hole Drilling Equipment:
      - 1) Electric or pneumatic rotary type with medium or light impact.
      - 2) Drill Bits: Carbide-tipped in accordance with ANSI B212-15.
      - 3) Hollow drills with flushing air systems are preferred. Air shall be free of oil, water, or other contaminants which will reduce bond.
      - 4) Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.

**END OF SECTION**

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**SECTION 22 13 29  
SUBMERSIBLE PUMPS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Requirements for provision of pump systems including submersible non-clog motor-driven pumps for service in raw sewage.
- B. Related Sections:
  - 1. Section 33 12 01 - Basic Mechanical Materials and Methods.

**1.02 REFERENCES**

- A. American Bearing Manufacturers Association (ABMA):
  - 1. 9 - Load Ratings and Fatigue Life for Ball Bearings.
  - 2. 11 - Load Ratings and Fatigue Life for Roller Bearings.
- B. American Society for Testing and Materials (ASTM):
  - 1. A 48 - Standard Specification for Gray Iron Castings.
  - 2. A 108 - Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
  - 3. A 167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - 4. A 176 - Standard Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet and Strip.
  - 5. A 276 - Specification for Stainless Steel Bars and Shapes.
  - 6. A 283 - Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
  - 7. A 532 - Specification for Abrasion-Resistant Cast Irons.
  - 8. A 576 - Specification for Steel Bars, Carbon, Hot Wrought, Special Quality.
  - 9. A 582 - Specification for Free-Machining Stainless and Heat-Resisting Steel Bars.
  - 10. A 743 - Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion-Resistant, for General Application.
  - 11. B 148 - Specification for Aluminum-Bronze Sand Castings.
  - 12. B 505 - Specification for Copper-Base Alloy Continuous Castings.
  - 13. B 584 - Specification for Copper Alloy Sand Castings for General Applications.
  - 14. E 10 - Test Method for Brinell Hardness of Metallic Materials.
  - 15. E 18 - Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials.
  - 16. F 593 - Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
  - 17. F 594 - Specification for Stainless Steel Nuts.
- C. American National Standards Institute/Hydraulic Institute (ANSI/HI):

1. 1.1-1.5 - Centrifugal Pumps - Nomenclature, Definitions, Application and Operation.
2. 1.6 - Centrifugal Pump Tests.
3. 9.1-9.5 - General Pump Standards For Types, Definitions, Application, And Sound Measurements.

### 1.03 DEFINITIONS

- A. Pump head (Total Dynamic Head, TDH), flow capacity, pump efficiency, net positive suction head available (NPSHa), and net positive suction head required (NPSHr): As defined in ANSI/HI 1.1-1.5, 1.6 and 9.1-9.5 and as modified in the Specifications.
- B. Suction Head: Gauge pressure available at pump intake flange or bell in feet of fluid above atmospheric; average when using multiple suction pressure taps, regardless of variation in individual taps.
- C. Tolerances: As defined in ANSI/HI 1.6 and 2.6, or more restrictive tolerances specified herein.

### 1.04 SYSTEM DESCRIPTION

- A. Submersible Pumps with Components: Submersible pump, motor driver, bearings, seals, supports, electrical cable, necessary controls and instrumentation, taps, lifting eyes, lifting chain and similar type items as specified and as required for complete operational units ready for use as specified and installed as indicated on the Drawings.
- B. Pump Types: Pumps supplied and installed shall be, rail-mounted submersible pumps having the general characteristics as tabulated below.

1. Flygt NP 3102 SH Impeller # 256 (Two Pumps)		
a. Design Capacity per Pump (gpm)		120
b. Rated Total Pump Head at Design (feet)		79
c. Maximum Rotative Speed (rpm)		3510
d. Shutoff Head (feet)		104
e. Motor Horse Power		6.5
f. Motor Voltage (3 phase)		460
g. Discharge Size (inches)		3
h. Impeller (in)		5.31
i. Pump Curve:		
	0	gpm 104.0 ft
	60	gpm 91.0 ft
	120	gpm 79.0 ft
	240	gpm 58.0 ft
	360	gpm 34.0 ft
	480	gpm 6.0 ft

### 1.05 SUBMITTALS

- A. The manufacturer shall submit to the Engineer for approval, certified performance curves and shop and assembly drawings. The drawings shall show the dimensions, ratings, component parts, arrangements, and materials of construction for all items covered under this section. The performance curves shall be based on data secured during actual tests run at the factory on the pump model proposed for installation, and signed by a responsible manufacturer's representative. The curves shall show the make, model, size, and trim of the impeller, the developed head, brake horse power, NPSH<sub>re</sub>, and efficiency at intervals of 20 gpm in capacity for the model operating at the specified rotative speed over the operating range of the pump.
- B. Pump Manufacturer shall have factory certified authorized warranty service facility within 60 miles of installation. The service facility shall have trained mechanics, spare parts, service contracts available, service training classes, and service vehicles equipped to perform service on the equipment specified herein. Documentation of factory authorized warranty facility must be included with bid and submittals.
- C. Manufacturer shall supply six (6) sets of its standard submittals which shall contain the following:
  - 1. Pump Outline Drawings
  - 2. Motor Performance Data
  - 3. Cable and Protective Device Data
  - 4. Typical Installation Guides
  - 5. Certified Pump Performance Curves
  - 6. Detailed Description and Dimensions of All Accessories
  - 7. Detailed Electrical Data
  - 8. Control Drawings and Data
  - 9. Technical Manuals
  - 10. Parts Lists
  - 11. Printed Warranty

### 1.06 QUALITY ASSURANCE

- A. **General:** Pumps shall be suitable for pumping municipal wastewater and shall be designed and fully guaranteed for this use. Motors supplied with submersible pumps under this specification shall be suitable for continuous operation under submerged, partially submerged or dry conditions. Motors shall be non-overloading throughout the full range of pump operation, as established by the pump model performance curve.
- B. **Standards:** Equipment furnished and installed by the contractor shall be in full conformity and harmony with the intent to secure the best standard of construction and equipment as a whole or in part. Pumps shall be installed in strict accordance with manufacturer specifications, standard drawings and installation instructions.
- C. **Submittals:** Submittal data provided shall be of sufficient depth to illustrate compliance with these specifications, the plans and other specifications that

may influence the proper operation of this pump. No pump equipment shall be shipped until the required drawings and curves have been submitted to and acknowledged by the Engineer as being of general compliance and conformance with the information in the contract documents.

- D. **Testing:** Model pumps shall be factory tested to determine head versus capacity, efficiencies, and kilowatt draw required for the operating points specified. All tests shall be run in accordance with the latest edition of the American Hydraulic Institute Standards. Pumps shall be tested at HI Acceptance Grade 2B.
- E. The actual pumps furnished shall also be tested for:
1. Impeller, propeller, motor rating and electrical connections tests shall be run for compliance with specification requirements.
  2. Motor and cable insulation test for moisture content or insulation defects shall be performed with a 500 volt DC megger.
  3. After a submerged test run of 15 minutes under 6 feet of water, Test 2 shall be repeated.
  4. If any deviation of the above tests is found, that pump shall be rejected.
- F. **Operation and Maintenance Manuals:** The pump supplier shall provide operation and maintenance manuals for all equipment and accessories furnished. The manuals shall be original (no photocopies) and contain at least the following:
1. Identification stating the general nature of the manual, which appears on or is readable through the front cover.
  2. Neatly typewritten index near the front of the manual, furnishing immediate information as to location in the manual of all emergency data regarding the equipment.
  3. Complete and detailed instructions regarding operation and maintenance of all equipment involved.
  4. Complete nomenclature of all replaceable parts, their part numbers, current cost, list of recommended spare parts to be kept on hand, and name, address and telephone number of nearest vendor of parts.
  5. Copies of all guaranties and warranties issued.
  6. Copies of the favorably reviewed shop drawings with all data concerning changes made during construction.
  7. Where content of manuals includes manufacturers' catalog pages, clearly indicate the precise items included in this installation.
- G. **Guarantee:** Products furnished and installed under this section shall be guaranteed for a minimum period of five (5) years against manufacturer defect. Parts and labor for the first 18 months of this guarantee period shall be covered in full, at no additional cost.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. As specified in Section 33 12 01.

**1.08 PROJECT CONDITIONS**

- A. Install pumps as indicated on the drawings.

**1.09 SEQUENCING AND SCHEDULING**

- A. Coordinate with the District as required.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Sanitary Sewer Pumps:
  - 1. Flygt N series, No Equal.

**2.02 SUBMERSIBLE PUMPS AND MOTORS**

- A. Pumps shall be designed for municipal wastewater. Pump characteristics shall be such that the motor nameplate rating is not exceeded at any point on the operating curve.
- B. Pumps shall have a discharge suitable for wet-pit installation. Pump and motor shall be explosion-proof (X Designation).
- C. Pump and motor characteristics; including pump design and construction, cable seal, cooling system, wear rings, seals, impellers, bearings and motors; shall strictly meet Flygt's published Performance Specification (latest release).
- D. Pump motors shall be the squirrel-cage induction type in accordance with NEMA MG, section IV Part 30. The pump motor shall be housed in a NEMA B air filled, watertight chamber, rated for continuous full load operation. Motors shall be capable of withstanding up to 30 starts per hour and shall have a minimum 1.15 service factor.
- E. The impeller shall be of Hard-Iron™ (ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. Brush/spray-on coating such as Belzona 'Metal-glide' or flame spray coating by means of HVOF are not acceptable. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The leading edges of the impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall be locked to the shaft, held by an impeller bolt. The impeller shall be capable of momentarily moving axially upwards a distance of 15mm/0.6-in. to allow larger debris to pass through and immediately return to normal operating position.

- F. The pump volute shall be a single piece grey cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of Hard-Iron™ (ASTM A-532 (Alloy III A) 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing. Brush/spray-on coating such as Belzona 'Metal-glide' or flame spray coating by means of HVOF are not acceptable
- G. Each unit shall be provided with an integral motor cooling system. A stainless steel motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F (40°C). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.
- H. **Nameplates:** Motors shall have a stainless steel plate showing the motor connection diagram and a stainless steel nameplate indicating type, frame, insulation class, full load current, horsepower, full load minimum guaranteed efficiency and nominal power factor, rpm, degree rise in Celsius, maximum ambient temperature rating in degrees Celsius, manufacturer's name, serial number, model, voltages, locked motor Kva code and bearing numbers.

### 2.03 ACCESSORIES

- A. Contractor shall provide a third, identical spare pump to the District at District Headquarters.
  - 1. The Contractor does not need to supply a discharge elbow, guiderails, or other accessories.
- B. Pump accessories shall be furnished as required and be compatible with each of the submersible pumps and the conditions of their installation.
- C. All accessory hardware including anchor bolts, lifting chain and cable brackets shall be Type 316 stainless steel.
- D. Accessories for each submersible pump and motor:
  - 1. Self-aligning discharge connection and base pedestal for mounting to concrete slab.
  - 2. 316 Stainless steel guide rails and mounting accessories as recommended by the pump manufacturer for pump removal and installation without the need to enter the wet well.



3. Intermediate guide bar brackets for guide rails.
4. Discharge Elbow.
5. At least 50 LF of submersible motor cable or as necessary to complete the installation.
6. 316 Stainless Steel Cable holder.
7. At least 5 LF of 316 stainless steel lifting chain per pump, 316 SS guide cable, and Flygt Grip Eye lifting system.
8. Lifting eye compatible with the pump.
9. Dual moisture sensing probe system to detect the entrance of moisture and provide an alarm. The moisture detection system shall be designed to detect the entrance of moisture in the high heat transfer fluid reservoir and the air-filled motor stator housing.
10. Type 316 stainless steel anchor bolts as recommended by the pump supplier and any other miscellaneous supplies required to complete the installation.
11. A selection of spare parts shall be included with each pump. The minimum spare parts included shall be bearings, mechanical seals, o-rings. 1 set of spare parts per model type of pump(s) specified.

#### **2.04 COATINGS**

- A. Equipment shall receive final finish coats at the factory. Each coat of paint shall be of the consistency as supplied by the paint manufacturer, or thinned if necessary, and applied in accordance with the manufacturer's written instructions. Work shall be free from "runs", "bridges", "shiners", or other imperfections. Care shall be taken to obtain a uniform, unbroken coating over welds, edges and corners. Weld splatter shall be removed and all welds neutralized with thinner. Blasted surfaces shall be coated within four hours of being sandblasted. All dust shall be removed from surfaces prior to coating.
- B. All surfaces to be coated or painted shall be in the specified condition to receive the material before any coating or painting is performed. Follow manufacturer's instructions. During and after final application of protective coatings, all metal surfaces shall be checked mechanically with an Elcometer, Mikrotest, or other approved dry film thickness gage to confirm that the specified dry film thickness has been attained. Coating testing and repair of damages, flawed areas, holidays, or mishaps shall conform to applicable AWWA standards.
- C. Care shall be taken to prevent damage to coated surfaces during shipment. Any coatings damaged during shipment shall be refinished as the original at no extra cost to the District.
- D. Coatings shall be guaranteed for a period of one year following the date of final acceptance.
- E. Any field coating shall be provided separately by the contractor.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Pumps shall be installed in strict accordance with the manufacturer's requirements.
- B. Anchor bolts for the pump pedestals shall be drilled and epoxied into place after the pumps and discharge piping are set. Anchor bolts to be provided by the contractor.

**3.02 FIELD QUALITY CONTROL**

- A. Witnessing: All field testing shall be witnessed by the Engineer. Contractor shall notify the District a minimum of 48-hours prior to field testing.
- B. Inspection and Check-out: As specified in Section 33 12 01.
- C. Equipment Performance Test: Test pump operations using automatic level controls as scheduled with the District and described herein.
- D. All water and electricity required for field testing shall be provided at CONTRACTOR's sole expense.
- E. Operational Testing:
  - 1. After installation, equipment shall be tested in the presence of the Engineer by an authorized pump manufacturer representative who shall certify, in writing, that the pumps are operating in compliance with these specifications and are free from binding, scraping, overloading, vibration or other defects.
  - 2. Each pumping unit shall be run and monitored for a minimum duration of one (1) hour during the test period. A minimum of 6 pump cycles shall occur during pump testing. Motor running current readings shall be taken for each phase. Coordinate testing with the District.
  - 3. The manufacturer's representative shall perform the following:
    - a. Check motor stator and power cables.
    - b. Check seal lubrication.
    - c. Check for proper rotation.
    - d. Check power supply voltage.
    - e. Measure motor operating load and no load current for each phase.
    - f. Check level control operation and sequence.

**3.03 MANUFACTURER'S FIELD SERVICES**

- A. Require manufacturer to inspect system before initial start-up and certify that system has been correctly installed and prepared for start-up as specified in this section and Section 33 12 01.
- B. The manufacturer's service representative shall review recommended operation and maintenance procedures with District staff/personnel.

**\*\*END OF SECTION\*\***

**SECTION 26 01 26**  
**POWER SYSTEM STUDIES**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. Provide a complete, computer based, short circuit study, equipment interrupting and withstand evaluation, protective device coordination study, and arc flash study for the project electrical distribution system. Provide arc flash labels for all electrical equipment included in the project.
- B. The studies shall include all portions of the electrical distribution system from the utility pole mounted transformers throughout the low voltage distribution system for equipment in this project.
- C. Obtain from the utility company the fault duty information necessary for the study, including service transformer primary protection, transformer ratings, impedance, X/R ratio, and secondary service conductor material and size.

**1.02 RELATED SECTIONS**

- A. Section 26 08 00 Electrical Acceptance Testing
- B. Section 26 24 12 Service Pedestal
- C. Section 26 09 17 Pump Control Panel

**1.03 REFERENCE STANDARDS**

- A. The power system study shall be conducted in accordance with the latest edition of the following applicable standards:

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)

IEEE 242	Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
IEEE 399	Recommended Practice for Power System Analysis
IEEE 620	Guide for the Presentation of Thermal Limit Curves for Squirrel Cage Induction Machines
IEEE 1584	Guide for Performing Arc Flash Hazard Calculations

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA P-32-382	Short Circuit Characteristics of Insulated Cables
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CALIFORNIA CODE OF REGULATIONS (CCR)

TITLE 24,	2019 California Electrical Code (CEC)
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)  
NFPA 70E Standard for Electrical Safety in the Workplace

#### 1.04 SUBMITTALS

- A. All studies shall be submitted to the Owner prior to granting the final approval of the distribution equipment shop drawings and/or prior to release of equipment for manufacture.
- B. Study Report
  - 1. The results of the power system study shall be summarized in a final report. Bound copies of the final report and an electronic copy on a CD shall be submitted to the Owner for approval.
  - 2. The report shall include the following sections:
    - a. Description, purpose, basis and scope of the study; and a single line diagram of the portion of the power system which is included within the scope of study.
    - b. Fault current study with tables listing all input data used, detailed short circuit calculations at each system bus, and tables summarizing the short circuit contribution at each bus, both interrupting and momentary short circuit currents for 3-phase and phase to ground faults.
    - c. Equipment evaluation report, with tabulations of circuit breaker, fuse, and other equipment ratings versus calculated short circuit duties, and commentary regarding same.
    - d. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
    - e. Tabulation of arc-flash hazard analysis results at each of the equipment.

#### PART 2 MATERIALS

##### 2.01 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

- A. Analytical features of fault current study computer software program shall include "mandatory", "very desirable", and "desirable" features as listed in IEEE 399 Table 7-4.
- B. Computer software program shall be capable of plotting and diagramming time-current characteristics curves as part of its output. Computer software program shall report device settings and rating of all overcurrent protective devices and shall demonstrate selective coordination by computer generated time-current coordination plots.

- C. Computer software program shall be capable of calculating Arc Flash Incident Energy (AFIE) levels and flash protection boundary distances.
- D. Acceptable software product is SKM Systems Analysis, Inc.

### **PART 3 EXECUTION**

#### **3.01 SHORT CIRCUIT STUDY**

- A. The study shall be in accordance with IEEE Standard 242, 399, and 620.
  - 1. The study input data shall include the utility company's short circuit single and three phase contribution, with the X/R ratio for each resistance and reactance components of the branch impedances, motor, and generator contributions, base quantities selected, and all other applicable circuit parameters.
  - 2. Short circuit momentary duties and interrupting duties shall be calculated on the basis of maximum available fault current at the service pedestal, motor control center, pertinent branch circuit panelboards, and other significant locations through the system. Conductor impedances at 75°C shall be used to determine worst-case resistance values.

#### **3.02 EQUIPMENT EVALUATION STUDY**

- A. An equipment evaluation study shall be performed to determine the adequacy of circuit breakers, controllers, surge arrestors, switches, and fuses by tabulating and comparing the short circuit ratings of these devices with the available fault currents. Any problem areas or inadequacies in the equipment shall be promptly brought to the Owner's attention prior to fabrication or ordering of affected equipment.

#### **3.03 PROTECTIVE DEVICE COORDINATION STUDY**

- A. A protective device coordination study shall be performed to select or to check the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated voltage and current transformers, low voltage breaker trip characteristics and settings. Use only data on the actual equipment being provided.
- B. The coordination study shall include all voltage classes of equipment from the utility's transformer down to and including, each motor control center feeder and/or panelboard. The phase and ground overcurrent protection shall be included as well as settings for all other adjustable protective devices.
- C. The time-current characteristics of the specified protective devices shall be plotted on the appropriate log-log paper similarly scaled computer printer output. The plots shall include complete titles, representative one-line diagram and legends, associated power company's relays or fuse characteristics, significant motor starting characteristics, complete parameters of transformers, complete operating bands of

low voltage circuit breaker trip curves, and fuse curves. The coordination plots where applicable, shall indicate the types of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, ANSI transformer magnetizing inrush and withstand curves per ANSI C37.91, cable damage curves, symmetrical and asymmetrical fault currents. All requirements of the 2019 California Electrical Code shall be adhered to. Reasonable coordination intervals and separation of characteristic curves shall be maintained. The coordination plots for phase and ground protective devices shall be provided on a system basis. Separate curves shall be used to clearly indicate the coordination achieved, where applicable, for each main breaker, feeder breaker and load protective device. There shall be a maximum of six protective devices per plot.

- D. The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios, manufacturer, type, range of adjustment and recommended settings. A tabulation of the recommended power fuse selection shall be provided for all fuses in the system. Discrepancies, problem areas, or inadequacies shall be promptly brought to the Owner's attention prior to fabrication or ordering of affected equipment.
- E. Circuit breaker trip unit settings and protective relay adjustments and tap settings shall be implemented on the equipment under study by the Independent Testing Organization.

### **3.04 ARC-FLASH HAZARD ANALYSIS**

- A. An arc-flash hazard analysis shall be performed in accordance with NFPA 70E and IEEE 1584. Arc-flash hazard analysis shall include:
  - 1. Calculation of arc current in accordance with the applicable standards.
  - 2. Determination of protective device total-clearing times based upon the time-current characteristics.
  - 3. Calculation of arc-flash incident energy level based on the protective device total-clearing time and appropriate working distance.
  - 4. Calculation of arc-flash protection boundary distance.
  - 5. Shock hazard voltage and associated limited approach and restricted approach distances.
- B. Determination of appropriate personnel protective equipment in accordance with risk levels defined in NFPA 70E.
- C. Preparation of arc-flash and shock hazard warning labels, with the data derived from the hazard analysis, to be affixed to the equipment by the Independent Testing organization.

**END OF SECTION**

**SECTION 26 05 00  
GENERAL ELECTRICAL REQUIREMENTS**

**PART 1 GENERAL**

**1.01 INCLUDED WORK**

- A. The General Conditions and Special Conditions form a part of these specifications.
- B. The provisions of this section shall apply to the furnishing of all labor, materials, equipment and supervision to provide the complete electrical requirements necessary for the operation of the Canon Pump Station for the Stege Sanitary District. In general, the electrical equipment and installation shall include but is not limited to the following items:
  - 1. Service Pedestal
  - 2. Pump Control Panel
  - 3. Float Switches
  - 4. Underground conduits, and pullboxes
  - 5. Low voltage power cables
  - 6. Rigid steel and PVC conduit system
  - 7. Grounding system
  - 8. Testing and system startup.
- C. Additional requirements are also provided in specific technical sections of the project specifications. Conflicting provisions between this general electrical requirement section and specific section requirements shall be brought to the attention of the Engineer for proper resolution.

**1.02 APPLICABLE PUBLICATIONS**

- A. The electrical equipment shall be manufactured, installed and tested in accordance with the latest edition of the following applicable standards:
  - 1. AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)
    - a. ANSI C2, National Electrical Safety Code
  - 2. CALIFORNIA BUILDING STANDARDS COMMISSION
    - a. California Electrical Code (CEC)
    - b. California Building Code (CBC)
  - 3. CODE OF FEDERAL REGULATIONS (CFR)
    - a. 29 CFR 1910.147, Control of Hazardous Energy (Lock Out/Tag Out)
  - 4. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC. (IEEE)

- a. IEEE 100, Dictionary of Electrical and Electronics Terms
5. INTERNATIONAL TESTING ASSOCIATION, INC
  - a. NETA ATS, Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems
6. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
  - a. NEMA ICS 1, General Standards for Industrial Control and Systems
  - b. MEMAS ICS 2, Industrial Control Devices, Controllers and Assemblies
  - c. NEMA ICS 4, Terminal Blocks for Industrial Use
  - d. NEMA ICS 6, Enclosures for Industrial Controls and Systems
7. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
  - a. NFPA 70E Standard for Electrical Safety in the Workplace
  - b. NFPA 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities
8. STATE OF CALIFORNIA PUBLIC UTILITIES COMMISSION
  - a. G.O. 128, Rules for Construction of Underground Electric Supply and Communication Systems
9. UNDERWRITERS LABORATORIES (UL)
  - a. UL 50, Enclosure for Electrical Equipment
  - b. UL 508A, Standard for Industrial Control Panels
  - c. UL698A, Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations

### **1.03 MODIFICATION OF REFERENCES**

- A. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears.

### **1.04 DEFINITIONS**

- A. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.
- B. The technical sections referred to herein are those specification sections, within this electrical specification, that describe products, systems, installation procedures, equipment, operations, and test methods.

### **1.05 ELECTRICAL CHARACTERISTICS**

- A. The service equipment will consist of a metered service pedestal. The service pedestal shall be rated as indicated on the Drawings



## 1.06 UTILITY COORDINATION

### A. Electrical Service Coordination

1. The power utility company serving this project is Pacific Gas and Electric Company (PG&E). It is the responsibility of the Contractor to make all necessary arrangements with PG&E for the inspection and construction of the underground conduit system. This work is to be performed in accordance with PG&E drawings, standards and details. Contractor shall also coordinate with PG&E the installation of secondary service conductors and service meter at the pump station service pedestal.

### B. Telephone Service Coordination:

1. The telephone utility serving this project is AT&T. It is the responsibility of the Contractor to apply for telephone service on behalf of the District, make all necessary arrangement with AT&T for the inspection and construction of the underground conduit system and other infrastructure. This work is to be performed in accordance AT&T drawings, standards and details. Contractor shall also coordinate with AT&T the installation of the telephone cable to the pump station telephone MPOE, and installation of a RJ-11 telephone jack for connection to the Autodialer equipment.

## 1.07 SUBMITTALS

### A. General

1. Submittals required in the technical sections which refer to this section shall conform to the following additional requirements. Submittals shall include the manufacturer's name, trade name, place of manufacture, catalog or model number, nameplate data, size, layout dimensions, capacity, project specification and technical paragraph reference. Submittals shall also include applicable industry, and technical society publication references, and years of satisfactory service, and other information necessary to establish contract compliance of each item to be provided. Photographs of existing installations are unacceptable and will be returned without approval.

### B. Manufacturer's Catalog Data

1. Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts. Handwritten and typed modifications and other notations not part of the manufacturer's preprinted data will result in the rejection of the submittal. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as requested.

**C. Drawings**

1. Submit drawings a minimum of 11-inches by 17-inches in size using a minimum scale of 1/8-inch per foot. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

**D. Instructions**

1. Where installation procedures or part of the installation procedures are required to be in accordance with manufacturer's instructions, submit printed copies of those instructions prior to installation. Installation of the item shall not proceed until manufacturer's instructions are received. Failure to submit manufacturer's instructions shall be cause for rejection of the equipment or material.

**E. Certificates**

1. Submit manufacturer's certification as required for products, materials, finishes, and equipment as specified in the technical sections. Certificates from material suppliers are not acceptable. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance.

**1.08 REFERENCE STANDARD COMPLIANCE**

- A. Where equipment or materials are specified to conform to industry and technical society reference standards such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), Underwriters Laboratories Inc. (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.

**1.09 CODE COMPLIANCE**

- A. Code compliance is mandatory. Nothing in these Drawings and Specifications permits work not conforming to these codes. Where work is shown to exceed minimum code requirements, comply with Drawings and Specifications.
- B. No work shall be concealed until after inspection and approval by proper authorities. If work is concealed without inspection and approval, the Contractor shall be responsible for all work required to open and restore the concealed areas in addition to all required modifications.

**1.10 INDEPENDENT TESTING ORGANIZATION CERTIFICATE**

- A. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Engineer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

**1.11 QUALITY ASSURANCE**

- A. Material and Equipment Qualifications
  - 1. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design, and workmanship. Products shall have been in satisfactory commercial or industrial use for 10 years prior to bid opening. The 10 year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturer's catalogs, or brochures during the 10-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacture; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.
- B. Regulatory Requirements
  - 1. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of CEC.
- C. Alternative Qualifications
  - 1. Products having less than a 10-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 20,000 hours, exclusive of the manufacturer's factory or laboratory tests, is furnished.

**1.12 SEISMIC ANCHOR DESIGN CALCULATIONS**

- A. Pump control panel, service cabinet and electrical materials shall be so installed as to remain in a secure and captive position when subjected to a horizontal force in accordance with the 2019 California Building Code for the areas where the equipment is to be installed. A seismic importance factor, corresponding to Essential Facility Occupancy Category, shall be used. Method of securing shall constrain equipment against both vertical and horizontal forces and overturning forces.
- B. Calculations shall be submitted, prepared by a structural engineer registered in the State of California, of earthquake forces on all specified equipment, details of securing devices, layout, location and size of all bolts, straps, clips or other devices used.

**1.13 DRAWINGS AND SPECIFICATIONS**

- A. All drawings and all Divisions of these specifications shall be considered as a whole and work of this Division shown anywhere therein shall be furnished under this Division.
- B. Drawings are diagrammatic and indicate the general arrangement of equipment and wiring. Most direct routing of conduits and wiring is not assured. Exact requirements shall be governed by civil, architectural, structural and mechanical conditions of the job. Consult all other drawings in preparation of the bid. Extra lengths of wiring or addition of pull or junction boxes, etc. necessitated by such conditions shall be in the bid. Check all information and report any apparent discrepancies before submitting bid.

**1.14 SERVICE SUPPORT**

- A. The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

**1.15 SITE CONDITIONS**

- A. Visit to site is required of all bidders prior to submission of bid. All will be held to have familiarized themselves with all discernible conditions and no extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not.

**1.16 EXISTING UTILITIES**

- A. When shown on the drawings, the locations of existing utility mains, etc. are approximate only. The accuracy of completeness of this information is not guaranteed and all utility lines, conduits etc. of any nature (surface or subsurface) that may be affected by the Work shall be checked by the

Contractor and shall not be disturbed, disconnected or damaged by him during the progress of the Work, unless specifically shown on the plans to be relocated, removed or otherwise revised. Should the Contractor during the performance of the Work disturb, disconnect, or damage any of the above, all expenses of whatever nature arising from such disturbance or the replacement or repair thereof shall be borne by Contractor.

- B. Carefully excavate all underground piping and conduit affected by the work and verify the elevations.
- C. When it is necessary to interrupt any existing utility service to make connections, the Contractor shall obtain authorization from the respective utility company and a minimum of 24 hours advance notice shall be given. Interruption in utility service shall be of the shortest duration for the work at hand and shall be approved by the District's Project Manager.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. All materials and equipment used in the electrical work herein specified shall be new, suited to the intended use, and shall be listed by the Underwriters Laboratories, Inc., or other nationally recognized testing laboratories. All material and equipment shall meet their requirements and bear their label whenever standards have been established and label service is regularly furnished by that agency.
- B. Materials shall be delivered to the site and stored in original containers suitably sheltered from the elements, but readily accessible for inspection by the District or his designated representative until installed. All items subject to moisture damage shall be stored in dry, heated spaces.
- C. Materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.
- D. Equipment specified by manufacturer's number shall include all accessories, control, etc., listing in catalog as standard with equipment. Furnish optional or additional accessories as specified.
- E. Where no specified make of material or equipment is mentioned, any product of reputable manufacturer which conforms to requirements of system may be used.

### **2.02 ALTERNATE EQUIPMENT**

- A. If Contractor wishes to submit equipment other than as specified and submittal of equipment is found to be not acceptable, the specified equipment shall be

furnished at no change in contract price. The decision of the Engineer shall be final.

- B. If Contractor wishes to propose equipment that represents an extensive change in system concept, he shall reimburse the Agency for engineering charges required to analyze and evaluate these changes. These changes shall be paid by the Contractor regardless of whether the proposed equipment is accepted or not.
- C. In the event that changes are made after submittal approval, Contractor shall revise the plans and resubmit for approval. Revised plans shall incorporate a dated revision note. Revision and resubmittal is required for any deviation between approved plans and the final installation regardless of the reason for the deviation. If the revised and resubmitted plans are not approved, Contractor shall modify the work to comply with approved plans at his expense.

### **2.03 MANUFACTURER'S NAMEPLATE**

- A. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, shop order number, serial number and date of manufacture securely affixed in a conspicuous place. The nameplate of the distributing agent will not be acceptable.

### **2.04 EQUIPMENT IDENTIFICATION NAMEPLATES**

- A. Provide laminated plastic nameplates for pump control panel. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be phenolic, laminated, plastic, 0.125-inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 1 x 2.5-inches. Lettering shall be a minimum of 0.25-inch high normal block style.

### **2.05 CABLE TAGS IN HANDHOLES AND PULLBOXES**

- A. Provide tags for each cable, wire or splice located in handholes, and pullboxes. Tag all wire and cable provided by this contract. The tags shall be polyethylene. Do not provide handwritten letters. Coordinate cable legend with District's Representative.
- B. Provide tags of polyethylene that have an average tensile strength of 4500 pounds per square inch; and that are 0.035-inch thick, non-corrosive, nonconductive; resistive to acids, alkalis, organic solvents, and salt water; and distortion resistant to 300 degrees F. Provide a one-piece nylon, self-locking tie at each end of the cable tag. Ties shall have a minimum loop tensile strength of 175 pounds. The cable tags shall have block letters, numbers, and symbols 1/4-inch high on a yellow background. Letters, numbers, and symbols shall not fall off or change positions regardless of the cable tags' orientation.

- C. Locate the tags so that they are clearly visible without disturbing cabling or wiring in the handholes and pullboxes.

### **PART 3 EXECUTION**

#### **3.01 PROTECTION OF PROPERTY, MATERIALS, AND WORK**

- A. The Contractor shall be responsible for protecting all properties of whatever description lying within the scope of the project from damage resulting from, or incidental to, this Contract. Likewise, the Contractor shall be obliged to pay for all such damage occurring during the progress of the work.
- B. All materials and equipment, both before and after erection, shall be properly protected from the weather and other hazards and kept in a clean and orderly manner.
- C. All conduit ends, and parts or equipment left unconnected shall be capped, plugged, or otherwise properly protected to prevent damage or the intrusion of foreign matter.
- D. At the completion of the work, equipment and materials shall be cleaned and turned over to the District in a condition satisfactory to the District.
- E. Damage or defects developing before acceptance of the work shall be replaced with new at the Contractor's expense.
- F. Manufacturer's direction shall be followed completely in the delivery, storage, protection, and installation of all equipment and materials.

#### **3.02 STORED EQUIPMENT**

- A. Storage shall be located on the site in a location specifically approved by the District and shall be moved at Contractor's expense if necessary because of interference with the work of any other Contractor.

#### **3.03 ALTERNATE EQUIPMENT PLACEMENT**

- A. Where equipment requiring a different arrangement of connections from those indicated is approved, it shall be the responsibility of the Contractor to install the equipment to operate properly and in harmony with all trades with the intent of the Drawings and Specifications.
- B. Where directed by the District or his designated representative, the Contractor shall submit drawings showing the proposed installation.
- C. If the proposed installation is approved, the Contractor shall make all incidental changes in piping, duct work, supports, insulation, wiring, etc. He shall provide all additional modifications and equipment required for the proper operation of

the system resulting from the selection of equipment, including all required changes in affected trades.

- D. The Contractor shall be responsible for the proper location of roughing in and connections by other trades. All changes shall be made at no increase in the Contract amount or additional cost to the other trades.

### **3.04 CONTRACTOR RESPONSIBILITIES**

- A. The Contractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work, ready for use and operation by the District in the manner intended by the Contract Documents.
- B. Provide services of an experienced superintendent who shall be constantly in charge of the erection of this work, together with all necessary journeymen, helpers, and laborers required to properly unload, erect, connect, adjust, start, operate and test functions properly in every detail.
- C. At the time that any electrical system included under this Contract is released for operation to the District, the Contractor shall furnish a competent instructor to advise the maintenance and/or operating personnel as to the proper maintenance and operation of all components of the system.
- D. The Contractor shall study thoroughly all Civil, Structural, Mechanical and Electrical Drawings, shop drawings and catalog data to determine how equipment is to be installed, fit the space available with proper access, mounted or suspended.
- E. The Contractor shall promptly notify the District or his designated representative in writing of any conflict between any requirement of the Contract Documents and the manufacturer's directions before proceeding with the work.
- F. Should the Contractor perform any work that does not comply with the manufacturer's directions or such written instructions from the District or his designated representative, he shall bear all costs arising in correcting the deficiencies. In the event the requirements of the manufacturer are different than those indicated on the Contract Drawings, such requirements shall be furnished by the Contractor at no additional cost to the District.

### **3.05 DISPOSAL OF EXCAVATED MATERIAL**

- A. The Contractor shall be responsible for the removal from the premises of all excess excavated materials unless otherwise directed by the District or his designated representatives.

### **3.06 RECORD DRAWINGS**

- A. The Contractor shall keep one set of plans to record all changes and deviations from the original design. These plans shall be used for no other purposes and



shall be kept clean from all dirt and obstructions. All changes shall be made each day on the plans as they come about. Immediately upon final inspection and acceptance by the District but before final payment, the Contractor shall deliver to the District the complete record drawings showing all the changes neatly and accurately arranged.

### **3.07 LOCKOUT REQUIREMENTS**

- A. Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147.

### **3.08 PAINTING OF EQUIPMENT**

- A. Factory Applied
  - 1. Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test and the additional requirements specified in the electrical sections.
- B. Field Applied
  - 1. Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in the section specifying the associated electrical equipment.

### **3.09 ACCEPTANCE DEMONSTRATION**

- A. Upon completion of the work, at a time to be designated by the District, the Contractor shall demonstrate to the District the operation of the electrical installation, including any and all special items installed by him or installed under his supervision.

### **3.10 INSTRUCTIONS TO DISTRICT'S OPERATIONS AND MAINTENANCE PERSONNEL**

- A. Contractor shall provide the services of competent instructors to give full instruction to designated District's personnel in the adjustment, operation, and maintenance of the below specified systems and equipment, including pertinent safety requirements as necessary for the safe, reliable and continuous operation of the pump control system. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work associated with sewage pump station control systems.
- B. Instruction shall be given during the first regular workweek after the equipment or systems have been accepted and turned over to the District for regular operation. The following systems and equipment shall require instruction to District's personnel:

1. Pump Station Control Panel.
  2. Backup Generator System
- C. The minimum number of man-days (8 hours per day) of instruction furnished for the above systems and equipment shall be as indicated in the equipment specifications sections. Classroom instructions shall be at a District specified facility. Field instructions shall be at the pump stations project site.

### **3.11 PROJECT COMPLETION**

- A. The Contractor shall remove from the site all packing cartons, scrap materials, and other rubbish or debris and leave the premises in a condition acceptable to the District.
- B. The Contractor shall, at completion of the project, leave the entire system installed under his contract properly operating, lubricated, and in a thoroughly clean condition.

END OF SECTION

**SECTION 26 05 10**  
**BASIC ELECTRICAL MATERIALS AND METHODS**

**PART 1 GENERAL**

**1.01 WORK INCLUDED**

- A. Furnish and install all materials and equipment and provide all labor required and necessary to complete the work shown on the Drawings and/or specified in this Section and all other work and miscellaneous items, not specifically mentioned, but reasonably inferred for a complete installation including all accessories and appurtenances required for testing the system. It is the intent of the Drawings and Specifications that all systems be complete, and ready for operation.

**1.02 APPLICABLE PUBLICATIONS**

- A. All work and materials shall comply with the latest edition of the standards, rules, codes, and regulations including, but not limited to the following:
  - 1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
    - a. ASTM B3, Standard Specification for Soft Annealed Copper Wire
    - b. ASTM B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium, or Soft
    - c. ASTM B228, Standard Specification for Concentric-Lay-Stranded Copper Clad Steel Conductors
  - 2. CALIFORNIA CODE OF REGULATIONS
    - a. Title 24, Part 2, 2019 California Building Code
    - b. Title 24, Part 3, 2019 California Electrical Code
  - 3. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
    - a. NEMA 250, Enclosures for Electric Equipment (1000 Volts Maximum)
    - b. NEMA AB 1, Molded Case Circuit Breakers, Molded Case Switches and Circuit Breaker Enclosures
    - c. NEMA ICS 2, Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts
    - d. NEMA FB 1, Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
    - e. NEMA FU1, Low Voltage Cartridge Fuses
    - f. NEMA TC 2, Electrical Polyvinyl Chloride (PVC) Tubing and Conduit
    - g. NEMA TC 3, Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing

- h. NEMA WC 70, Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy
- 4. UNDERWRITER'S LABORATORIES, INC. (UL)
  - a. UL 44, Thermoset-Insulated Wires and Cables
  - b. UL 6, Electrical Rigid Metal Conduit-Steel
  - c. UL 467, Grounding and Bonding Equipment
  - d. UL 486 A, Wire Connectors
  - e. UL 486 C, Splicing Wiring Connectors
  - f. UL 508, Industrial Control Equipment
  - g. UL 514 B, Conduit, Tubing, and Cable Fittings
  - h. UL 651, Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
  - i. UL 83, Thermoplastic-Insulated Wires and Cables
  - j. UL 943, Ground Fault Circuit Interrupters

### 1.03 SUBMITTALS

- A. Product Data: Provide material, finish, dimensions and weights for rigid metal conduit, rigid nonmetallic conduit, fittings, boxes, conduit bodies, conductors, and grounding equipment.

## PART 2 PRODUCTS

### 2.01 MATERIALS APPROVAL

- A. All materials must be new and bear Underwriters' Laboratories label. Materials that are not covered by UL testing standards shall be tested and approved by an independent testing laboratory or a governmental agency.
- B. Material not in accordance with these Specifications may be rejected either before or after installation.

### 2.02 CONDUITS AND OTHER RACEWAY

- A. Rigid Steel Conduit
  - 1. Rigid steel conduit (RSC) shall be in accordance with UL 6 and shall be galvanized by the hot-dip process.
  - 2. Fittings for rigid steel conduit shall be threaded, Sealing fittings for Class I, Division 1 and Division 2 shall be provided where indicated on the Drawings. Sealing fittings shall be 40% fill, EY series for vertical or horizontal as manufactured by Appleton, Crouse-Hinds, Killark or approved equivalent.

- B. Rigid Nonmetallic conduit
  - 1. Rigid nonmetallic conduit shall be in accordance with NEMA TC 2 and shall be PVC with wall thickness not less than Schedule 40. Conduit shall be approved for use as a nonmetallic raceway with 90 degree Centigrade conductors.
  - 2. PVC Conduit Fittings shall be in accordance with NEMA TC 3.

**2.03 CONDUCTORS**

- A. All conductors shall be of size noted on the plans. All conductors shall be stranded copper type XHHW-2 insulation. Minimum size conductors shall be #12 AWG.
- B. Wiring shall be color coded as follows:

Location or Use	Type	Color
For 240/120V, 1-Phase System	Phase A	Black
	Phase B	Red
	Neutral	White
	Ground	Green
For 240/120V, 3-Phase System and For 208/120V, 3-Phase System	Phase A	Black
	Phase B	Red *
	Phase C	Blue
	Neutral	White
	Ground	Green
For 480/277V, 3-Phase System	Phase A	Brown
	Phase B	Orange
	Phase C	Yellow
	Neutral	Gray
	Ground	Green

\* Provide Orange color wire for High Leg conductor

- C. Wires that are #10 AWG and smaller shall be color-coded over the entire length of the wire. Wires that are #8 AWG and larger may be color-coded with PVC tape that covers at least 50% of the length of the wire that is visually accessible in pull boxes, service pedestal, pump control panel, and similar places.

- D. Wires for control and instrumentation shall be #14 AWG, 600 V, stranded copper, type XHHW.

#### **2.04 TERMINALS AND SPLICING DEVICES**

- A. Make all splices in AWG No. 8 and smaller with twist-on insulated type wire nut electrical connector.
- B. Make all splices in AWG No. 6 and larger with compression type connectors. Joints shall be insulated with heavy wall, heat shrink, sealant coated tubing, UL Listed for use with compression connectors. Where equipment to which it is to connect has box type terminal lugs, no separate lug will be required.
- C. Submersible splices shall be as manufactured by NSI Industries Polaris Black Series or approved equal. Provide ferrules for extra flexible, thin strand pump cables.

#### **2.05 GROUNDING**

- A. Grounding electrode system cables shall be medium drawn, bare copper cables, concentric-stranded, in accordance with ASTM B8. The solid wires used in forming the cable shall be in accordance with ASTM B3.
- B. Ground cable taps and connections shall be made with exothermic type welded connections. Exothermic welded connections shall be specifically designed for the conductor sizes to be used and shall be manufactured by Cald weld or approved equal.
- C. All cable fittings, lugs, clamps and connectors, together with bolts, nuts and washers used therewith, shall be of copper alloy, solderless type and shall have current-carrying capacity not less than that of the copper cables with which they are used. The connectors shall be clamped firmly and locked securely with spring-type lock washers.
- D. All machine screws used in grounding shall be corrosion resistant, stainless steel, bronze or brass.
- E. Ground rods shall be cone pointed copper-clad steel, conforming to ASTM B228, 3/4" diameter by 10 feet long, unless otherwise indicated on the Drawings.
- F. Ground rod boxes shall be 9 inch diameter, 12 inches deep, precast concrete unit, with cast iron traffic cover. Covers shall be embossed with the words "Ground Rod".
- G. Equipment grounding conductor shall be insulated and of the same type as the power carrying conductors.

**PART 3 EXECUTION**

**3.01 GENERAL**

- A. Electrical system layouts indicated on the Drawings are generally diagrammatic, but shall be followed as closely as actual construction and work of the trades will permit. Govern exact routing of conduit and wiring and the locations of devices by the structure and equipment served.

**3.02 WIRING METHOD**

- A. Conduit
  - 1. All conduits shall be sized per CEC Table 4, 3/4-inch minimum or larger, as noted on the Drawings, and shall be of types listed below:

Location or Use	Type
Underground Conduits	PVC Schedule 40
Conduits Outdoors, Above Ground	Rigid Steel

- 2. Run all conduits concealed unless otherwise noted or shown.
- 3. Run exposed conduit parallel to or at right angles to center lines of equipment.
- 4. Run no conduit in concrete slabs or floors except where indicated on the Drawings. All penetrations shall be at right angles to wall and slab surfaces.
- 5. Support conduits with UL's listed steel conduit supports at intervals required by the CEC.

**3.03 INSTALLATION OF WIRES**

- A. Pull no wire into any portion of the conduit system until all construction work which might damage the wire has been completed.
- B. Install all wire continuous from equipment to equipment. Splices in cables, when required, shall be made in handholes, pull boxes or junction boxes.
- C. All control and instrumentation wiring shall be connected to equipment with insulated, compression type ring tongue terminations. All conductors shall be identified with a wire name as shown on the Drawings or as designated by equipment manufacturer. Wire identification shall be of the heat shrink type, installed at both wire ends.
- D. Perform wiring insulation tests in accordance with NETA ATS testing guidelines.
- E. Install sealing fittings for Class I, Division 1 at all power, control and instrumentation conduits interfacing with the wet well equipment. Sealing fitting shall be installed in the underground pullboxes having conduit interface with the pump station control panel equipment.

**3.04 GROUNDING**

- A. Contractor shall provide a grounding electrode system as shown on the Drawings and in accordance with CEC Article 250.50. Separately derived alternating current systems shall be grounded in accordance with CEC Article 250.30.
- B. Ground non-current carrying metal parts of electrical equipment enclosures, frames, conductor raceways, to provide a low impedance path for line-to-ground fault current and to bond all non-current carrying metal parts together.
- C. Equipment grounding conductor shall be electrically and mechanically continuous from the electrical circuit source to the equipment to be grounded. Size equipment grounding conductors per CEC Article 250.122 unless larger conductors are shown on drawings.
- D. Perform test to measure the ground resistance of the ground system. Submit certified test report to the engineer for review and approval. Ground resistance tests shall be conducted by a testing company qualified to conduct tests of this nature.

**3.05 IDENTIFICATION**

- A. Provide a phenolic nameplate for service pedestal, pump control panel, and for other major items of electrical equipment. Secure nameplate to equipment with stainless steel screws. For pump control panel, indicate the equipment designation, voltage, current, number of phases, and wires and the source of power. For all other equipment and cabinets provide engraving as shown on the Drawings or as directed by the District's representative.

END OF SECTION



**SECTION 26 05 43  
UNDERGROUND DISTRIBUTION SYSTEM**

**PART 1 GENERAL**

**1.01 WORK INCLUDED**

- A. The work covered in this section consists of furnishing all labor, supervision, tools, materials, equipment and performing all work necessary to furnish and install a complete underground distribution system, including underground conduits and precast concrete pullboxes, as indicated on the Drawings and as specified herein.

**1.02 APPLICABLE PUBLICATIONS**

- A. All work and materials shall comply with the latest edition of the standards, rules, codes, and regulations including, but not limited to the following:
  - 1. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
    - a. Standard Specifications for Highway Bridges
  - 2. AMERICAN CONCRETE INSTITUTE (ACI)
    - a. ACI 318, Building Code Requirements for Structural Concrete
  - 3. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
    - a. ANSI C2, National Electrical Safety Code
  - 4. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
    - a. ASTM A1064, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
    - b. ASTM A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
    - c. ASTM C33, Standard Specification for Concrete Aggregates
    - d. ASTM C150, Standard Specification for Portland Cement

**1.03 SUBMITTALS**

- A. Manufacturer's Data and Shop Drawings: Provide catalog data and shop drawings for all the precast pullboxes sizes, including metal covers.
- B. Submit manufacturer's statement certifying that the products supplied meet specified requirements.
- C. Submit and obtain approval from PG&E for all material used in connection to the service to the pump station, starting from the point of connection to the meter pedestal ending at the riser pole. Contractor shall copy the District on all correspondence and submittals to PG&E.

## **PART 2 PRODUCTS**

### **2.01 PRECAST PULLBOXES**

#### **A. General**

1. The Contractor shall provide precast concrete pullboxes, subject to the requirements as shown on the Drawings and specified below. Precast units shall be the product of a manufacturer regularly engaged in the manufacture of precast concrete products, including precast pullboxes.

#### **B. Concrete Structure**

1. Concrete for precast work shall have an ultimate 28-day compressive strength of not less than 4,000 psi. Structures shall be precast to the size and details indicated on the drawings. Precast pullboxes shall be fabricated monolithically and placed as a unit, or structures may be assembled sections, designed and produced by the manufacturer in accordance with the requirements specified. Structures shall be identified with the manufacturer's name embedded or in otherwise permanently attached to an interior wall face.

#### **C. Covers**

1. Covers for pullboxes shall be fabricated of steel, welded by qualified welders in accordance with standard commercial practice. Steel covers shall be rated AASHTO H-20. Frames for pullboxes of interior dimensions, 3 ft x 5 ft, and larger shall have removable full traffic cover support beams. Precast pullbox covers shall be secured to the frame with minimum 7/16" diameter coarse threaded pentahead bolts having approximately 6 threads per inch.

#### **D. Grounding**

1. Provide a 3/4-inch diameter, 10-foot long copper-clad ground rod at each handhole, pullbox and splice box.

#### **E. Duct Seal**

1. Provide duct seals wherever underground conduits enter an equipment enclosure to prevent water or moisture from entering the equipment enclosure through the conduit. Duct seals shall be compatible with plastic and steel ducts and shall provide a watertight duct seal regardless of whether the duct is empty or occupied by cables. Duct seals shall allow for cable movement due to vibration or load cycling without leaking. Ducts shall be sealed at both the pullbox and at the equipment end.

### **2.02 UNDERGROUND CONDUIT SYSTEM**

- A. Underground conduits system shall be PVC Schedule 40, as specified in Section 26 05 10 of this specification.

**PART 3 EXECUTION****3.01 UNDERGROUND INSTALLATION****A. General**

1. Underground installation shall conform to the 2019 CEC, ANSI C2, State of California Public Utilities Commission G.O. 128, and PG&E Standards and Requirements.

**3.02 PRECAST PULLBOXES INSTALLATION**

- A. Commercial precast assembly shall be set on 6-inches of level, 90% compacted granular fill, 1-inch to 2-inch size, extending 12-inches beyond the pullbox on each side. Granular fill shall be compacted by a minimum of four passes with a plate type vibrator.

**3.03 CONDUIT PLACEMENT**

- A. Conduit shall have a continuous slope toward underground structures and away from the electrical equipment with a minimum pitch of 3-inches in 100-feet. Except at conduit risers, accomplish changes in direction of runs exceeding a total of 10 degrees, either vertical or horizontal, by long sweep bends. Sweep bends may be made up of one or more curved or straight sections or combinations thereof. Manufactured bends shall have a minimum radius of 24-inches for use with conduits 3-inches in diameter and larger. Excavate trenches along straight lines from structure to structure before ducts are laid or structure constructed so the elevations can be adjusted, if necessary, to avoid unseen obstruction.
- B. Terminate PVC conduits in end-bells where conduit enters underground structures. As each section of conduit is completed from structure to structure, conduits shall be cleaned and provided with end plugs to prevent dirt and debris from entering the ducts. For conduit sizes 3-inches and larger, cleaning shall consist of drawing a flexible testing mandrel, approximately 12-inches long with diameter less than the diameter of conduit, through the duct. Following the mandrel, draw a stiff bristle brush, having the same diameter as the conduit through the duct until duct is clear of particles of earth, sand, and gravel, then immediately install end plugs. For conduit sizes less than 3-inches, draw a stiff bristle brush through the conduit, until conduit is clear of particles of earth, sand, and gravel, then immediately install end plugs.

**3.04 CONDUIT PLUGS AND PULL ROPE**

- A. Conduit not used or empty shall be provided with plugs on each end. Plugs shall contain a weep hole or screen to allow water drainage. Provide a plastic pull rope having 3-feet of slack at each end of unused or empty conduits.

**3.05 CABLE PULLING**

- A. Test duct lines with a mandrel and thoroughly swab out to remove foreign material before pulling cables. Pull cables down grade with the feed-in point at the handhole, pullbox, or equipment of the highest elevation. Use flexible cable feeds to convey cables through handhole or pullbox openings and into duct runs. Accumulate cable slack at each handhole or pullbox where space permits by training cable around the interior to form one complete loop. Maintain minimum allowable bending radii in forming such loops. Do not provide less than the specified cable bending radii when installing cable under any conditions, including turnups into pump control panel, and other enclosures. If basket-grip type cable-pulling devices are used to pull cable in place, cut off the section of cable under the grip before splicing and terminating.

**3.06 CABLE LUBRICANTS**

- A. Use lubricants that are specifically recommended by the cable manufacturer for assisting in pulling jacketed cables. Lubricant shall not be deleterious to the cable sheath, jacket, or outer coverings.

**3.07 CABLE PULLING TENSIONS**

- A. Tensions shall not exceed the maximum pulling tension recommended by the cable manufacturer. Monitor pulling tension during cable installation to ensure maximum pulling tension is not exceeded.

**3.08 GROUNDING CONDUCTOR**

- A. Provide insulated copper equipment grounding conductor, sized as indicated or required by the rating of the overcurrent device supplying the phase conductors, per NEC.

**3.09 CABLES IN PULLBOXES**

- A. Do not install cables utilizing the shortest route, but route along those walls providing the longest route and the maximum spare cable lengths.

**3.10 FIELD TESTING**

- A. Field testing shall be provided for all cables, and grounding system in accordance with NETA ATS.

END OF SECTION

## SECTION 26 08 00

### ELECTRICAL ACCEPTANCE TESTING

#### PART 1 GENERAL

##### 1.01 SCOPE

- A. Applicable provisions of Section 26 05 00 become a part of this Section as if repeated herein.
- B. Provide electrical testing to assure that electrical equipment and wiring is operational, within industry and manufacturers tolerances and is installed in accordance with other sections of these specifications.
- C. Conduct tests in the presence of the District for the purpose of demonstrating the equipment or systems' compliance with specifications. Demonstrate all electrical and mechanical tests to the District that the entire installation is functioning properly and that all circuits, including power, control, instrumentation, relaying and communication, will function properly and as specified.
- D. Furnish, install and maintain all tools, instruments, material, test equipment, test connections and power. Furnish all personnel including supervision and "stand-by" labor required for the testing, setting, and adjusting of all electrical facilities and component parts including putting the electrical system and equipment into operation.
- E. Make tests with proper regard for the protection of equipment and personnel.
- F. Protect equipment from subsequent testing of other equipment and systems after equipment has been tested, checked for operation, and accepted by the District.
- G. Record all test values of equipment, giving both "as-found" and "as-left" conditions.
- H. The witnessing of any test by the District does not relieve the Contractor of warranties for material, equipment, and workmanship, as specified in the General Conditions.
- I. Check control circuits for conformance with the wiring diagrams furnished by manufacturers.

##### 1.02 RELATED SECTIONS

- A. Section 26 24 12 Service Pedestal
- B. Section 26 09 17 Pump Control Panel

##### 1.03 REFERENCE STANDARDS

- A. All inspections and tests shall be performed in accordance with applicable codes and standards including 2019 CEC, ANSI, IEEE, NFPA, NEMA, and OSHA.

B. InterNational Electrical Testing Association (NETA)

ATS Acceptance Testing Specifications for  
Electrical Power Distribution Equipment and Systems,  
latest edition.

#### 1.04 QUALIFICATIONS FOR INDEPENDENT TESTING ORGANIZATION

- A. The Contractor shall engage the services of a qualified independent testing organization to provide final inspection, testing, calibration, and adjusting on the electrical distribution system as defined in this contract. The independent testing organization shall have been engaged in full practice for a minimum of five years. The organization shall be corporately and financially independent of the supplier, producer, or installer of the equipment.
- B. The independent testing organization shall have a calibration program with accuracy traceable every six months, and in an unbroken chain, to the National Institute of Standards and Technology (N.I.S.T.).
- C. The independent testing organization shall have a designated safety representative on the project. The safety standards shall include OSHA and NFPA 70E.
- D. Testing, inspection, and calibration shall be performed by an Engineering Technician, certified by a national organization, with a minimum of 5 years experience inspecting, testing, and calibrating electrical distribution equipment, systems, and devices.
- E. The Contractor shall supply to the independent testing organization complete sets of approved shop drawings, coordination study, settings of all adjustable devices, and other information necessary for an accurate inspection and evaluation of the system prior to the performance of any tests.

#### 1.05 SUBMITTALS

- A. Submit a copy of this specification section with addenda updates and all referenced sections with addenda updates as the first item of the submittal. Place a bold word "Comply" next to each paragraph to indicate that the paragraph will be complied with. Place a bold word "Deviate" next to each paragraph to which deviations will be proposed. Provide an explanation on the same page for each proposed deviation. Submittal made without this marked specification section(s) will be returned without review.
- B. Bound copies of the certified test reports shall be submitted to the District as soon as possible after the completion of the electrical work. The final report shall be signed and include the following information:
  - 1. Summary of the project.
  - 2. Description of the equipment tested.
  - 3. Visual inspection report.

4. Description of the tests.
  5. Test results.
  6. Conclusions and recommendations.
  7. Appendix including appropriate test forms.
  8. Identification of the test equipment used.
- C. The qualifications of the independent testing organization shall be submitted to the District for approval prior to the start of testing. Full membership in the InterNational Electrical Testing association is a minimum requirement for qualification.
- D. The qualifications of the Certified Engineering Technician shall be submitted to the District for approval prior to the start of work.
- E. After the evaluation of the system and equipment has been made, the independent testing organization shall submit for approval an acceptance test procedure for each item of electrical distribution equipment to be tested on this project. Test procedures shall include the proposed system function test. No testing shall be performed until the test procedures have been approved.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS AND TEST EQUIPMENT**

- A. The independent testing organization shall provide all materials and equipment necessary to perform the inspections and tests.

## **PART 3 EXECUTION**

### **3.01 GENERAL TESTING REQUIREMENTS**

- A. Test all parts of the electrical work including all electrical conductors for proper phasing, continuity, shorts, and grounds, prior to placing in service. Test for proper operating of all equipment functions, including alarm and indication functions.
- B. Furnish labor, instruments, products, temporary power, and sufficient fuel as required for tests.
- C. Correct deficiencies found as a result of tests and make replacements or repairs to tested products which are damaged as the result of the tests.
- D. Schedule tests at a time convenient to witness thereto or persons affected by the tests.
- E. Where specified, give written notification to the District for test procedures prior to the test.

- F. Check control, instrumentation, and power cables and conductors for proper connections, workmanship and identification.
- G. Check motors for correct rotation prior to operating equipment driven by any motor.
- H. Verify that equipment has been lubricated before operating during motor test procedures.
- I. Upon completion of the electrical work, recheck the following electrical connections: cable to bus, cable to panels, bus to bus and also throughout the job for tightness. Re-torque to manufacturers printed specifications where torque is less than the recommended value.
- J. Make records of all tests in a neat and legible form. Identify the equipment or system tested and the test data.
- K. Additional tests required shall be as outlined under the various Sections of these electrical specifications.

### **3.02 INSPECTION**

- A. A visual inspection of the installed equipment shall be performed by the independent testing organization to verify that the equipment installed and to be tested is the equipment denoted on the approved shop drawings. The inspection shall check the equipment designations, device characteristics, special installation requirements, applicable codes and standards.
- B. After completion of the visual inspection, a report shall be developed stating any discrepancies that may have been found.

### **3.03 TESTING, CALIBRATION AND ADJUSTMENT**

- A. The independent testing organization shall perform tests on each item of equipment contained in this contract in accordance with the latest edition of the InterNational Electrical Testing Association's (NETA) "Acceptance Testing Specification for Electrical Power Equipment and Systems", and the requirements of this specification.
- B. Field Acceptance Testing shall be accomplished on each item of electrical equipment installed or connected to a part of this contract. This shall include:
  - 1. Control Panel per NETA ATS Section 7.6 for circuit breakers, and Section 7.16.1.2 for starters
  - 2. Circuit breakers per NETA ATS Section 7.6.1.1
  - 3. AC Induction Motors (including pump motors) per NTA ATS Section 7.15.1
  - 4. Low voltage cables, terminations, splices, joints, and connectors Per NETA ATS Section 7.3.2



5. Grounding system Per NETA ATS Section 7.13
  6. Power Failure Relay. Perform simulation of power conditions to verify proper operation of the relay and the time delay characteristics. Simulation shall include phase loss and undervoltage for each phase, and phase reversal.
  7. Thermal Scan. Infrared scan or survey shall be made and photographed with the equipment loaded at least 25 percent of the rated full load value. Thermal scan shall be conducted for the following equipment:
    - a. Service Pedestal
    - b. Pump Control Panel
    - c. Panelboard
- C. Systems shall be energized or otherwise placed in service only after completion of all required tests and an evaluation of the test results have been completed.

### **3.04 SYSTEM FUNCTION TESTS**

- A. Each system provided in this contract and covered by this section of specifications shall be function tested to ensure total system operation.
- B. Upon satisfactory completion of equipment acceptance tests, the system functional tests shall be performed. It is the intent of System Function Tests to provide the proper interaction of all sensing, processing and action devices to effect the designed end product or result.
- C. Implementation
  1. The testing firm shall develop test parameters for the purpose of evaluating performance of all integral components and their functioning as a complete unit within design requirements.
  2. Test all interlock safety devices for fail-safe functions in addition to design function.
  3. The testing firm shall propose methods to initiate the sensing devices.
  4. The testing firm shall note the operation of all alarms and indicating devices.

### **3.05 CORRECTION OF DEFICIENCIES**

- A. Any deficiencies found shall be rectified, and work affected by such deficiencies shall be completely retested at the Contractor's expense. Final acceptance of the electrical power and control system is contingent upon satisfactory completion of the acceptance and system function tests.

**END OF SECTION**

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**SECTION 26 09 17  
PUMP CONTROL PANEL**

**PART 1 GENERAL**

**1.01 WORK INCLUDED**

- A. The work covered in this section consists of furnishing all labor, supervision, tools, materials, equipment, testing and performing all work necessary to furnish and install an outdoor pump control panel (Motor Control Center) as indicated on the Drawings. The pump control panel shall be completely constructed and pre-wired at the factory of the manufacturer. No part of its construction is to be performed or wiring completed at the job site or during installation.
- B. The pump control panel shall include motor feeder circuit breakers, power monitoring relay, surge suppression device, motor starters, motor monitoring, SCADA RTU equipment, HOA selector switches, toggle switches, indicating lights, elapse time meters, control power transformers, intrinsically safe relays, 120 VAC uninterruptible power supply (UPS), anti-condensation space heaters, ventilating fans, and all other devices required for a complete and operational system.
- C. SCADA RTU equipment shall be procured from Mission Communication, the District's SCADA system supplier. The SCADA RTU equipment model to be used for this pump station is the MyDro M150 in a FlatPak NEMA 1 enclosure to be mounted on the front of the Control Panel inner door. The SCADA RTU is to be provided with a step down 120VAC-12VAC) transformer, 12 VDC, 5AH Battery, Dual band Cellular Antenna and RG58 coaxial cable. The cellular antenna is to be mounted on the side of the outdoor canopy as indicated on the Drawings. Control Panel manufacturer shall engage the services of Mission Communication for the commissioning process and integration of the SCADA RTU system.

**1.02 APPLICABLE STANDARDS**

- A. The pump control panel shall be designed, manufactured and tested in accordance with the latest edition of the standards and publications listed below:
  - 1. INTERNATIONAL TESTING ASSOCIATION (NETA)
    - a. NETA-ATS, Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems
  - 2. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
    - a. AB 1, Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures
    - b. ICS-1, Industrial Control and Systems: General Requirements

- c. ICS-2, Controllers, Contactors and Overload Relays Rated 600 V
- d. ICS-4, Application Guideline for Terminal Blocks
- e. ICS-6, Industrial Control and Systems: Enclosures
- f. UNDERWRITERS LABORATORIES, INC. (UL)
  - g. UL 486A, Wire Connectors
  - h. UL 508, Industrial Control Equipment
  - i. UL 508A, Industrial Control Panels
  - j. UL 698A, Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations

### 1.03 SUBMITTALS

- A. Supplier shall furnish six (6) sets of submittals containing the following information for District's approval:
  - 1. Descriptive Bulletins and catalog information of all equipment and devices provided with the pump control panel.
  - 2. Product Data Sheets of all equipment and devices provided with the pump control panel.
  - 3. Shop drawings submittal shall include:
    - a. Front view and elevation
    - b. Floor plan
    - c. Top view
    - d. Assembly ratings, including voltage, continuous current and short circuit current rating
    - e. Single line diagram
    - f. Control diagrams
    - g. Nameplate schedule
    - h. Conduit entry/exit locations
    - i. Anchorage detail and calculations, signed and stamped by a Civil or Structural Engineer. Contractor shall submit panel anchorage detail and calculations to the District for their review and approval.
  - 4. Component Schedule Bill of Material, including voltage, continuous current and interrupting ratings:
    - a. Circuit breakers, power monitoring relay, surge suppression device, control power transformers, 120 VAC uninterruptible power supply (UPS), Solid State Soft Starters, Isolating Contactors, pump controller equipment, level controller system, SCADA RTU equipment, intrinsically safe relays, interposing relays, timing relays, selectors switches, toggle switches, push

buttons, pilot lights, elapse time meters, terminal blocks, space heaters, and ventilating fans.

5. Cable terminal lugs sizes
6. Equipment seismic certification
7. Factory testing plan of Pump Control Panel equipment, including simulation to verify control logic. Provide a detailed description of the proposed factory test plan for District and Engineer's approval. The testing plan shall also include all programming settings (Protection and Metering) of the Solid State Reduced Voltage Starters (SSRVs). The SSRVS Parameter List form (Appendix B of the manufacturers user manual), shall be completed for each of the pump motor starters included in the project. Indicate on the Parameter List form if a Default Setting is being used and cross out parameters that are not applicable to the starting method being used.
8. Installation information
9. Operations and Maintenance Manual, including:
  - a. General description.
  - b. Description of all control functions.
  - c. Performance data and technical data.
  - d. Catalog information of all equipment and devices used in the pump control panel.
  - e. Programming parameters of all Solid State Reduced Voltage Starters.
  - f. Operating and Maintenance Procedures.
  - g. A complete set of as-built drawings, including one-line diagrams, schematic diagrams, wiring diagrams, plan views, elevations and details.
  - h. Certified copy of test reports.
  - i. Recommended renewal parts list.

#### **1.04 QUALIFICATIONS**

- A. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. A list of installations with similar equipment shall be provided to demonstrate compliance with this requirement.
- B. The pump control panel shall be suitable for and certified to meet all applicable seismic requirements of the 2019 California Building Code (CBC) for the project areas. Guidelines for the installation consistent with these requirements shall be provided by the pump control panel manufacturer and be based upon testing of representative equipment. Panel manufacturer shall also provide Arc Flash label for the completed panel assembly in accordance with NFPA 70E.

**PART 2 PRODUCT****2.01 GENERAL**

- A. The pump control panel shall consist of a custom made multiple sections enclosure sized adequately to accommodate all motor starting equipment, control, instrumentation, and auxiliary devices required for the operation of the pump station equipment.

**2.02 RATINGS**

- A. The pump control panel shall be 600 V class suitable for operation on three-phase, 60 Hz system. The system operating voltage and number of wires shall be as indicated on the Drawings.

**2.03 CONSTRUCTION**

- A. The pump control panel enclosure shall be NEMA 3R, constructed of 12 gauge hot dipped galvanized steel minimum, fully welded construction, with hinged outer door and provided with 3-point latching mechanism and handle with provisions for padlocking. Minimum dimensions of enclosure shall be as indicated on the drawings. Inner door and interior of control panel shall be cold rolled hot dipped galvanized steel, 14 gauge minimum. Inner door shall be hinged and provided with suitable latches to secured door in place. The enclosure base shall have a 2" flange all around, 11 gauge minimum, with pre-drilled holes for anchoring the control panel to the concrete floor. Exterior of enclosure shall be painted with paint color to be selected by the District. Control panel interior shall have a powder coated white finished paint color.
- B. The control panel enclosure shall include the following accessories:
  - 1. Swing-Out inner door for mounting control and auxiliary devices behind the exterior door.
  - 2. Backpanel for mounting control devices, terminal blocks, control power transformers and other auxiliary devices.
  - 3. Enclosure door contact to send a remote alarm when any of the outside enclosure door is opened.
  - 4. Low profile LED light to illuminate interior of control panel enclosure. Light shall be turned on with a light switch to be mounted flush on the enclosure swing-out panel.
  - 5. Convenience Receptacle to be mounted flush on the enclosure swing-out panel. Receptacle shall be industrial grade, 120V, 20A, GFCI, grounded type.
  - 6. Surge protection device shall have 100,000 amp peak current rating for all mode of protection, 65 kAIC fault current fusing level, LED status and audible alarms. Surge protection device shall be as manufactured by SOLA Hevi-Duty, model number STV100K Series or approved equal.

## **2.04 CIRCUIT BREAKERS**

- A. Circuit breaker shall be molded case type, rated as indicated on the Drawings.

## **2.05 PANELBOARD**

- A. Panelboards shall be UL 67 construction and shall have ampacity and voltage ratings indicated on the Drawings. Panelboards used in 240 VAC maximum rated voltage systems shall have short-circuit ratings as shown on the Drawings, but not less than 22,000 A RMS symmetrical. Panelboards shall be of the compact type constructed to utilize minimum enclosure space. Circuit breakers shall be bolted on type. Provide phenolic nameplates to identify panelboard and all branch circuit devices.

## **2.06 MAGNETIC CONTACTORS**

### **A. GENERAL**

1. Magnetic contactors shall be sized as required for the horsepower rating of the pump motor. Magnetic contactors shall conform to NEMA or to IEC Standards at the option of Control Panel Manufacturer.
2. Magnetic contactors shall be provided with the number of auxiliary contacts required for the intended control function indicated on the Drawings, but shall be no less than two (2) NO and two (2) NC auxiliary contact.
3. Coils shall be of molded construction. All coils to be permanently marked with voltage, frequency and part number.
4. Magnetic contactors shall be Allen-Bradley Bulletin 100-C or approved equal.
5. Provide one spare contactor of each size used in this project.

## **2.07 SOLID STATE REDUCED VOLTAGE STARTERS (SSRVS)**

- A. The controller shall be Allen-Bradley SMC Flex and shall include the following features:
  1. Integrated bypass contactor that is closed once the motor is up to full speed
  2. Electronic overload protection with adjustable trip class
  3. Four programmable auxiliary contacts
  4. Selectable control capabilities: soft start, kickstart, current limit start, dual ramp, full voltage, linear speed, preset slow speed, soft stop
  5. Additional control capabilities: Pump Control
  6. LCD display
  7. Keypad programming for configuration

8. Built-in, selectable protective functions for: overload, jam, stall, excessive starts per hour, underload, over/under voltage, voltage unbalance
  9. Metering capabilities for: current, voltage, kW, kWh, power factor, motor thermal capacity utilized, elapsed time
  10. The SMC unit shall be provided with line side protective modules. The modules shall contain capacitors and metal oxide varistors (MOVs) that protect the internal power circuitry from severe electrical transients and/or high electrical noise.
  11. Provide a door-mounted human interface module (HIM) for programming, display and control. HIM shall be Cat No. 20-HIM-A3.
- B. Provide IEC rated isolating contactor at the line side of the SSRV.
  - C. Provide suitable sized current limiting fuse to protect SSRV from high level short circuit faults.
  - D. Provide door mounted 120V AC elapse time meter.
  - E. Provide one spare SSRV of each size used in this project.

## **2.08 AUTODIALER EQUIPMENT**

- A. An autodialer device shall be provided as a backup to the SCADA RTU equipment for transmission of critical pump station alarms. The autodialer shall be able to monitor up to eight (8) critical pump station alarms, and have the capability of notifying up to four (4) responding personnel via a standard telephone line.
- B. The autodialer shall be "Sensaphone" Series 800, with keypad for programming and with battery backup.

## **2.09 AUTOMATIC TRANSFER SWITCH (ATS)**

- A. Control panel manufacturer shall provide an empty section for the installation of a Bid Alternate Automatic Transfer Switch. The Automatic Transfer Switch shall be as specified in Section 263623- Automatic Transfer Switch. ATS shall be installed by the control panel manufacturer as indicated on the Drawings.
- B. Control panel manufacturer shall coordinate automatic transfer switch installation requirements with the manufacturer of the automatic transfer switch. Coordinate installation of all door mounted devices and connecting wiring.

## **2.10 CONTROL, INDICATION AND AUXILIARY DEVICES**

- A. Provide fused control power transformers, indicating lights, HOA selector switches, toggle switches, pushbuttons, intrinsically safe relays, interposing relays, and other control, indication and auxiliary devices indicated on the



Drawings. Indicating lights shall be LED push-to-test type, with lens colors as indicated on the drawings. Selector switches and pushbuttons shall be NEMA 4X, with contact block arrangement as required for the application.

- B. The pump control panel manufacturer shall install and wire the Over-Temperature and Seal Failure Detection Relay provided by the pump manufacturer for the additional protection of the pump motors. The Over-Temperature and seal Failure Detection Relay shall be installed inside the motor starter compartment of each of the pumps motor starters.
- C. Control relays shall be general purpose, blade type, 4PDT contact configuration with neon indicating light. Provide matching socket base with hold down clips.
- D. Each section of the control panel shall be provided with anti-condensation space heaters, thermostatically controlled.
- E. Float switches shall be mercury free, and shall consist of a mechanical micro switch in a plastic casing, with normally open and normally closed switch positions. The float switch casing shall be made of smooth polypropylene material, so that deposits or impurities will not adhere to its surface. The float switch cable shall be long enough to reach the Pump Control Panel without the need for an intermediate splice. Float switches shall be provided with a counterweight and mounting bracket for wall mounting at the wet well wall. Float switches shall be as manufactured by MJK Automation Model Number 7030.
- F. Timing relay shall be DIN rail mounted, multi-function type (On Delay, Interval, Cycle On and Cycle Off), with selectable timing range of 0 Sec to 30 Seconds, built-in status LED and surge protection. Output contacts shall be DPDT, rated at 7A inductive load at 240VAC. Timing Relay shall be IDEC RTE Series, Part No. RTE-B1AF20 or approved equal.
- G. Undervoltage relay shall be single phase, adjustable 102-135 VAC pickup voltage range, DPDT contact arrangement, plug-in type. Relay shall detect undervoltage of the UPS output power. One output contact of the undervoltage relay shall be provided as an input to SCADA RTU. Undervoltage relay shall be Diversified Electronics Type UOA series, Model No. UOA-120-AKA or approved equal.
- H. Intrinsically safe relays shall be provided with SPST contact to control loads to 5A at 120VAC. Intrinsically safe relays shall be GEMS SAFE-PAK Part No. 22445, or approved equal.
- I. Elapse time meter shall be round case 2-1/2" diameter, 120 VAC input voltage, non-reset, 6 digit counter hour register with tenths of hour register. Elapse time meter shall be weather resistant with sealed window and flange for panel mounting.
- J. Terminal Blocks and Accessories

1. Terminal blocks shall be rail mounted. Terminal blocks and terminal accessories shall be Phoenix Contact, Entrelec, or approved equal.
2. End covers and end clamps shall be installed to secure terminal blocks.

### **2.11 ALTERNATING RELAY**

- A. Alternating relay shall be a Duplex Controller. Control Voltage shall be 120VAC. Alternating Relay shall be Macromatic Catalog No. ARP120A3 or approved equal.

### **2.12 120VAC UNINTERRUPTIBLE POWER SUPPLY (UPS)**

- A. UPS system shall be UL 1778 listed for industrial applications without derating and for use in UL 508 applications. UPS capacity is to be calculated by Pump Control Panel manufacturer, but in no case should be less than 1500 VA. UPS shall be Marathon, Vault Series, Tower Model VTWE-1500-1 or approved equal.
- B. UPS shall be provided with a relay card with output contacts to indicate UPS fault, Summary Alarm, Bypass Active, Battery Low, and AC Power Fail. The summary alarm contact is to be wired to the SCADA RTU.

### **2.13 CONTROL REQUIREMENTS**

- A. Float switches shall be provided for the control of the pumps. Five (5) float switches shall be provided to perform the following functions:
  1. Lead Pump Off
  2. Lead Pump On
  3. Lag Pump Off
  4. Lag Pump On
  5. High Water Level Alarm
- B. The float switches output shall be connected to the Alternating Control Relay as indicated on the drawings. The High Water Level float switch shall provide an all pumps start signal in the event the wet well water level reach the high water level mark, bypassing the individual Lead and Lag pump start float switches. The pumps will be stopped as usual upon reaching the Lag Pump Off and Lead Pump Off float switches.
- C. The High Water Level float switch shall also send an alarm to the District SCADA RTU and to the Autodialer equipment.
- D. All alarms, indications, controls and instrumentation wiring interfacing with the SCADA RTU shall be terminated first into terminal blocks and then extended to the SCADA RTU equipment.

## 2.14 NAMEPLATES

- A. Provide phenolic nameplates to identify each component of the pump control panel. A nameplate shall also be installed on the outside enclosure door identifying the enclosure as the Sewage Pump Station Control Panel. Each nameplate shall be appropriately sized for the engraved legend. The lettering shall be black  $\frac{3}{16}$ -inch high, on a white background.

## PART 3 EXECUTION

### 3.01 FACTORY TESTING

- A. All factory tests required by the latest ANSI, NEMA and UL standards shall be performed.
- B. The pump control and alarm functions shall be tested by simulating actual field conditions. The operation of all pump starters shall be tested and verified to be in accordance with the control and alarm functions specified. A test plan shall be submitted to the District for approval prior to performing this factory test.
- C. A certified test report of all standard production tests, including all control and alarm functions simulation test shall be provided with the pump control panel operations and maintenance manual.
- D. Factory tests as outlined above may be witnessed by the District's representative.
  - 1. The manufacturer shall notify the District two (2) weeks prior to the date the tests are to be performed.
  - 2. The manufacturer shall include the cost of transportation and lodging for up to three (3) District's representatives. The cost of meals and incidental expenses shall be the District's responsibility.

### 3.02 EXAMINATION

- A. Contractor shall fully inspect shipments for damage and report damage to manufacturer and file claim upon shipper, if necessary.
- B. Contractor to verify CEC clearances as dictated on the Contract Drawings prior to installation. Verify UL labeling of the assembly prior to installation.

### 3.03 INSTALLATION

- A. Contractor to follow the installation instructions supplied by the manufacturer.
- B. Control wiring shall be as shown on the Contract Drawings except as modified by the approval and submittal process. Interface all local and remote devices into the control wiring and operational systems for each load.

### 3.04 FIELD ADJUSTMENTS

- A. Follow the manufacturer's instructions and the contract documents concerning any overload relay setting, timing relays, or startup of components.

### 3.05 FIELD TESTING

- A. Test the completed installation to demonstrate to the District that the system is performing its intended control function in accordance with this specification, contract drawings and manufacturer's shop drawings.
- B. Test each individual SCADA RTU input for proper transmission and confirmation that signal has been received at the District's SCADA System. This test shall be conducted in coordination with the District's SCADA Consultant.
- C. Test each individual Autodialer input for proper transmission and confirmation that signal has been received by the District's designated operation personnel. This test shall be conducted in coordination with the District's operation personnel.
- D. Generate a field report on tests performed, test values experienced, etc., and make available to the District upon request.

### 3.06 FIELD QUALITY CONTROL

- A. Provide the services of a qualified factory-trained manufacturer's representative to assist the Contractor in the startup of the equipment specified under this section for a period of 2 working days. The manufacturer's representative shall provide technical direction and assistance to the Contractor in connections and adjustments, and testing of the assembly, components contained therein, and provided field devices.
- B. The following minimum work shall be performed by the manufacturer's representative, with the assistance of the Contractor:
  - 1. Verify all power wiring and control wiring and verify basic operation of each starter from control power source.
  - 2. Calibrate any solid-state control relays for their intended purpose and make written notations of adjustments on record drawings.
  - 3. Set the microprocessor base overload relays operation, and protection parameters. Provide a listing of all settings.
  - 4. Verify installation level and operation of the level float system. Verify start and stop operation of pumps and alarm/indications to SCADA RTU.
  - 5. Simulate each SCADA RTU input by actual operation of the field device or control panel device or, if this is not practical, by a jumper across the device terminals. Verify that the correct SCADA RTU input is actuated, transmitted and received at the District's SCADA System.

- C. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

### **3.07 MANUFACTURER'S CERTIFICATION**

- A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations. Equipment shall be inspected prior to the generation of any reports.
- B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

### **3.08 TRAINING**

- A. The Contractor shall provide a training session for up to five (5) District's representatives for 4 hours at the jobsite or other office location chosen by the District.
- B. The training session shall be conducted by a manufacturer's qualified representative.
- C. The training program shall consist of the following:
  - 1. Review of the factory record shop drawings.
  - 2. Review of all control schematics and pump controller control logic.
  - 3. Review contactor coil replacement and contact replacement procedures.
  - 4. Discuss the maintenance timetable and procedures to be followed in an ongoing maintenance program.
  - 5. Provide three-ring binders to participants complete with copies of drawings and other course material covered.

END OF SECTION

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**SECTION 26 24 12  
SERVICE PEDESTAL**

**PART 1 GENERAL**

**1.01 WORK INCLUDED**

- A. This specification covers the equipment and services necessary for the design, manufacture, factory testing, installation, and field testing of a complete and operable service pedestal in full compliance with the serving electrical utility company requirements. Service pedestal voltage, number of phases, and ampacity shall be as indicated on the Drawings.

**1.02 APPLICABLE STANDARDS**

- A. The Service Pedestal and all accessory equipment shall be designed, manufactured and tested in accordance with the following applicable standards:
  - 1. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
    - a. AB-1, Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures
  - 2. UNDERWRITERS LABORATORIES INC. (UL)
    - a. UL-508, Industrial Control Equipment
    - b. UL-508A, Industrial Control Panels
  - 3. CALIFORNIA CODE OF REGULATIONS (CCR):
    - a. Title 24, Part 3, 2019 California Electrical code (CEC)
  - 4. PACIFIC GAS AND ELECTRIC CO. (PG&E)
    - a. Conform to utility company metering requirements

**1.03 SUBMITTALS**

- A. Manufacturer shall furnish six (6) sets of submittals containing the following information for PG&E's approval:
  - 1. Manufacturer's literature describing the product.
  - 2. Catalog Data of all circuit breakers, listing interrupting rating and trip functions provided.
  - 3. Manufacturer's Shop Drawings
    - a. Shop drawings of service pedestal indicating the enclosure's overall dimensions, floor plan, elevation and top view, metering section details, arrangement of circuit breakers, schematic diagram, and nameplate schedule.

- b. Contractor shall submit anchorage details and calculations, signed and stamped by a Civil or Structural Engineer, to the District for their review and approval.
- B. Contractor shall coordinate all submittal information with PG&E and shall copy the District on all correspondence and submittal information.

## **PART 2 PRODUCTS**

### **2.01 GENERAL**

- A. The service pedestal shall have a voltage rating as indicated on the Plans and shall be UL listed for service entrance application. Manufacturer shall coordinate metering requirements with the serving utility company.
- B. Manufacturers
- C. The following manufacturers and equipment suppliers are approved, provided they meet the specifications and requirements listed herein.
  1. Tesco
  2. Pacific Utility Products

### **2.02 SERVICE PEDESTAL CONSTRUCTION**

- A. General
  1. The service pedestal shall house the utility service main circuit breaker and the generator receptacle circuit breaker. The main circuit breaker and generator breaker, and all wiring, shall be located behind an interior dead front door or panel. The main circuit breaker and generator receptacle circuit breaker shall be mechanically interlock, so that only one of these breakers can be close at the same time.
- B. Enclosure
  1. The service pedestal assembly shall be 50 inch high, UL listed weatherproof NEMA 3R switchboard and instrument pedestal. Enclosure shall be similar to a TESCO Class 27-000 section with dead front interior and hinged gasketed exterior doors. Outer enclosure shall be constructed of 12 gauge hot dipped galvanized steel. Doors shall be equipped with hasps and staples for District's padlocks.
- C. Circuit Breaker
  1. Main circuit breaker and generator circuit breaker shall have interrupting capacities of not less than 25,000 amperes or higher interrupting rating as indicated on the Drawings. Circuit breakers shall be of the indicating type, providing ON, OFF and TRIPPED positions of the operating handle. Circuit breakers shall be quick-make, quick-break, with a thermal-magnetic action. Circuit breakers shall be the bolted on type, and shall be designed so that an overload on one pole



automatically causes all poles to open. Circuit breakers shall meet the requirements of UL and NEMA AB 1.

D. Ground Bus

1. The service pedestal ground bus and incoming neutral service conductor shall be connected to a "rod" type "ground". The ground rod shall be 3/4" diameter x 10' copper clad with connection made by exothermic weld and driven in earth at base of pedestal. The ground rod shall extend up into the service pedestal for visible connection with an approved "exothermic weld". Grounding and bonding wires shall be installed in all PVC conduit runs and connected to ground bus and all equipment.
2. Grounding conductor - All grounding conductor shall be sized as shown on the Drawings or in accordance with the CEC, whichever is larger.
3. Ground bus - A ground bus shall be provided in the service equipment. It shall be connected to the grounding electrode system by exothermic welded stranded copper grounding conductors. Screw type lugs shall be provided for connection of equipment grounding conductors.

E. Utility Meter

1. The electric service meter compartment shall be arranged approximately as shown to meet the electric utility company and EUSERC requirements. Provide neutral bar for grounding. Provide guard over power company watt hour meter with hinged access cover that has a hasp for utility company padlock. Provide wire and lugs for service entrance as required by utility company. The pull section and utility compartments shall be accessible only by the utility company. A lightning arrestor shall be provided to protect the panel equipment from lightning and utility power surges. Provide a meter base, test perch with test by-pass and other materials, as required by the electric utility which will provide service to the facility, for installation of metering equipment and attachment of service conductors.

F. Generator Receptacle

1. Generator receptacle shall be mounted on the side of the Service Pedestal.
2. Generator receptacle shall be 100A, 600V, 4P, 4W, reverse feed, and with angle adapter as indicated on the Drawings

G. Nameplates

1. Provide individual nameplates for each of the circuit breakers on the service pedestal. Nameplates shall be phenolic type with white characters on black background.

H. Enclosure Finish

1. Finish shall be polyester dry powder, electrostatically applied and baked on at 380 deg. F. Color of interior door and mounting plate shall

be white. Color of enclosure exterior shall be light grey. Provide color chip samples to the District for approval. The painting process shall include five stages of metal preparation using dip tanks as follows:

- a. Alkaline cleaner
- b. Clear water rinse
- c. Iron phosphate application
- d. Clear water rinse
- e. Inhibitive rinse to seal phosphated surfaces.

I. Anchoring Details

1. Service pedestal manufacturer shall provide anchoring details for mounting service pedestal on a concrete pad.

### **PART 3 EXECUTION**

#### **3.01 FACTORY TESTING**

- A. Service pedestal shall be completely assembled, wired, adjusted and tested at the factory. After assembly, the complete service pedestal shall be tested for operation under simulated service conditions to assure accuracy of the wiring and function of the equipment. Certified copies of factory test reports shall be provided.

#### **3.02 INSTALLATION**

- A. The service pedestal shall be installed in accordance with manufacturer's instructions at the location shown on the Drawings.
- B. Contractor shall provide all labor and material to cast in place concrete pad and to anchor the service pedestal to the concrete pad.

END OF SECTION

**SECTION 26 32 13  
DIESEL GENERATOR SET  
(Bid Alternate)**

**PART 1 GENERAL**

**1.01 WORK INCLUDED**

- A. This specification covers the equipment and services necessary for the design, manufacture, factory testing, installation, and site testing of a complete and operable on-site standby power system composed of diesel engine-driven generator set and all other devices, equipment, and appurtenances which are specified herein, shown on the drawings or required for the service. Equipment shall be new, factory tested, and delivered complete and ready for installation, without requiring any field assembly.
- B. Acceptable generator manufacturers are Cummins and Caterpillar. No other generator manufacturer will be accepted.

**1.02 APPLICABLE STANDARDS**

- A. The Diesel Engine Generator Set and all associated equipment shall be designed, manufactured and tested in accordance with the following applicable standards:
  - 1. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
    - a. ANSI C2, National Electrical Safety Code
  - 2. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
    - a. ASTM A 53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
    - b. ASTM A 181, Standard Specification for Carbon Steel Forgings, for General-Purpose Piping
    - c. ASTM A 234, Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
    - d. ASTM D 975, Standard Specification for Diesel Fuel Oils
  - 3. AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
    - a. ASME B16.3, Malleable Iron Threaded Fittings
    - b. ASME B16.5, Pipe Flanges and Flanged Fittings

- c. ASME B16.11, Forged Steel Fittings, Socket-Welding and Threaded
  - d. ASME B31.1, Power Piping
4. CALIFORNIA CODE OF REGULATIONS
- a. Title 24, Part 2, 2019 California Building Code
  - b. Title 24, Part 3, 2019 California Electrical Code
5. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
- a. IEEE Std 43, Recommended Practice for Testing Insulation Resistance of Rotating Machinery
  - b. IEEE Std 112, Standard Test Procedure for Polyphase Induction Motor and Generators
  - c. IEEE Std 115, Test Procedures for Synchronous Machines Part I - Acceptance and Performance Testing Part II-Test Procedures and Parameter Determination for Dynamic Analysis
  - d. IEEE Std 519, Recommended Practice and Requirements for Harmonic Control in Electric Power Systems
6. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
- a. NEMA ICS 2, Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts
  - b. NEMA ICS 6, Industrial Control and Systems: Enclosures
  - c. NEMA MG 1, Motors and Generators
7. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
- a. NFPA 30, Flammable and Combustible Liquids Code
  - b. NFPA 37, Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
  - c. NFPA 110, Standard for Emergency and Standby Power Systems
8. UNDERWRITERS LABORATORIES (UL)
- a. UL 142, Steel Above Ground Tanks for Flammable and Combustible Liquids
  - b. UL 508, Industrial Control Equipment
  - c. UL 1236, Battery Chargers for Charging Engine-Starter Batteries

- d. UL 2200, Stationary Engine Generator Assemblies
- 9. CALIFORNIA AIR RESOURCES BOARD (CARB)
- 10. BAY AREA AIR QUALITY MANAGEMENT DISTRICT
- 11. CITY OF RICHMOND FIRE MARSHAL OFFICE
  - a. Municipal Code Requirements for installation of above ground diesel fuel storage tank.

### 1.03 SUBMITTALS

- A. As a minimum for all equipment specified, supplier shall furnish six (6) sets of submittals containing the following information for District's approval:
  - 1. Engine-Generator Sizing Calculations:
    - a. Engine-Generator manufacturer shall provide sizing calculations confirming that the proposed equipment will meet the specifications and project requirements. Engine-Generator sizing calculations shall be based on the load indicated on the Drawings and as included in Attachment A to this specification. Failure to provide the engine-generator sizing calculations will result in return of the entire submittal without further review and consideration until calculations are resubmitted with the entire package.
    - b. Maximum starting voltage dip shall not exceed 20% of nominal voltage. Maximum frequency dip shall not exceed 5% of nominal frequency
  - 2. Specification and data sheets.
    - a. Manufacturer's standard data for the engine and generator, including sound attenuating enclosure.
    - b. Engine generator control panel.
    - c. Battery, charger and battery secondary containment.
    - d. Exhaust muffler.
  - 3. Equipment and Performance Data
    - a. Engine generator output power capability, including efficiency and parasitic load data.
    - b. Harmonic and non-linear load capability.
    - c. Cooling system maximum and minimum allowable inlet temperature.

- d. Generator Direct-Axis and Quadrature synchronous, transient and subtransient reactance. Negative and Zero sequence reactance, transient open-circuit and short circuit time constants.
  - e. Magnitude of monitored values which define alarm or action set points and the tolerance (plus and/or minus) at which the devices activate the alarm or action.
  - f. Vibration isolator performance data for the range of frequencies generated by the engine-generator set during operation from no load to full load and the maximum vibration transmitted to the floor. Provide description of the seismic qualification of the engine-generator mounting, base, and vibration isolation.
4. Manufacturer's published warranty documents.
- a. Shop drawings submittal shall include:
    - 1) Plan and elevation views with certified overall, and interconnection point dimensions. Include engine-generator weight data on drawings.
    - 2) Sub-base fuel storage tank, showing dimensions, vents and fuel fill piping, anchor bolt template and recommended clearances for operation and maintenance. Identify location and type of vibration isolators furnished.
    - 3) Outdoor sound attenuating enclosure, showing dimensions, weight, door swings, and attachment to the engine generator base or to the sub-base fuel storage tank.
    - 4) Engine-generator set lifting points and rigging instructions.
    - 5) One-line schematic and wiring diagrams of the generator, exciter, regulator, governor, and instrumentation.
    - 6) Wiring diagrams, schematics, and panel layouts of the safety system, including a detailed description of how it is to work. Description to include a listing of normal parameter ranges, alarm and shutdown values for operating parameters such as pressures, temperatures, voltages, currents, and speeds.
    - 7) Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
5. Structural calculations, stamped by an engineer registered in the State of California, verifying the integrity of the isolators and anchoring systems. Calculations shall demonstrate that the systems adequately resist seismic and wind loads according to the 2019 California Building Code. Contractor shall submit anchorage detail to the District for review and approval.

6. Manufacturer proposed factory and on-site testing plan and procedures.
7. Manufacturer's installation instructions, including pre-start checklist and precautions; startup procedures for test mode, manual start mode, and automatic start mode; running checks, procedures, and precautions; and shutdown procedures, checks and precautions.
8. Manufacturer's Operations and Maintenance Manual, including recommended list of spare parts.
9. Certified Test Reports documenting factory tests per the requirements of this specification, as well as certified factory test of generator set sensors per NFPA 110 Level 1.
10. Documentation that the engine-generator set manufacturer has a minimum of 5 years experience in the manufacture, assembly and sale of stationary, diesel engine-generator sets for commercial and industrial use.
11. Certificates:
  - a. Emissions: A certification from the engine manufacturer stating that the engine emissions meet the federal, state, and local regulations restrictions.
  - b. Regulatory Compliance: A certification stating that materials and equipment provided comply with the requirements of UL, wherever a standard covering the material and equipment has been published by such organization.
  - c. Contractor shall obtain all required permits from the Bay Area Air Quality Management District (BAAQMD) to install and operate the standby engine-generator set. Permit fees shall be included in the bid item for the diesel generator set.
  - d. Functional Facilities: A letter certifying that all facilities are complete and functional, that each system is fully functional, and that each item of equipment is complete, free from damage, adjusted and ready for beneficial use.

#### **1.04 SERVICE CAPABILITY**

- A. The equipment supplier shall have qualified service engineers available. These engineers shall be available on a 24-hours, 7 days per week basis. The service facility shall be located within 100 miles radius from the project site.

**1.05 WARRANTY**

- A. Shall be provided for all products against defects in materials and workmanship, for two year period from the start-up and acceptance date, per the manufacturer's Base Coverage Warranty.

**PART 2 PRODUCTS****2.01 GENERAL REQUIREMENTS**

- A. The engine-generator shall be provided complete, with all necessary ancillary equipment, including air filtration; starting system; generator controls, protection, and isolation; instrumentation; lubrication; fuel system; cooling system; and engine exhaust system. The engine-generator set shall satisfy the requirements specified in the following Engine-Generator Parameter Schedule.

<b>ENGINE-GENERATOR PARAMETER SCHEDULE</b>	
Power Application	Standby
Power Factor	0.8 Lagging
Engine-Generator Application	Stand-Alone
Heat Exchanger Type	Fin-Tube
Governor Type	Electronic Governor
Governor Application	Isochronous
Voltage Operational Bandwidth (Steady State)	±1.0% from No Load to Full Load
Frequency Bandwidth (Steady State)	± 0.25% from No Load to Full Load
Maximum Speed	1800 rpm
Frequency	60 Hz
Voltage	As Shown on the Drawings
Phases	As Shown on the Drawings
Maximum Generator Subtransient Reactance	8%
Maximum Step Load Increase	Single step load pickup of 100% nameplate and power factor
Frequency Recovery Time	2 seconds maximum
Frequency Deviation	5% maximum
Tolerance for Recover	1.5 Hz
Voltage Recovery Time	3 seconds maximum



Voltage Deviation	25% maximum
Maximum Time to Start and be Ready To Assume Load	10 seconds
Seismic Zone	Per 2019 CBC
Installation Elevation	1000 ft Above Sea level

- B. Generator set ratings: As shown on the Drawings. Minimum kW Standby rating, shall be based on site conditions of: Altitude at sea level, ambient temperatures up to 120°F.
- C. The integrated generator set control system shall include required voltage regulation and governing systems, inherent overcurrent, short circuit and overload protection, digital and analog AC metering equipment, sensor failure detection, required protective relaying, and remote monitoring and control capability.
- D. The transient response characteristics of the engine-generator set shall be controlled by the governor and voltage regulator, which shall cause the engine-generator to respond to the maximum step load changes such that output voltage and frequency recover to and stabilize within the operational bandwidth within the transient recovery time. The engine-generator set shall respond to maximum step load changes such that the maximum voltage and frequency deviations from bandwidth are not exceeded.
- E. Voltage regulation shall be  $\pm 1.0$  percent for any constant load between no load and rated load. Random voltage variation shall be  $\pm 1.0$  percent.
- F. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed  $\pm 0.25$  percent.
- G. The diesel engine-generator set shall be capable of single step load pick up of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at ambient temperature.
- H. The generator set shall be capable of sustaining a minimum of 90% of rated no load voltage with the specified kVA load at near zero power factor applied to the generator set. Minimum motor starting capability shall be 90 kVA.

## 2.02 ENGINE

- A. The engine shall be diesel, 4-cycle, 1800 RPM, radiator and fan cooled. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive all connected accessories and the alternator at full generator set rated load. Two cycle engines are not acceptable. The engine must meet all current EPA and CARB emission standards without the use of exhaust after treatment devices.

- B. An electronic governor system shall provide automatic isochronous frequency regulation. The engine governing system shall not utilize any exposed operating linkage.
- C. Skid-mounted radiator and cooling system rated for full load operation in 122°F (50°C) ambient as measured at the generator air inlet. Provide prototype test data verifying total cooling system performance with submittal documentation. Radiator shall be provided with a duct adapter flange. The cooling system shall be filled with 50/50 ethylene glycol/water mixture by the equipment supplier. Rotating parts shall be guarded against accidental contact per OSHA requirements.
- D. An electric starter capable of up to five complete cranking cycles without overheating.
- E. Positive displacement, mechanical, full pressure, lubrication oil pump. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.
- F. An engine driven, mechanical, positive displacement fuel pump. Fuel filter with replaceable spin-on canister element.
- G. Replaceable dry element air cleaner with restriction indicator.
- H. Flexible supply and return fuel lines.
- I. Engine mounted battery charging alternator, with solid-state voltage regulator. The battery charging alternator shall have sufficient capacity to recharge the batteries, with all parasitic loads connected, within 4 hours after a normal engine starting sequence.

### 2.03 ALTERNATOR

- A. The alternator shall be synchronous, four pole, 2/3 pitch, revolving field, dripproof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc.
- B. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 120 degrees Centigrade.
- C. The alternator shall be capable of delivering rated output kVA at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.
- D. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.

## 2.04 ENGINE-GENERATOR SET CONTROL

- A. The generator set shall be provided with a microprocessor-based control system and an integral backlit LED display panel having status LED indicating lights, tactile feel membrane switches, and 128x64 pixels digital readout. Control panel shall be designed to provide governing, voltage regulation, metering, protective relaying, automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification. The control shall be mounted on the generator set. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered. The control shall be UL508 recognized and suitable for use on UL 2200 listed generator sets. The controls, including all control, monitoring and protective functions, shall meet or exceed the requirements of Mil-Std 461C part 9, and IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions. The entire control shall be tested and meet the requirements of IEEE 587 for voltage surge resistance. Manufacturers utilizing components which have not been tested as a system, as installed, (as demonstrated by a statement of performance on standard published literature) shall conduct RFI/EMI testing on the equipment in the manufacturer's facility prior to shipping the equipment to the project job site. Voltage surge testing shall be performed on an identical prototype unit.
1. System control voltage shall be 12VDC. The control system provided shall withstand the DC surge voltage produced by a DC battery charging alternator operating at full load when the battery bank is disconnected. The test shall be successfully completed without tripping protective circuit breakers or blowing fuse protective devices. Generator set governing, voltage regulation, protection, and control equipment shall be capable of proper operation with battery voltage levels down to 8VDC.
  2. All adjustments to the control system for voltage and frequency set-up, governing, and voltage regulation settings shall be made from the front of the generator set control panel, with the aid of the digital readout display which shall be integral to the equipment. All adjustments shall be made with the digital tactile feel raise/lower switches which shall include position indicators. No rotary pots shall be acceptable for any function of the control system provided for the generator set. Control panel status LED's lights shall provide system diagnostic to assist in analyzing proper system functions, alarms and system shutdowns.
  3. The entire generator set control system, as supplied, shall be capable of being directly monitored and controlled by a personal computer connected to the control for monitoring, diagnosis, service, and adjustment of the system via an RS-485 port on the control panel.
  4. The generator set mounted control shall include the following features and functions:

- a. RUN/OFF/AUTO control. In the RUN position the generator set shall automatically start, and accelerate to rated speed and voltage. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
  - b. Red "mushroomhead" pushbutton EMERGENCY STOP switch. Depressing the emergency stop switch shall cause the generator set to immediately shut down and be locked out from automatic restarting. Reset of the control shall require reset of the emergency stop switch and the control system.
  - c. The OFF membrane button shall also be used to acknowledge warning and shutdown messages after the fault condition has been cleared and allow restarting the generator set after it has shut down for any fault condition.
  - d. LED Status Lights Test. This function shall be integrated into the Display Panel by accessing the Service Menu "LAMP TEST" function.
5. Generator Set and Engine Control Functions:
- a. The control system provided shall include a cycle cranking system which allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15 second rest period between cranking periods.
  - b. The control system shall include an idle mode control which allows the engine to run in idle mode. In this mode, the alternator excitation system shall be disabled and the engine protection parameters for engine oil pressure and engine temperature shall be reduced to proper levels to reflect the lower engine operating speed.
  - c. The control system shall include a digital engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification.
  - d. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting. The control system shall automatically adjust governor gain and stability settings to compensate for engine performance variation related to engine temperature.
  - e. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions. Indicators shall be provided to reflect that the time delays are in operation, and the time remaining for completion of the time delay period.

- f. The starting control logic shall check for engine rotation at each signal for the engine starter to run. If engine rotation is not present when the starter is operating, a "fail to crank" alarm and shutdown shall be indicated on the generator set control panel.
  - g. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual engine failure conditions.
  - h. Generator set start contacts rated 10 A at 32VDC.
  - i. Cooldown time delay, adjustable: 0-600 seconds. The control panel shall indicate the time remaining in the time delay period when the generator set is timing for shutdown.
  - j. Start time delay, adjustable: 0-300 seconds. The control panel shall indicate the time remaining in the time delay period when the generator set is timing for start.
  - k. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 12VDC. During engine starting, the low voltage limit shall be disabled, and the system shall conduct a battery capacity test. A "weak battery" alarm shall be initiated if the starting/control battery does not pass this test.
6. Alternator Control Functions:
- a. The generator set shall include an automatic voltage regulation system which shall be matched and prototype tested with the governing system provided. It shall be immune from miss operation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic which shall reduce output voltage in proportion to frequency below a threshold of 59 Hz. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range and made via digital raise-lower switches, with an alpha-numeric LCD readout to indicate setting level.
  - b. Electronic alternator overcurrent alarm and shutdown protection. The overcurrent alarm shall be indicated when the load current on the generator set is more than 110% of rated current for more than 60 seconds. The overcurrent shutdown shall be matched to the thermal damage curve of the generator set, and shall not have an instantaneous function.

- c. Electronic alternator short circuit protection. Short circuit shutdown shall occur when the load current on the generator set is more than 175% of rated current and an aggregate time/current calculation indicates that the system is approaching the thermal damage point of the alternator. The equipment used shall not have an instantaneous function.
  - d. The system shall control the alternator output to provide 300% of rated current under short circuit conditions for both single phase and three phase faults. Systems which regulate single phase and 3-phase faults at identical excitation levels are not acceptable.
  - e. Controls shall be provided to monitor the kW load on the generator set and initiate an alarm condition when total load on the generator set exceeds the generator set rating for a time period in excess of 5 seconds.
  - f. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.
  - g. A three-phase sensing AC over/under voltage monitoring system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.
  - h. An under frequency sensing and protection system shall be provided which causes a shutdown of the generator set if true RMS frequency falls below 90% of rated for more than 20 seconds.
7. Control Interfaces for Remote Monitoring
- a. All control and interconnection points from the generator set to remote components shall be brought to a single separate connection box. No field control connections shall be made in the control enclosure or in the AC power output enclosure.
  - b. The field connections shall be made on permanently labeled terminal blocks which are designed and tested by the manufacturer of the generator set to be suitable for use without wire termination lugs. Provisions shall be made for future addition of DIN-rail mounted components.
  - c. Provide the following features in the control system:
    - 1) Form "C" dry common alarm contact set rated 2A @ 30VDC to indicate existence of any warning or alarm condition on the generator set.

- 2) Two (2) Form "C" dry common alarm contact set rated 2A @ 30VDC to indicate existence of any shutdown condition on the generator set. .
- 3) One set of contacts rated 2A @ 30VDC to indicate generator set is ready to load. The contacts shall operate when voltage and frequency are greater than 90% of rated condition.
- 4) One set of contacts rated 2A @ 30VDC to indicate generator set fuel tank low level.
- 5) A minimum of four (4) programmable spare contacts for Customer use.
- 6) A fused 10 amp switched 12VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.
- 7) A fused 10 amp 12VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.
- 8) The control shall be provided with provisions for connection of remote monitoring equipment as described herein or shown on the drawings.

## **2.05 GENERATOR SET AC OUTPUT METERING**

- A. The generator set shall be provided with a metering set with the following features and functions:
  1. Provide bar graph analog display in percentage for voltmeter, ammeter, frequency meter, and kilowatt (kW) meter and for power factor. Ammeter and kW meter bar scales shall be color coded and scaled in the following fashion: readings from 0-90% of generator set standby rating: green; readings from 90-100% of standby rating: amber; readings in excess of 100%: red. The bar graph analog meters and shall be installed so that they are totally oil-tight and dust-tight.
  2. Digital metering set, 0.5% accuracy, to indicate generator RMS voltage and output current, frequency, and total kVA. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three-phase voltages (line to neutral or line to line) simultaneously.

## **2.06 GENERATOR SET ALARM AND STATUS MESSAGE DISPLAY**

- A. The generator set shall be provided with alarm and status indicating lamps to indicate non-automatic generator status, generator running, common warning

alarms, common shutdown, manual run mode, and remote start conditions. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright lighting conditions. In addition, the generator set control shall indicate the existence of alarm and shutdown conditions on the LCD digital display panel. Multiple warning or shutdown conditions shall all be stored, and require individual clearing by the operator. Alarm horn shall be located on the generator set control panel. Conditions to be annunciated on the generator set control shall include, as a minimum:

FUNCTION	ALARM HORN	SHUTDOWN UNIT
Low DC Voltage	*	
High DC Voltage	*	
Weak Battery	*	
Low Oil Pressure Alarm	*	
Low Coolant Temp Alarm	*	
High Coolant Temp Alarm	*	
Leak Detected – Subbase Tank	*	
Overcurrent Alarm	*	
Oil Pressure Sender Failure	*	
Engine Temp Sender Failure	*	
Low Fuel Level	*	
Not in Auto	*	
High Coolant Temp	*	*
Low Oil Pressure	*	*
Overcurrent	*	*
Short Circuit	*	*
Overcrank	*	*
Overspeed	*	*
Under Frequency	*	
Under Voltage	*	*
Over Voltage	*	*
Low Coolant Level	*	*
Emergency Stop	*	*

- B. Customer fault alarms: Provisions shall be made for indication of two customer-specified alarm or shutdown conditions. Labeling of the customer-specified alarm or shutdown conditions (on the digital display panel) shall be of the same type and quality as the above specified conditions and shall be programmable by the operator. The non-automatic indicating lamp shall be red, and flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.
- C. Engine Status Monitoring: The following information shall be available on the LCD digital display panel on the generator set control:
1. Engine oil pressure (psi or kPA)



2. Engine coolant temperature (degrees F or C; Both left and right bank temperature shall be indicated on V-block engines.)
3. Engine oil temperature (degrees F or C)
4. Engine speed (rpm)
5. Number of hours of operation (hours)
6. Number of start attempts
7. Battery voltage (DC volts)

## **2.07 BASE**

- A. The engine-generator set shall be mounted on a heavy duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails. The battery tray shall provide secondary containment to the starting batteries in the event a battery jar leaks or ruptures.

## **2.08 OUTDOOR SOUND-ATTENUATED ENCLOSURE**

- A. The generator set shall be provided with an outdoor, level 2, sound attenuated steel housing that shall reduce the sound level of the generator set, while operating at full rated load, to a maximum of 65 dBA at any location 7 meters from the generator set in a free field environment. The complete assembly shall be listed under UL 2200. The assembly shall comply with the requirements of the California Electrical Code for all wiring materials and component spacing. The assembly of generator set, sub-base tank, and enclosure shall be designed to be lifted into place using spreader bars. Housing shall provide ample airflow for generator set operation at rated load in an ambient temperature of 104F. The housing shall have hinged access doors as required to maintain easy access for all operating and service functions. All doors shall be lockable, and shall include retainers to hold the door open during service. Enclosure roof shall be cambered to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure. All electrical power and control interconnections shall be made within the perimeter of the enclosure. Sound attenuated enclosures shall be insulated with non-hydroscopic materials.
- B. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color using a two step electrocoating paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating that meets the following requirements:
  1. Primer thickness, 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.

2. Gloss, per ASTM D523-89, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.
  3. Crosshatch adhesion, per ASTM D3359-93, 4B-5B.
  4. Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.
  5. Salt Spray, per ASTM B117-90, 1000+ hours.
  6. Humidity, per ASTM D2247-92, 1000+ hours.
  7. Water Soak, per ASTM D2247-92, 1000+ hours.
- C. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.
- D. All hardware and hinges shall be stainless steel.
- E. A factory-mounted, exhaust silencer shall be installed inside the enclosure. The exhaust shall exit the enclosure through a rain collar and terminate with a rain cap. Exhaust connections to the generator set shall be through seamless flexible connections.
- F. The enclosure shall include the following maintenance provisions:
1. Flexible coolant and lubricating oil drain lines, that extend to the exterior of the enclosure, with internal drain valves
  2. External radiator fill provision.

## **2.09 GENERATOR SET AUXILIARY EQUIPMENT AND ACCESSORIES**

- A. Generator main circuit breaker: set-mounted and wired, UL listed, molded case thermal-magnetic type, 80% rated. Field circuit breakers shall not be acceptable for generator overcurrent protection.
- B. Engine mounted, thermostatically controlled, jacket water heater. The heater shall be sized as recommended by the generator set manufacturer. Heater voltage shall be 120 V, single-phase, as shown on the project Drawings.
- C. Vibration isolators, spring type, quantity as recommended by the generator set manufacturer. Isolators shall include built-in vertical limit stops and seismic restraint in all directions in accordance with 2019 CBC requirements. Provide Seismic Calculations signed by a California State Registered Professional Engineer verifying the integrity of the isolator restraint and the anchor.
- D. Starting and control batteries shall be calcium/lead antimony type, 12 VDC, sized as recommended by the generator set manufacturer. Batteries shall be supplied with battery cables and connectors.

- E. Provide a UL listed/CSA certified, 10 A minimum, voltage regulated battery charger. The charger shall be mounted on the engine generator set. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual form C contacts rated at 4 A, 120 VAC, 30 VDC for remote indication of: Loss of AC power - red light, Low battery voltage - red light, High battery voltage - red light, Power ON - green light (no relay contact). Provide charger with a LCD display to indicate charge rate and battery voltage, 12 hour equalize charge timer, AC and DC fuses.
- F. Exhaust muffler shall be of the size and type as recommended by the generator set manufacturer. The muffler shall be critical grade. Provide flexible exhaust fitting sized for the engine exhaust flange.
- G. Exhaust pipe and Vent pipe shall be A-53 steel, Schedule 40, black. Provide flip top at end of exhaust pipe and an OPW 523V Pressure Vacuum Vent cap at end of vent pipe.
- H. Sub-Base Fuel Storage Tank shall be double wall, regional type, fuel storage tank with minimum capacity for 24 hours of operation at full load. The tank shall be equipped with high, low, and leak detection switches for remote monitoring and alarms. The tank shall be provided with a visual fuel level gauge. The tank shall be constructed of corrosion resistant steel with a 2 inch spacer at the bottom of the tank to allow visual inspection. Tank shall be UL 142 listed and labeled. Installation shall be in compliance to NFPA37. The equipment, as installed, shall meet all local and regional requirements for above ground tanks, and shall be provided with fill drop tube, high fuel alarm panel, 5 gallon fill/spill bucket and with overfill prevention valve (OFPV).
- I. Engine-Generator Remote Emergency Stop Switch, NEMA outdoor rated, shipped loose for installation on the side of the ATS by the Control Panel Manufacturer.
- J. Provide City Fire Department approved Knox Key-Lock Box for Fire Department access to generator enclosure. Lock Box to be mounted at convenient location on exterior of generator enclosure per manufacturer's installation instructions. Contact the City Fire Inspector for requirements and applications.

### **PART 3 EXECUTION**

#### **3.01 FACTORY TESTS**

- A. Generator set factory tests on the equipment to be shipped, shall be performed at rated load and rated PF. Generator sets that have not been factory tested at rated PF will not be acceptable. Tests shall include: run at full load for 2 hours, maximum power, voltage regulation, transient and steady-state governing, single step 100% cold load pickup, and safety shutdowns.

- B. A certified test report shall be issued, confirming the results of this testing. Copies of test specifications and all performance test data shall be included in project submittals.

### **3.02 INSTALLATION**

- A. The engine generator set shall be installed at location indicated on the Drawings. The sub-base fuel storage tank shall be anchored to the concrete pad. The engine generator set shall be installed above the tank on manufacturer's provided vibration isolators.
- B. Install flexible fitting, exhaust muffler, pipe, and weather flap.
- C. Install vent pipe for sub-base tank and for secondary containment in accordance with the California Mechanical Code.
- D. Installation shall be performed by the electrical Contractor, including external point to point power cable and control wiring installation. The manufacturer's representative shall provide periodic inspection and supervision to ensure conformance to installation drawings and instructions.
- E. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

### **3.03 START-UP AND TESTING**

- A. The generator set manufacturer shall provide factory trained personnel to perform the following field services:
  - 1. Visual Inspection of Installation, including:
    - a. Verify that equipment has not been damaged during shipment.
    - b. Generator set mounting, exhaust system, fuel system, cooling system and vent system.
  - 2. Verify system interconnection wiring.
  - 3. Normal Check-Out Procedures For All System Functions:
    - a. Verify Manual and Automatic Modes
    - b. Safeties and Alarms
  - 4. Contractor shall provide all fuel required during testing and shall fill the diesel generator tank upon completion of testing and acceptance.

### **3.04 ON-SITE ACCEPTANCE TEST**

- A. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. Testing shall include pressure testing of the tank and of the interstitial secondary containment space. The District shall be notified in advance and shall have the option to witness the tests. Installation acceptance tests to be conducted on-site shall include a "cold start" 100% load pickup test, a two hour full load test, and a one step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary. Contractor is to re-fuel the sub-base tank to 100% capacity after the completion of all tests.
- B. Demonstration of complete system operation for acceptance testing by Factory Representative during initial on-site testing. This testing shall be a witness test.

### **3.05 OPERATIONS AND MAINTENANCE MANUAL**

- A. Provide three (3) sets of the system Operations and Maintenance Manual as "As-Installed" documentation three (3) weeks after completion of installation and start-up. This manual shall include the following:
  - 1. Project Description
    - a. Complete project description, including equipment serial numbers for generator sets.
  - 2. Introduction
    - a. Describes the major components and power of the system.
  - 3. Safety Precautions
    - a. Describes system operation and maintenance precautions.
  - 4. Operation
    - a. Describes generator set operations.
  - 5. Periodic Maintenance
    - a. Describes necessary procedures to maintain the system.
  - 6. Adjustments
    - a. Describes generator set adjustments.
  - 7. Troubleshooting
    - a. Describes generator set troubleshooting.

8. Generator Set Manual
  - a. Include a copy of the generator set manuals.
9. Wiring Diagrams
  - a. Include all system wiring diagrams.
10. Copy of factory and on-site test reports.
11. Glossary
  - a. Includes a list of specialized terms and their meanings.

### **3.06 TRAINING**

- A. The equipment manufacturer shall provide maintenance and operational training to the District's personnel. There shall be a 4 hours allowance for on site training. A training date shall be scheduled and coordinated with the District.

### **3.07 SPARE PARTS**

- A. The equipment manufacturer's distributor shall stock critical control components in quantities as needed in the local or nearest field service office. These parts shall typically be printed circuit boards, control fuses, LEDs, breakers, and isolating relays. This shall be part of the manufacturer's Parts Department's standard procedure and the cost of these spare parts shall not be added to the proposal.

END OF SECTION

## ATTACHMENT A

## GENERATOR SIZING CALCULATIONS

Generator sizing calculations based on the following requirements:

**Load Step 1:**

Heaters	Control Panel Heaters, 120V, 0.5 kW, 100% PF
Lighting	Control Panel and Outdoor Lighting, 120V, 0.3 kW, 95% PF
Control/ Instrumentation	UPS, 120V, 1.5 kVA Output, 90% PF, 90% Eff
Motor load:	Pump No. 1, 6.5 HP, 230V, 3-Ph, 91% Running Power Factor, 87% Efficiency, NEMA Design Letter B, NEMA Code Letter L, 3505 RPM, Solid State Reduced Voltage Started, 400% Current Limit.

**Load Step 2:**

Motor load:	Pump No. 2, 6.5 HP, 230V, 3-Ph, 91% Running Power Factor, 87% Efficiency, NEMA Design Letter B, NEMA Code Letter L, 3505 RPM, Solid State Reduced Voltage Started, 400% Current Limit.
Miscellaneous	Convenience Receptacle, 120V, 1.0 kW, 90% PF

Maximum starting voltage dip shall not exceed 25% of nominal voltage. Maximum frequency dip shall not exceed 5% of nominal frequency.

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**SECTION 26 36 23  
AUTOMATIC TRANSFER SWITCH  
(Bid Alternate)**

**PART 1 GENERAL**

**1.01 WORK INCLUDED**

- A. This specification covers the equipment and services necessary for the design, manufacture, factory testing, delivery, installation supervision, site testing and startup of a complete and operable automatic transfer switch with programmed transition. Equipment shall be new, factory tested, and delivered ready for installation. The transfer switch shall be compatible with the diesel engine generator system specified herein. Transfer switch is to be installed in an empty section of the Pump Station Control Panel by the Control Panel Manufacturer. Provide ATS Section with suitably sized space heaters, control thermostat and humidistat.

**1.02 QUALITY ASSURANCE**

- A. Automatic transfer switch shall be UL1008 listed, CSA certified, comply with the NEMA ICS 2-447, and conform to applicable requirements of NFPA 99, and 110, and CEC.

**1.03 SUBMITTALS**

- A. Supplier shall furnish six (6) sets of submittals containing the following information for District's approval:
1. Specification and data sheets.
  2. Manufacturer's published warranty documents.
  3. Shop drawings showing plan and elevation views with certified overall dimensions.
  4. Schematic control diagrams and wiring diagrams.
  5. Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
  6. Factory test reports.
  7. Manufacturer's installation instructions.

**1.04 SERVICE CAPABILITY**

- A. The equipment supplier shall have qualified service engineers available. These engineers shall be available on a 24-hours, 7-days per week basis. The service facility shall be located within 100 miles radius from the project site.

**1.05 WARRANTY**

- A. Shall be provided for all products against defects in materials and workmanship, for two year period from the start-up and acceptance date, per the manufacturer's Base Coverage Warranty.

**PART 2 PRODUCTS****2.01 TRANSFER SWITCH REQUIREMENTS**

- A. General
  - 1. Complete factory assembled transfer equipment with electronic control designed for surge voltage isolation, voltage sensors on all phases of both sources, linear operator, positive mechanical and electrical interlocking, and mechanically held contacts.

**2.02 RATINGS**

- A. Transfer switch shall have ampacity and voltage ratings as indicated on the Drawings. The switch shall have a minimum withstand and closing rating of 30 kA RMS (when used with molded case circuit breakers).
- B. Main contacts shall be rated for 600 VAC minimum.
- C. Transfer switch shall be rated to carry 100 percent of rated current continuously in the enclosure. Circuit breaker type transfer switches do not meet this specification.
- D. Transfer switch shall be continuously rated in ambient temperatures of -40 to +50 degrees C, relative humidity up to 95% (non-condensing), and altitudes up to 10,000-feet.

**2.03 CONSTRUCTION**

- A. Transfer switch shall be double-throw, electrically and mechanically interlocked, and mechanically held in both positions.
- B. Transfer switch shall be equipped with permanently attached manual operating handles and quick-break, quick-make over-center contact mechanisms suitable for safe manual operation under load.
- C. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent interphase flashover.
- D. Provide two (2) sets of Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 A, 250 VAC.

- E. Transfer switch shall be mounted inside a section of the Pump Station Control Panel by the Control Panel manufacturer. Transfer switch manufacturer shall provide required wire bend space at point of entry and installation instructions for all enclosure door mounted devices.
- F. Transfer switch shall be supplied with a switched neutral pole where indicated on the Drawings. The neutral pole shall be of the same construction and have the same ratings as the phase poles. All poles shall be switched simultaneously using a common crossbar. Equipment using add-on accessory overlapping contacts are not acceptable.

#### **2.04 TRANSFER SWITCH CONTROL FEATURES**

- A. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600 VAC. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.
- B. All transfer switch sensing shall be configurable from an operator panel or from PC-based service tool. Designs utilizing DIP switches or other electromechanical devices are not acceptable.
- C. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device to prevent transfer to the generator service.
- D. The transfer switch shall provide a relay contact signal prior to transfer or re-transfer. The time period before and after transfer shall be adjustable in a range of 0 to 60 seconds.
- E. The control system shall be designed and prototype tested for operation in ambient temperatures from - 40 degrees C to + 60 degrees C (- 40 to +140 degrees F). It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.
- F. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.

#### **2.05 AUTOMATIC CONTROLS**

- A. Control panel shall be microprocessor based with sealed membrane pushbuttons for operator controlled functions, and LED lamps for system status indication. Control panel shall include an alphanumeric display for detailed system information. Panel display and indicating lamps shall include permanent labels.
  - 1. The indicator panel LEDs shall display:

- a. Which source the load is connected to (Source 1 or Source 2)
  - b. Which source or sources are available
  - c. When switch is not set for automatic operation, the control is disabled
  - d. When the switch is in test/exercise mode
2. The indicator shall have pushbuttons that allow the operator to activate the following functions:
    - a. Activate pre-programmed test sequence
    - b. Override programmed delays, and immediately go to the next operation
    - c. Reset the control by clearing any faults
    - d. Test all of the LEDs by lighting them simultaneously
  3. The alphanumeric digital display shall be vacuum fluorescent-type, clearly visible in both bright sunlight and no-light conditions over an angle of 120 degrees, and shall display the following:
    - a. AC voltage for all phases, normal and emergency
    - b. Source status: connected or not connected.
  4. The display panel shall be password-protected, and allow the operator to view and make adjustments:
    - a. Set nominal voltage and frequency for the transfer switch
    - b. Adjust voltage and frequency sensor operation set points
    - c. Set up time clock functions
    - d. Set up load sequence functions
    - e. Enable or disable control functions including program transition
    - f. View real-time clock data, operation log (hours connected, times transferred, failures) and service history
- B. Control Functions: Functions managed by the control shall include:
1. Software adjustable time delays:
    - a. Engine start (prevents nuisance genset starts in the event of momentary power fluctuation): 0 to 120 seconds
    - b. Transfer normal to emergency (allows genset to stabilize before load is transferred): 0 to 120 seconds
    - c. Re-transfer emergency to normal (allows utility to stabilize before load is transferred from genset): 0 to 30 minutes
    - d. Engine cooldown: 0 to 30 minutes
    - e. Programmed transition: 0 to 60 seconds

2. Undervoltage sensing: all-phase normal, all-phase emergency source.
  3. Over-voltage sensing: all-phase normal, all-phase emergency source.
  4. Over/under frequency sensing:
    - a. Pickup: +/- 5 to +/-20% of nominal frequency
    - b. Dropout: +/-1% beyond pickup
    - c. Dropout time delay: 0.1 to 15.0 seconds
    - d. Accurate to within +/- 0.05 Hz
  5. Voltage imbalance sensing:
    - a. Dropout: 2 to 10%
    - b. Pickup: 90% of dropout
    - c. Time delay: 2.0 to 20 seconds
  6. Phase rotation sensing:
    - a. Time delay: 100 msec
  7. Loss of single-phase detection:
    - a. Time delay: 100 msec
- C. Control features shall include:
1. Programmable genset exerciser: A field-programmable control shall periodically start and run the generator with or without transferring the load for a preset time period, then re-transfer and shut down the generator after a preset cool-down period.
  2. In event of a loss of power to the control, all control settings, real-time clock setting and the engine start-time delay setting shall be retained.
  3. The system shall continuously log information including the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. An event recorder shall store information, including time and date-stamp, for up to 50 events.
  4. Re-Transfer Inhibit Switch: Inhibits automatic re-transfer control so automatic transfer switch will remain connected to emergency power source as long as it is available regardless of condition of normal source.
  5. Transfer Inhibit Switch: Inhibits automatic transfer control so automatic transfer switch will remain connected to normal power source regardless of condition of emergency source.
- D. Control Interface
1. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.

- E. Engine Starting Contacts
  - 1. One isolated and normally closed pair of contacts rated 10A at 32 VDC minimum.

## **2.06 FRONT PANEL DEVICES**

- A. Provide devices to be mounted on pump control panel door consisting of:
  - 1. Transfer Switch Control Panel
  - 2. A key-operated selector switch to provide the following positions and functions:
    - a. Test - Simulates normal power loss to control for testing of generator set. Controls shall provide for a test with or without load transfer.
    - b. Normal - Normal operating position.
    - c. Retransfer - Momentary position to override retransfer time delay and cause immediate return to normal source, if available.
- B. Transfer switch position and source available lamps.

## **PART 3 EXECUTION**

### **3.01 FACTORY TESTS**

- A. Transfer switch shall be tested at the factory to verify functionality and operational sequence.
- B. A certified test report shall be issued, confirming the results of this testing. Copies of test specifications and all performance test data shall be included in project submittals.

### **3.02 INSTALLATION**

- A. Installation of transfer switch inside a section of the Pump Station Control Panel by the Control Panel manufacturer, including point to point power cable and control wiring installation. The transfer switch manufacturer's representative shall provide periodic inspection and supervision to ensure conformance to installation drawings and instructions.
- B. Field installation of the transfer switch section shall be performed by the contractor at location indicated on the Drawings. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

**3.03 START-UP AND TESTING**

- A. The equipment manufacturer shall provide factory trained personnel to perform the following field services:
- B. Verify that equipment has not been damaged during shipment.
- C. Visual Inspection of Installation, including:
  - 1. Transfer switch mounting
  - 2. System interconnection wiring.
- D. Normal Check-Out Procedures For All System Functions:
  - 1. Verify Manual and Automatic Modes
  - 2. Time delays and pick-up/drop-out settings

**3.04 ON-SITE ACCEPTANCE TEST**

- A. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer. Demonstration of complete system operation for acceptance testing by Factory Representative during initial on-site testing of the diesel generator set. This testing shall be a witness test.

**3.05 OPERATIONS AND MAINTENANCE MANUAL**

- A. Provide three (3) sets of the system Operations and Maintenance Manual "As-Installed" documentation three (3) weeks after completion of installation and start-up. This manual shall include the following:
  - 1. Project Description
    - a. Complete project description, including equipment serial number for transfer switch.
  - 2. Introduction
    - a. Describes the major components and power of the system.
  - 3. Safety Precautions
    - a. Describes system operation and maintenance precautions.
  - 4. Operation
    - a. Describes transfer switch operations.
  - 5. Periodic Maintenance
    - a. Describes necessary procedures to maintain the system.
  - 6. Adjustments
    - a. Describes transfer switch adjustments.

7. Troubleshooting
  - a. Describes transfer switch troubleshooting.
8. Wiring Diagrams
  - a. Includes system wiring diagrams.
9. Copy of factory and on-site test reports.
10. Glossary
  - a. Includes a list of specialized terms and their meanings.

### **3.06 TRAINING**

- A. The equipment manufacturer shall provide maintenance and operational training to the District's personnel. There shall be 2 hour of on site training. A training date shall be scheduled and coordinated with the District.

### **3.07 SPARE PARTS**

- A. The equipment manufacturer's distributor shall stock critical control components in quantities as needed in the local or nearest field service office. These parts shall typically be printed circuit boards, control fuses, LEDs, transformers, and isolating relays. This shall be part of the manufacturer's Parts Department's standard procedure and the cost of these spare parts shall not be added to the proposal.

END OF SECTION



**SECTION 31 00 00**  
**EARTHWORK**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. The general extent of all excavation, fill and grading is shown on the Plans.
- B. Section Includes:
  - 1. Removal of excess and unsuitable material from the site.
  - 2. Excavation of material to allow for the placement of underground structures, including any necessary shoring and bracing.
  - 3. Backfilling of underground conduit, pipe, and structures.
  - 4. Preparation of subgrade for concrete slab work and pavement.
  - 5. Furnish and compact artificial fill.
  - 6. Finish grading.
- C. Related Sections:
  - 1. Section 31 50 00 - Excavation Support and Protection.
  - 2. Section 31 23 16 - Trenching.
  - 3. Section 32 11 23 - Aggregate Base Course.
  - 4. Section 31 00 00 Earthwork

**1.02 REFERENCES**

- A. Associated General Contractors (AGC):
  - 1. Manual of Accident Prevention in Construction (Section 9).
- B. American Society for Testing and Materials (ASTM):
  - 1. C 131 - Test Method for Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - 2. C 136 - Test Method for Sieve Analysis of Fine and Course Aggregates.
  - 3. D 422 - Standard Test Method for Particle - Size Analysis of Soils.
  - 4. D 1556 - Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method.
  - 5. D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m).
  - 6. D 2419 - Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
  - 7. D 2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

8. D 3017 - Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
  9. D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- C. Division of Industrial Safety (DIS).
  - D. Institute of Makers of Explosives (IOMOE).
  - E. Occupational Safety and Health Act (OSHA).
  - F. State of California Department of Transportation (Caltrans).

### 1.03 DEFINITIONS

- A. Excavation: Consists of satisfactory loosening, removing, loading, transporting, depositing, and compacting in final location, wet and dry materials, necessary to be removed for purposes of construction, or as required for ditches, grading, roads, and such other purposes as are indicated on the Plans.
- B. Backfill Adjacent to Structure: Is backfill around the exterior surfaces of a structure from the bottom of the excavation to finish grade.
- C. In-Place Density of Compacted Backfill: Is density determined in accordance with ASTM D 1556, or with ASTM D 2922 and ASTM D 3017.
- D. Maximum Density: Is maximum density obtained in laboratory when tested in accordance with ASTM D 1557 and ASTM D4253 for levee toe drain aggregate.
- E. Definitions Related to Compaction of Coarse Fill:
  1. One Pass: Defined as one movement of roller over area being compacted.
  2. Measurement Of Pass Width: Measure width of pass between centers of outside tires or outside edge of roller wheel.
- F. Optimum Moisture Content: Is the optimum content at the maximum density when tested in accordance with ASTM D 1557.

### 1.04 SYSTEM DESCRIPTION

- A. Performance Requirements:
  1. General:
    - a. Obtain acceptable material from other sources if surplus or borrow materials obtained within project site do not conform to specified requirements or are not sufficient in quantity for structural backfill.
    - b. No extra compensation will be made for hauling fill materials or for water required to compact fills.
  2. Subgrade Preparation:

- a. Where mud or other soft or unstable material is encountered, remove such material to a minimum of 12 inches. The bottom of the over-excavation should then be completely covered with geotextile and backfilled with crushed rock. The stabilization fabric should be wrapped around the backfill up to the bottom of the excavation.
  3. Structural Backfill:
    - a. Material for Backfill: As specified in these specifications
  4. Compacted Fills:
    - a. Provide specified compaction for backfill, fill, and other earthwork.
    - b. The District will perform confirmation tests to verify and confirm that work has complied, and is complying at all times, with requirements specified in this Section concerning field quality control testing.
  5. Borrow Area:
    - a. Where borrow material is required, provide such material from source selected by the Contractor, subject to acceptance by the Engineer, but not necessarily from within project site.
    - b. Use of imported borrow shall not cause additional cost to the Contract.
- B. Environmental Requirements:
1. Keep excavations reasonably free from water.
  2. Provide standby power to ensure continuous dewatering in case of power failure.

#### **1.05 SUBMITTALS**

- A. Product Data: Submit material source, gradation, and testing data for all materials, including imported and on-site materials.
- B. Test Reports: Submit certified test reports of all tests specified to be performed by the Contractor. Test reports shall be signed and sealed by a registered geotechnical engineer in the state of California.
- C. Excavation Plan: Submit proposed excavation plan which shall include a detailed description of materials and equipment to be used, limits of excavation, material stockpile locations, and a shoring plan in accordance with Section 31 50 00.
- D. Dewatering Plan: Proposed dewatering plan including arrangement, location, and depths of system components, type, and sizes of filters, water sample, and required permits.

#### **1.06 QUALITY ASSURANCE**

1. Compaction Sequence Requirements: Until specified degree of compaction on previously specified amounts of earthwork is achieved, do not perform additional earthwork of the same kind.

2. After satisfactory conclusion of initial compaction demonstration and at any time during construction, provide confirmation tests as directed by the Engineer.
3. Dewatering: Dispose of water from dewatering in accordance with District requirements.

### **1.07 SEQUENCING AND SCHEDULING**

- A. Schedule earthwork operations to meet requirements as provided in this Section for excavation and uses of excavated material.
- B. Excavation and Filling: Perform excavation and filling, during construction, in manner and sequence that provides drainage at all times.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Water for Compacting Fills: Use water from source acceptable to Engineer.
- B. Fill Materials:
  1. General:
    - a. Provide aggregate base course, select material, bedding, engineered fill and native material, where required for fill and backfill.
    - b. Obtain material for fills from cut sections or from borrow sources.
    - c. Provide material having maximum particle size not exceeding 1 inch and that is free of trash, lumber, debris, leaves, grass, roots, stumps, and other vegetable matter.
    - d. Fill materials provided shall be free of environmental contaminants.
    - e. Materials derived from processing demolished or removed asphalt concrete are not acceptable.
    - f. Proposed imported fill shall be approved by the Engineer at least five working days prior to site delivery. Compliance testing for aggregate base may require up to ten days.
  2. Crushed Rock: Crushed rock for mat foundation underlayment, pipe bedding, and where necessary to stabilize excavation bottoms shall be a clean, durable uniformly graded rock between ½ inch and 1½ inch size.
  3. Aggregate Base Course: As specified in Section 32 11 23.
  4. Controlled Density Fill (CDF): CDF shall be self compacting upon backfilling placement and shall be composed of cementitious materials, aggregates, water, and an air-entraining admixture, as follows:
    - a. Cementitious materials shall be Portland cement in combination with fly ash.
    - b. Admixture shall be an air-entraining agent.

- c. CDF admixture shall contain no aggregate larger than 3/8 inch. Amount passing a No. 200 sieve shall not exceed 12 percent. No plastic fines shall be present.
  - d. Total calculated air content shall not exceed 30 percent, as tested in accordance with ASTM C231.
  - e. CDF shall have an unconfined compressive strength at 28 days from a minimum of 50 psi to a maximum of 150 psi.
  - f. The in-place unit weight of CDF shall not exceed 120 pcf.
5. Pipe Bedding Material:
- a. Crushed rock as defined herein and as shown on the Plans.
6. General Fill:
- a. Material for general site filling should be obtained from suitable native or import material as described herein.
  - b. Trench backfill above the pipe zone shall be general fill.
7. Native Material:
- a. Sound, earthen material passing 1 inch sieve.
  - b. Free from sod, large lumps, boulders, rocks, roots, brush, or other objectionable material, and free of hazardous materials as defined by Section 25117 of the State Health and Safety Code.
  - c. Percent of material by weight passing Number 200 sieve shall not exceed 30 when tested in accordance with ASTM C 136.
  - d. Expansion index less than 35.
8. Imported Materials:
- a. Imported materials shall be in conformance with Section 19 of the State Standard Specifications, these Technical Specifications for their intended use, and approved by the Engineer prior to use. The Contractor shall submit for review information on all backfill materials to be used on the project giving a description of the source of the material, environmental history and past uses of the property at the source location, quantity of material and the purpose for which it is intended.
  - b. Imported materials shall conform to the following gradation as tested in accordance with ASTM D422:

<u>Sieve</u>	<u>Percentage of Dry Material Passing by Weight</u>
3/4"	100
3/8"	70 – 90
3/16"	55 – 85
No. 8	45 – 75
No. 40	20 – 50

No. 100	0 – 10
No. 200	0 – 3

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verification of Conditions:
1. Character and Quantity of Material:
    - a. Verify character and quantity of rock, gravel, sand, silt, water, and other inorganic or organic materials to be encountered in work to be performed.
    - b. Determine gradation and shrinkage of excavation and fill material, and suitability of material for use intended in work to be performed.
    - c. Determine quantity of material, and cost thereof, required for construction of excavations and fills, whether from on-site excavations, borrow areas, or imported materials. Include in cost of work to be performed.
    - d. Include wasting of excess material, if required, in cost of work to be performed.
    - e. All excavated soils will need to be segregated, cleaned, and/or screened prior to re-use (Native Material).
    - f. The Contractor shall, prior to submitting his bid, visit the site and become familiar with actual site and soil conditions. No allowance will be made by the District for any unfavorable conditions or events which should have been foreseen from a thorough examination of the contract documents, the site, and working conditions.
- B. Verification of Prepared Subgrade prior to Constructing Improvements:
1. The Contractor shall request the Engineer to visually inspect and provide written confirmation of the suitability of prepared subgrade soils prior to the continuation of work.
    - a. Work completed without such confirmation is at the Contractor's risk and subject to removal at the direction of the Engineer.
    - b. The Engineer will perform this inspection no later than two working days after the Contractor makes his request.
  2. Contractor shall protect excavation prior to and during the inspection.
    - a. The Contractor remains solely responsible for excavation safety. This responsibility is not waived when the Engineer agrees to enter the work site for inspection.

#### **3.02 PROTECTION**

- A. If existing live utilities are encountered, they are to be protected from damage

and the proper authorities and affected utility companies notified.

- B. Record unmarked utility locations on record drawings and notify the Engineer.
- C. Open excavations, trenches, and the like are to be protected with fences, barricades, covers and railings as required.
- D. Every precaution shall be taken to prevent spillage when hauling on or adjacent to any public street or highway. Any spillage shall be promptly removed.

### **3.03 SAFETY**

- A. In conformance with Section 31 50 00, the Contractor is solely responsible for excavation safety, including support to all adjacent improvements at all times.

### **3.04 PREPARATION**

- A. Surface Preparation:
  - 1. Preparing Ground Surfaces for Fill or Concrete:
    - a. After clearing, grubbing and stripping is completed, scarify entire areas which underlie fill sections or structures to a depth of 6 inches and until surface is free of ruts, hummocks, and other features which would prevent uniform compaction by equipment to be used.
    - b. Moisture condition and recompact areas to density specified in "Compacted Fills" before placing of fill material or concrete.
    - c. Where cemented rock, cobbles, or boulders compose a large portion of foundation material underlying structures, slabs, or paved areas, it may not be advisable to scarify the top 6 inches prior to compaction. If the ENGINEER deems it advisable not to scarify existing natural ground, then moisten the native soil and compact it as specified in "Compaction of Coarse Fill."
    - d. Where subgrade stabilization is required, scarification and compaction of native soils is not practical. In these instances stabilize the subgrade by placing geotextile and crushed rock as shown on the plans and/or specified herein.
    - e. Finished compacted subgrade shall be firm and non-yielding under the weight of compaction equipment. If the relative compaction of the subgrade is less than specified, or the surface of the subgrade exhibits significant yielding, over-excavate the area and rebuild or rework the area until the subgrade compaction conforms to this specification.
  - 2. Preparing for Backfill:
    - a. After completion of foundation footings and walls and other construction below the elevation of the final grades and prior to backfilling, all forms shall be removed and excavation shall be cleaned of all trash and debris.

- b. After inspection of foundation, walls, and pipes, backfill shall be placed symmetrically to prevent eccentric loading upon or against structures.
- c. All backfill shall be compacted per the requirements of this specification or as indicated on the plans.

### 3.05 APPLICATION

#### A. General:

1. Dispose of excavated materials which are not required or unsuitable for fill and backfill in lawful manner.
2. Dispose of surplus material on private property only when written permission agreement is furnished by owner of property. Submit copies of such agreements.
3. Obtain material required for fills in excess of that produced by excavation from borrow areas subject to the fill material requirements specified herein.
4. Rocks, broken concrete, or other solid materials larger than 4 inches in greatest dimension shall not be placed in fill areas, but removed from project site at no additional cost to the Contract.
5. Stabilization of Subgrade: Provide materials used or perform work to stabilize subgrade so it can withstand loads which may be placed upon it by CONTRACTOR's equipment.
6. No material larger than 1" shall be placed in the first two feet below subgrade.

#### B. Excavation:

1. Excavations for Structures:
  - a. All excavations shall comply with Section 31 50 00, Excavation Support and Protection.
  - b. Dimensions and Elevations of Excavations: Provide excavations conforming to dimensions and elevations indicated on the Drawings for each structure, including trenching for adjacent piping and all work incidental thereto.
  - c. Soil of Unsuitable Bearing Value: Where soil is encountered having unsuitable bearing value, ENGINEER may direct in writing that excavation be carried to elevations above or below those indicated on the Drawings.
  - d. Unless directed by the ENGINEER, excavations shall not be carried below elevations indicated on the Drawings.
  - e. Bottom of Excavations for Structures: Consist of native material with top 6 inches compacted to 95 percent of maximum density and graded to conform to outside limits of structures as indicated on the Drawings, except where otherwise indicated on the Drawings or specified.
2. Necessary Over Excavation:



- a. General:
    - 1) Where it becomes necessary to excavate beyond normal lines of excavation in order to remove boulders or other interfering objects, backfill voids remaining after removal as specified in Backfilling of Voids, or as acceptable to the Engineer.
    - 2) Perform necessary excavation beyond normal lines as specified above and backfill such voids.
  - b. Backfilling of Voids:
    - 1) Fill voids with suitable material acceptable to the Engineer, placed in manner and to same uniform density as surrounding material.
    - 2) With acceptance of the Engineer, concrete may be used.
- C. Compaction:
- 1. Compacted Fills:
    - a. Lines and Grades:
      - 1) Construct fills, and backfills, designated herein as fills, at locations and to lines and grades indicated on the Plans.
  - 2. Where required, Contractor shall provide necessary imported fill material from outside sources.
    - a. Compacted Fill Shape and Sections: Provide completed fill that corresponds to shape of typical sections indicated on the Plans or that meets requirements for particular case.
    - b. Preparation of Areas Designated to Receive Fill Material: Scarify to minimum depth of 6 inches, unless otherwise indicated on the Drawings, and recompact to density of fill material as specified in following Article.
    - c. Fills and Backfills and Upper 6 Inches in Cuts: Compact to percentage of maximum density as follows and as determined by ASTM D1557:
      - 1) Backfill adjacent to structures: 95 percent.
      - 2) Under present and future structures: 95 percent.
      - 3) Under paved areas not subject to traffic loading, curbs, and sidewalks: 90 percent.
      - 4) Other areas: 85 percent.
      - 5) Demolition areas: 95 percent.
    - d. Placing Compacted Fills:
      - 1) Placement: Place loose material in successive layers that do not exceed 8 inches in thickness after compaction.
      - 2) Moisture Content: Bring each layer to specified moisture content for maximum density before compaction by rolling.
      - 3) Each successive lift shall be firm and non-yielding under the weight of construction equipment.
      - 4) Defective Compacted Fills: Remove and recompact.

### 3.06 FIELD QUALITY CONTROL

- A. Tests:

1. Confirmation Tests:
    - a. CONTRACTOR shall accomplish specified compaction for backfill, fill, and other earthwork.
    - b. CONTRACTOR may, at his option, arrange for conformation testing through his own forces or a testing laboratory.
    - c. Confirmation testing is only for the Contractor's benefit and shall not substitute for Compliance Tests as specified herein.
    - d. Control operations in response to confirmation tests and District Compliance Testing to verify that compaction work complies, and is complying at all times, with requirements specified in this Section concerning compaction, control, and testing.
    - e. Cost of Confirmation Tests: Paid for by the CONTRACTOR.
    - f. Confirmation Test submittals are not required.
  2. Compliance Tests:
    - a. Compliance tests will be made by the ENGINEER to verify that compaction is meeting requirements specified herein.
    - b. The District's Testing Laboratory will perform confirmation testing as acceptable to the ENGINEER.
    - c. CONTRACTOR shall coordinate with ENGINEER regarding the frequency of Compliance Testing and testing results.
    - d. Copies of Compliance Test Reports will be submitted promptly to the ENGINEER for disbursement to CONTRACTOR.
    - e. Coordination with ENGINEER Testing: Remove overburden above level at which the ENGINEER wishes to test and backfill and recompact excavation after testing is completed.
    - f. If compaction fails to meet specified requirements, perform remedial work by one of the following methods:
      - 1) Remove and replace backfill at proper density.
      - 2) Bring density up to specified level by other means acceptable to the ENGINEER.
    - g. Retesting:
      - 1) Costs of Retesting: Costs of retesting required to confirm and verify that remedial work has brought compaction within specified requirements shall be borne by the CONTRACTOR.
      - 2) The District's Compliance Tests During Performance of Remedial Work will be performed as follows:
        - a) Tests will be performed in a manner acceptable to the ENGINEER.
        - b) Frequency: Double amount specified for initial confirmation tests.
- B. Tolerances:
1. Finish Grading of Excavations, Backfill and Fills:

- a. Perform fine grading under concrete structures such that finished surfaces are never above established grade or approved cross section and are never more than 0.10 feet below.
  - b. Provide finish surface areas outside of structures that are not more than 0.10 feet above or below established grade or accepted cross section.
2. Of Areas Which Are Not under Structures, Concrete, Asphalt, Roads, Pavements, Walks, Dikes and Similar Type Items:
- a. Provide finish graded surfaces of either undisturbed natural soil, or cohesive material not less than 6 inches deep.
  - b. Intent of preceding is to avoid sandy or gravelly areas.
3. Finished Grading Surfaces:
- a. Reasonably smooth, compacted, and free from irregular surface changes.
  - b. Provide degree of finish that is ordinarily obtainable from blade grader operations, except as otherwise specified.
  - c. Uniformly grade areas which are not under concrete.
  - d. Finish gutters and ditches so that they drain readily.

### **3.07 WET WEATHER AND WET SOIL CONDITIONS**

- A. To the maximum extent possible within schedule constraints, major excavation should take place during periods of suitable weather conditions.
- B. The continuous presence of groundwater at the project sites is expected.
- C. When the moisture content of fill materials is significantly above optimum:
  1. Scarify and air dry until fill materials have a suitable moisture content for compaction; or
  2. Over-excavate the fill and replace with suitable on-site or import materials with an appropriate moisture content; and/or
  3. Install a geotextile or geogrid to reinforce soft fill.
  4. Chemically treat with lime, kiln-dust, or cement to reduce the moisture content and increase the strength of the fill.

### **3.08 CONTROL OF WATER**

- A. Water may be encountered within the Work at any time, and the presence of such water is likely to be continuous. Contractor shall control site water so that work may be done in the dry in a safe working environment according to relevant provisions of the Safety Orders.
- B. Contractor may discharge disposal water to the District's sewer system provided the following requirements are met:

1. Prior to beginning any continuous dewatering activity, the Contractor shall provide a sample of disposal water to the District for testing.
    - a. The District will allow the suspended particles to settle out of solution prior to testing the sampled water. (Water samples taken during initial studies included suspended particles that contained metals.)
    - b. All confirmation samples will be submitted to a State-certified analytical laboratory for chemical analysis.
  2. If groundwater contamination is confirmed by District testing, a change order will be negotiated to cover additional work performed by the Contractor.
  3. The District may periodically resample disposal water from dewatering activities. These test costs will be borne by the District under separate contract.
- C. If the Contractor chooses to discharge any water to the storm drain system, the Contractor shall adhere to the requirements within the State Water Resources Control Board NPDES General Permit Requirements (Order No. 2009-0009-DWQ) for Risk Level 1 sites. The Contractor shall also obtain a waste discharge permit from the Regional Water Quality Control Board (RWQCB). Permit requirements are available for download on the State Water Resource Control Board's website (<http://www.waterboards.ca.gov>).
- D. During excavation operations, if the Contractor encounters suspected contaminated water, the Contractor shall immediately implement the CSEDWP and stop the disposal of excavated groundwater. Any non-contaminated water that becomes mixed with contaminated water shall be designated as contaminated water and shall be handled and disposed as such at no additional cost to the District. Contractor will not be paid for handling and disposal of the volume of non-contaminated water at the negotiated contaminated price, if it is mixed with contaminated water.
- E. If contaminated water is discovered, the Contractor shall identify a minimum of one disposal site that is permitted to and will accept the contaminated water expected for disposal. The Contractor shall select facilities that are established, fully operational, and in full compliance with all applicable federal, state, and local regulations.
- F. All construction equipment used for the handling of contaminated material shall be decontaminated prior to use for other work elements or removal from site.
- G. Prior to the preparation of bedding or subgrade, the excavation shall be thoroughly dewatered by the use of sump pumps and dewatering equipment as necessary to safely convey water away from structural excavations.
- H. The Contractor shall prevent surface water (e.g. rainwater) and subsurface or groundwater from flowing into excavations and from flooding the project site and surrounding areas.
- I. The Contractor shall remove all water which accumulates in all excavations

during the progress of work so that all work can be done in the dry. Excavated areas shall be kept free from water while structures are constructed, while concrete is setting and until backfill has been placed to a sufficient height to anchor the work against possible floatation.

- J. Contractor shall implement sufficient measures to limit the inflow of groundwater so that the maximum allowed dewatering pumping rate of 50 gpm is sufficient to keep excavated areas free from water.
- K. Sufficient pumping equipment for immediate use shall be on the project site at all times, including standby pumps for use in case other pumps become inoperable. Water shall be disposed of so as to cause no injury to public or private property, or to be a menace to the public health.
- L. Dewatering devices shall be adequately filtered to prevent the removal of fines from the soil.
- M. The Contractor shall be responsible for any damage to foundations or other parts of existing structures or of the new work, caused by the failure of any part of the Contractor's protective works.
- N. Depending upon groundwater conditions and the degree of project completion, underground structures are susceptible to floatation prior to backfill and anchorage. Contractor shall prevent the floatation or movement of structures during construction.
- O. After dewatering is no longer necessary, all dewatering pumps and appurtenances shall be removed by the Contractor.

### **3.09 ADJUSTING**

- A. Finish Grades of Excavations, Backfilling and Fill:
  - 1. Repair and reestablish grades to required elevations and slopes due to any settlement or washing way that may occur from action of the elements or any other cause prior to final acceptance.
- B. Finish Grades of Excavations, Backfilling and Fill:
  - 1. Protect newly graded areas from action of the elements.

**\*\*END OF SECTION\*\***

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## **SECTION 31 10 00 SITE PREPARATION**

### **PART 1 GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes: Clearing, grubbing, and stripping Project Site areas in preparation for the construction of improvements.
- B. Related Sections:
  - 1. Section 01 50 00 - Temporary Facilities and Controls.
  - 2. Section 01 56 39 - Tree Care and Protection.

#### **1.02 DEFINITIONS**

- A. Clearing: Consists of removal of natural obstructions and existing foundations, buildings, fences, lumber, walls, stumps, brush, weeds, rubbish, trees, boulders, utility lines, pavement, and any other items which shall interfere with construction operations or are designated for removal.
- B. Grubbing: Grubbing shall consist of the removal and disposal of wood or root matter below the ground surface remaining after clearing and shall include stumps, trunks, roots, or root systems greater than 1 inch in diameter or thickness.
- C. Stripping: Stripping shall include the removal and disposal of all organic sod, topsoil, grass and grass roots, and other objectionable material remaining after clearing and grubbing from the areas designated to be stripped. The depth of stripping shall be 6 inches, subject to field conditions and the Engineer's approval.

#### **1.03 QUALITY ASSURANCE**

- A. Regulatory Requirements: Verify and comply with applicable regulations governing noise, dust, nuisance, drainage and runoff, fire protection, and disposal.
- B. Pre-construction Conference: Discuss order and method of Work.

#### **1.04 PROJECT CONDITIONS**

- A. The Contractor shall adhere to appropriate methods recommended by the Bay Area Air Quality Management District to minimize airborne pollution, including but not limited to frequent watering of open trenches, covering of excavated dirt and related actions.

#### **1.05 SEQUENCING AND SCHEDULING**

- A. Clearing and Grubbing: Perform clearing and grubbing in advance of grading operations.

**PART 2 PRODUCTS**

Not Used.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verification of Conditions: Examine site and verify existing conditions for beginning Work.

**3.02 PREPARATION**

- A. Protect existing improvements from damage by site preparation work. Install fence at drip line of trees to remain as indicated on the Plans.

**3.03 INSTALLATION**

- A. Site Clearing:
  - 1. Clear work areas of all surface and subsurface deleterious materials, including abandoned buried structures, utilities, irrigation lines, pavements, debris, trees, shrubs and associated roots.
    - a. Tree root balls shall be removed down to a depth of at least 3 feet below finished grade.
  - 2. Remove all associated foundations, as well as buried utilities unless otherwise noted on the Plans.
  - 3. All vegetation, debris, and deleterious materials shall be removed from areas to be graded.
- B. Site Stripping:
  - 1. Strip the site to remove surface organic materials.
  - 2. Strip organics from the ground surface to a depth of at least 2 to 3 inches below the surface.
    - a. Actual depth of stripping should be evaluated by the Geotechnical Engineer's field representative during construction.
    - b. The use of organics in future landscape areas shall be approved by the District's field representative.
    - c. The District's field representative shall evaluate site vegetation at the time of grading to assess the feasibility of mulching organics in place.
- C. Grubbing:
  - 1. From Excavated Areas: Grub stumps, roots, and other obstructions 1 inch or over in diameter to depth of not less than 36 inches below finish grade.
  - 2. Backfill and compact cavities left below subgrade elevation by removal of stumps or roots to density of adjacent undisturbed soil.



**3.04 PRESERVATION OF PROPERTY**

- A. The Project area shall be cleared and grubbed **only** to the extent necessary to accommodate the work in conformance with the notes and details shown on the plans. Trees or growth shall not be trimmed back unnecessarily. Attention is directed to Section 01 56 39 regarding the protection of trees.
- B. Contractor shall take extreme care not to damage shrubs, trees, fences, irrigation systems and other improvements of adjacent property owners.
- C. All existing improvements not specifically designated on the Plans to be removed or relocated shall remain in their original condition and location undisturbed. However, upon written permission by the Engineer, existing improvements may, for the convenience of the Contractor, and at his expense, be removed and temporarily relocated during construction and shall be replaced in their original location in as good or better condition as when the Contractor entered upon the work site

**3.05 DEMOLITION OF SURFACE IMPROVEMENTS**

- A. Removal of sidewalks, curbs and gutters, driveways, concrete slabs and pavement if necessary, shall be in accordance with the provisions of Section 15-3 of the State Standard Specifications.
- B. Curbs, gutters, sidewalks, driveways, slabs and pavement shall be removed by full depth saw cut to the nearest joint from the lines shown on the plans or as directed by the Engineer.
- C. Where the plans indicate construction under existing asphalt pavement or the replacement of existing asphalt pavement, the existing pavement shall be removed and disposed of off-site.

**3.06 DEMOLITION OF SUBSURFACE IMPROVEMENTS**

- A. Removal of buried boxes, utilities, previously abandoned facilities, and other obstructions to the Work shall be in accordance with provisions of Section 15 of the State Standard Specifications.
- B. Buried obstructions shall be removed to the extent necessary to safely prosecute the Work. Portions of the obstruction may be left in place if the Work can be completed per the Plans and Specification.
- C. Demolished subsurface structures, or portions thereof, shall not become part of the Work and be removed from the site and disposed of legally.
- D. The excavation created to demolish subsurface improvements shall be backfilled in accordance with the Plans and Specifications, to match the surrounding backfilled areas.
- E. Areas that are over-excavated to facilitate subsurface demolition shall be backfilled to the subgrade elevation with a clean, durable uniformly graded rock between  $\frac{3}{4}$  inch and  $1\frac{1}{2}$  inch size.

**3.07 REMOVAL OF DEBRIS**

- A. All demolished and cleared material and equipment shall become the property of the Contractor and shall be legally disposed of by the Contractor.
- B. Demolished concrete shall not be buried in structure backfill areas.

END OF SECTION

**SECTION 31 11 00  
CLEARING AND DEMOLITION**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Furnish all labor, materials, equipment, facilities, transportation and services to complete all clearing and demolition and related work as shown on the plans and/or specified herein.
- B. **Work Included:** All work necessary to move or remove and legally dispose of all interfering or objectionable material from the project site, including but not necessarily limited to tree branches, brush, shrubs, weeds, debris, roots, rocks, concrete rubble, concrete masonry units, pipe, concrete curbs and gutters, asphalt pavement, concrete structures and concrete slabs, but only as required.

**1.02 DEFINITIONS**

- A. **Clearing:** Clearing shall consist of cutting, removing, and disposing of trees, shrubs, brush, limbs, and other vegetative growth. Clearing shall also include the removal and disposal of trash piles, rubbish and fencing, and the preservation of trees, shrubs, and vegetative growth which are not designated for removal.
- B. **Grubbing:** Grubbing is the removal and disposal of wood or root matter below the ground surface remaining after clearing.
- C. **Stripping:** Stripping refers to the removal and disposal of all organic sod, topsoil, grass, and grass roots; all evidence of surface improvements and other objectionable material remaining after clearing and grubbing.
- D. **Demolition:** The removal of existing structures, portions of existing structures, equipment, utilities, concrete curbs, sidewalks, and driveways, pipelines and other appurtenances.

**PART 2 PRODUCTS**

Not Used.

**PART 3 EXECUTION****3.01 EQUIPMENT**

Equipment shall be suitable for the work to be done and shall be in good operating condition. Equipment operators and workmen are to be skilled in such operations and shall be competently supervised.

**3.02 CLEARING, GRUBBING AND STRIPPING**

Clear, grub and strip areas to be excavated or surfaced.

**3.03 DEMOLITION**

- A. Remove existing structures, portions of existing structures, and equipment called for on the plans and as directed by the Engineer.
- B. Contractor shall not demolish existing facilities beyond the limits designated on the drawings unless specifically directed to do so by the Engineer.
- C. Demolition of electrical equipment shall adhere to the requirements herein and per specification the requirements detailed in Division 26 of these specifications.

**3.04 PRESERVATION OF PROPERTY**

- A. The project area shall be cleared and grubbed **only** to the extent necessary to accommodate the work in conformance with the notes and details shown on the plans. Trees or growth shall not be trimmed back unnecessarily. Attention is directed to Section 3.05 of this specification section, regarding the protection of trees.
- B. Contractor shall take extreme care not to damage shrubs, trees, fences, irrigation systems and other improvements adjacent to the project site.
- C. All existing improvements not specifically designated on the plans to be removed or relocated shall remain in their original condition and location undisturbed. However, upon written permission by the District, existing improvements may, for the convenience of the Contractor, and at his expense, be removed and temporarily relocated during construction and shall be replaced in their original location in as good or better condition as when the Contractor entered upon the work site.

**3.05 TREE PROTECTION**

- A. No cutting of any part of trees to remain, including roots, shall be done without direct supervision of the District's arborist.
- B. Contractor shall protect all trees within the project limits at all times from damage by workers and equipment. Repair all minor damage to existing trees by using a licensed tree surgeon or other personnel approved by the District Arborist. Remove such trees permanently disfigured or killed, including roots from the site and replace each such tree or trees with equal sized trees if possible, or reimburse the District the cost listed below if such replacement is not possible. The District Arborist shall

be the sole judge of the condition of any tree. Provide regular watering of existing landscaping within the construction area through the construction period.

### **3.06 DEMOLITION OF SURFACE IMPROVEMENTS**

- A. Curbs, gutters, sidewalks, driveways, slabs and pavement shall be removed by full depth saw cut to the nearest joint from the lines shown on the plans or as directed by the Engineer.
- B. Asphalt pavement disturbed during construction shall be replaced; the existing pavement shall be removed and disposed of off-site. Asphalt removal and replacement shall conform to Section 32 12 16 of these Specifications.

### **3.07 DEMOLITION OF UNDERGROUND PIPE AND PUMP STATION**

- A. Demolition of underground pipe shall be only as shown on the Drawings or necessary as determined in the field by the Engineer.
- B. Pump station and connecting pipes to be abandoned in place shall be filled with lightweight engineered fill conforming to the Plans and these Specifications. Material placed within pipe shall be placed by the use of a horizontal tremie and fill the entire pipe volume.
- C. Temporary re-routed sewer main may be abandoned in place by filling it with controlled density fill (CDF) or lightweight engineered fill conforming to the Plans and these Specifications. Material shall be placed by the use of a horizontal tremie and fill the entire pipe volume.
- D. Portions of interfering pipelines removed from the trench shall be replaced with bedding material, controlled density fill or select backfill as appropriate, in conformance with the Plans and these Specifications.

### **3.08 ROOT REMOVAL**

- A. The roots encountered during the course of Work, either trees removed previously on site or bushes removed as part of the Work, shall be removed to a depth of at least 24 inches below the natural grade.
- B. All exposed surface roots beyond the stump area shall be removed to a depth of at least 12 inches below the natural grade.
- C. Holes and depressions remaining after stump and root removal shall be filled per the Drawings.

### **3.09 REMOVAL OF DEBRIS**

- A. All demolished and cleared material shall become the property of the Contractor and shall be legally disposed of by the Contractor.

- B. Removed concrete and asphalt concrete shall be legally disposed of off the right-of-way at a location provided by the Contractor. Demolished concrete shall not be buried in structure backfill areas.

**\*\*END OF SECTION\*\***

**SECTION 31 22 00  
GRADING**

**PART 1 GENERAL**

**1.01 Work Included**

1. Rough and finish grading of all work sites.
2. Dust control measures.
3. Cleanup, removal and disposal of excess material.
4. Provision of all material, equipment, and labor necessary to complete the specified work,
5. Contractor shall obtain all necessary permits for trench and excavation work.
6. Contractor shall implement and comply with erosion control measures to prevent run-off of sediment and other unsuitable materials to the storm drain system.

**1.02 Related Sections**

1. Earthwork: Section 31 00 00
2. Trenching: Section 31 23 16
3. Excavation Support and Protection: Section 31 50 00

**1.03 References**

1. California Department of Transportation (Caltrans) – Standard Specifications, current edition.
2. ASTM D 1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).

**1.04 Quality Assurance**

- A. All work under this section is subject to the review, inspection and approval of the District and his designated consultants, including registered geotechnical engineers.
- B. Compaction testing shall be performed by the District with a California registered geotechnical engineer or by a District-approved independent testing laboratory under the supervision of a California registered geotechnical engineer.
- C. Finish grades shall not vary by more than one tenth of one foot (0.10') from the elevations shown on the Contract Drawings.

- D. The minimum allowable relative compaction shall be 90%. Where indicated in the Contract Documents, relative compactions greater than 90% are required but in no instance shall the relative compaction be less than 90%. Compactions shall be determined using ASTM D 1557.

**END OF SECTION**



**SECTION 31 23 16**  
**TRENCHING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Trench excavation, fine grading, pipe bedding, backfilling, and compaction for the following:
  - 1. Sewage Piping.
  - 2. Electrical conduits.
  - 3. Pull boxes and other accessories.
  
- B. Related Sections:
  - 1. Earthwork: Section 31 00 00
  - 2. Excavation Support and Protection: Section 31 50 00

**1.02 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. C 131 - Test Method for Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - 2. C 136 - Test Method for Sieve Analysis of Fine and Course Aggregates.
  - 3. D 1556 - Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method.
  - 4. D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.lbf/ft<sup>3</sup> (2,700 kN.m/m<sup>3</sup>)).
  - 5. D 2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 6. D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

**1.03 SUBMITTALS**

- A. Products Data: For all proposed bedding and backfill materials.
  - 1. Material source.
  - 2. Gradation.
  - 3. Testing data and testing laboratory qualifications including lab certification.
  
- B. Trench excavation plan, drawings, and calculations as specified in Section 31 50 00.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. General:
  - 1. Provide bedding and backfill material per Section 31 00 00.

**PART 3 EXECUTION****3.01 PREPARATION**

- A. General:
  - 1. Trench Condition:
    - a. Install pipe and materials as specified herein and detailed on the Drawings.
  - 2. Embankment Condition:
    - a. Exists where width of pipe trench exceeds limits specified herein.
    - b. Before laying pipes or electrical conduits in fill, place fill and compact it to not less than 2 feet above top of pipe or conduit.
    - c. After placing and compacting fill, excavate through fill and fine grade as required in this Section.
  
- B. Protection: Stabilize excavation as specified in Section 31 50 00.

**3.02 INSTALLATION**

- A. Trench Excavation:
  - 1. General Requirements:
    - a. If because of soil conditions, safety requirements or other reasons, trench width at top of pipe is increased beyond width specified in this Section and shown on the plans, upgrade laying conditions or install stronger pipe designed in conformance with Specifications for increased trench width, without additional cost.
    - b. Pipe and Electrical Conduits:
      - 1) Lay pipe and electrical conduits, and associated location wire and warning tape in open trench; install pipe bedding as shown on the Plans.
      - 2) If bottom of excavation is found to consist of rock or any material that by reason of its hardness cannot be excavated to provide uniform bearing surface, remove such rock or other material to a depth of not less than 4 inches below bottom of pipe and refill to grade with bedding material placed at uniform density, with minimum possible compaction, at no additional cost.
      - 3) If bottom of excavation is found to consist of soft or unstable material which is incapable of properly supporting pipe, remove such material to a depth and for the length required, as determined by the ENGINEER, and then refill trench to grade with crushed rock and compacted to 90 percent maximum density.
      - 4) In all locations where Bay Mud is encountered Geotextile filter fabric (Mirafi 500X or approved equal) shall be placed at the bottom of the final excavation, on the sides, and on top of the bedding material. Minimum overlap of the filter fabric shall be 12 inches.
    - c. Trench Widths: as shown on drawings
    - d. For Manholes, Valves, or Other Accessories:
      - 1) Provide excavations sufficient to leave at least 12 inches clear between their outer surfaces and embankment or shoring which may be used to hold banks and protect them.

- 2) Do not backfill with earth under manholes, vaults, tanks, or valves.
- 3) Fill any unauthorized excess excavation below elevation indicated on the Drawings for foundation of any structure with crushed rock at no additional cost. Backfill material may be substituted for crushed rock in areas where foundation material is not required and when approved by the ENGINEER.
- 4) Backfilling of Manhole Excavation: Conform to backfilling requirements as specified for trenches in this Section.
- e. At Road Crossings or Existing Driveways:
  - 1) Make provision for trench crossings at these points, either by means of backfills, tunnels, or temporary bridges.

B. Pipe Bedding:

1. Bedding material shall be as scheduled herein unless otherwise specified or shown on the drawings.
2. General:
  - a. Over excavate bottom of trench to allow installation of at least 6 inches, or 1/12 outside diameter of pipe, whichever is greater.
  - b. Place bedding material at uniform density, with minimum possible compaction.
3. Bell or Coupling Holes:
  - a. Dig holes after trench fine grading has been placed.
  - b. Provide holes of sufficient width to provide ample room for grouting, banding, or welding.
  - c. Excavate holes only as necessary in making joints and to ensure that pipe rests upon prepared trench bottom and not supported by any portion of the joint.
4. Depressions for Joints, Other than Bell-and-spigot:
  - a. Make in accordance with recommendations of joint manufacturer for particular joint used.
5. Bedding material shall be as scheduled herein unless otherwise specified.
6. After Pipe Laid:
  - a. Place bedding material under, around, and above pipe to 12 inches above top of pipe in maximum 6-inch lifts and compact to 90 percent of maximum density.
7. Pipe Displacement:
  - a. Take necessary precautions in placement and compaction of bedding material to prevent displacement of piping.
  - b. In event there is movement or floating, re-excavate, re-lay, and backfill the pipe.
8. Consolidation:
  - a. Bedding shall be mechanically compacted at optimum moisture content or above according to ASTM D1557 with vibratory or other compaction equipment. Water settling methods such as flooding and poling or jetting are prohibited.

C. Trench Backfill:

1. Backfill material shall be as specified in Section 31 00 00.
2. Place and compact backfill in accordance with following requirements:

- a. From 6 inches above top of pipe to natural surface level. Match finish grade as indicated on the Drawings.
  - b. Trench Backfill from 6 inches above top of pipe to finish grade with backfill material compacted to 95 percent of maximum density.
  - c. Existing Conditions: Where existing underground pipes or conduits larger than 3 inches in diameter cross trenches above new work:
    - 1) Backfill from bottom of intersecting trench to spring line of intersecting pipe or conduit with backfill material compacted to 90 percent of maximum density when tested in accordance with ASTM D 1556 or ASTM D 2922.
      - a) Provide controlled density fill material as specified in Section 31 00 00 below existing pipe or conduit where backfill cannot be placed and compacted as specified. Controlled density fill shall have a minimum thickness of 12 inches beneath the existing pipe or conduit and shall extend up to the springline of the pipe or conduit. Controlled density fill shall extend a minimum of 12 inches beyond the outside of the pipe or conduit in either direction and as a minimum shall extend to the edge of the trench crossing the pipe or conduit.
    - 2) Extend backfill material 2 feet on either side of intersecting pipe or conduit to ensure that material remains in place while other backfill is placed.
  - d. Backfill shall be mechanically compacted at optimum moisture content or above according to ASTM D1557 with vibratory equipment weighing no more than 12 tons static weight. All backfill shall be placed in maximum 8-inch lifts. Water settling methods such as flooding and poling or jetting are prohibited.
- D. Native or Import Material:
1. Native or Import material meeting the requirements within Section 31 00 00 shall be used as backfill.
- E. Excess Material:
1. Remove excess excavated material and any excavated Bay Mud from the project site and dispose of legally off-site.

### 3.03 FIELD QUALITY CONTROL

- A. Shall meet the compaction and testing requirements in Section 31 00 00-3.06
- B. Testing Pipe:
- a. After Bedding the Pipe, CONTRACTOR Has the Following Option To:
    - 1) Test pipe as specified in Section 33 31 15.
    - 2) Backfill to surface, at his own risk, before testing pipe.
  - b. If pipe does not pass test, uncover pipe, locate leaks, repair and retest, repeating until pipe section under test passes.

**END OF SECTION**

**SECTION 31 23 23  
LIGHTWEIGHT ENGINEERED FILL**

**PART 1 - GENERAL**

**1.01 DOCUMENTS**

The General Conditions and all other Contract Documents for this project are complementary and applicable to this Section of the Specifications.

**1.02 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment, facilities, transportation and services for the placement of lightweight engineered fill as shown on the Drawings and specified herein.
- B. **Related Work Specified Elsewhere**
  - 1. Clearing and Demolition: Section 31 11 00.
  - 2. Cast in Place Concrete: Section 03 30 00.

**1.03 REFERENCE STANDARDS**

ASTM C150                      *Portland Cement*

**1.04 QUALITY ASSURANCE**

- A. Skilled workmen who are trained, experienced and familiar with the specified requirements and methods for proper performance of this work shall be used.
- B. Specialized batching, mixing, and placing equipment shall be automated.
- C. Proposed engineered fill material shall have been successfully applied on ten projects which have performed satisfactorily for at least ten years.

**1.05 SUBMITTALS**

- A. List of projects demonstrating compliance with these requirements.
- B. Mix Design: Mix design shall be submitted and shall show names and brands of all materials, proportions, slump, strength, gradation of coarse and fine aggregates, and location to be used on job.
- C. Product Data: Manufacturer's catalog sheets including instructions for use and description of application shall be provided on each of the following materials:
  - 1. Portland Cement
  - 2. Lightweight Aggregate
  - 3. Admixtures
  - 4. Curing Compounds
  - 5. Chemical Hardener

- D. **Weight and Batch Tags:** Weight and batch tags will be supplied to the engineer upon request.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. **Lightweight Aggregate:** Lightweight aggregate shall be Perlite or approved equal.
- B. **Cement:** Portland cement shall comply with ASTM C150. The mix shall be designed by the manufacturer of the engineered fill.
- C. **Water:** Potable water free from deleterious amounts of alkali, acid, and organic materials that would adversely affect the setting time or strength of the engineered fill shall be used.
- D. **Admixtures:** Admixtures may be used when specifically approved by the manufacturer of the engineered fill.

### 2.02 PROPERTIES

- A. Engineered fill shall meet the following requirements:

Maximum dry density	90 pcf
Maximum wet density	100 pcf
Minimum compressive strength at 28 days	1,000 psi
Coefficient of permeability	0.00001 cm/sec at 2.0 psi

## PART 3 - EXECUTION

### 3.01 JOB CONDITIONS

- A. The Contractor shall, prior to submitting his bid, visit the site and become familiar with actual site working conditions. No allowance will be made by the District for any unfavorable conditions or events which should have been foreseen from a thorough examination of the contract documents, the site and working conditions.
- B. Correct conditions detrimental to timely and proper completion of work. Do not proceed until unsatisfactory conditions are corrected.

### 3.02 INSTALLATION

- A. Installation of engineered fill shall be in accordance with the procedures provided by the manufacturer.
- B. The area to be filled shall not have any standing water in it prior to placement of engineered fill.
- C. Any items to be encased in the fill shall be properly set and stable prior to the installation of engineered fill. The placement of fill shall be sequenced to allow the

- construction of all proposed improvements, without the need to remove fill placed prior to the construction of those structures.
- D. Cast the engineered fill in lifts as recommended by the manufacturer. The material shall be placed in such a manner to prevent segregation. The final surface finish shall be within  $\pm 0.1$  foot of the elevation shown on the Drawings.

### **3.04 TESTING**

- A. During placement of the initial batches, check the density and adjust the mix as required to obtain the specified cast density at the point of placement.
- B. Sampling and Testing: The District's agent will perform sampling and testing of materials during placement. Contractor shall accommodate for the testing procedures and supply materials as requested.

### **3.05 COMPLETION**

- A. Construction traffic loads shall not be placed on areas supported by lightweight engineered fill until that fill has reached its 28-day compressive strength.
- B. At the completion of fill placement, the site shall be left in a clean and finished condition.

**\*\*END OF SECTION\*\***

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**SECTION 31 23 33**  
**EXACATION, BACKFILL, AND COMPACTION**

**PART 1 -- GENERAL**

**1.1 DESCRIPTION**

- A. Work included: Excavate, trench, backfill, and compaction for pipelines, structures, conduits, inlets, sidewalks, and other work, to the required lines and grades as indicated on the drawings.
- B. If an existing pipeline is encountered that is not indicated on the Drawings or in the specifications, or is not indicated with reasonable accuracy, and if the pipeline is within or encroaches upon the specified limits of excavation, notify the Engineer immediately.

**1.2 REFERENCES**

- A. American Standard of Testing Materials (ASTM):
  - 1. D1557 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
  - 2. D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate Nuclear Density (Shallow Method)

**1.3 QUALITY ASSURANCE**

- A. The District will take samples and perform tests to determine compliance with the specified compaction requirements.
  - 1. Compaction requirements are specified as relative compaction and expressed as a percentage. Relative compaction is the ratio of the field in-place dry density to the laboratory maximum dry density.
  - 2. Laboratory maximum dry density will be determined in accordance with ASTM D1557.
  - 3. Field in-place density and field in-place moisture will be determined in accordance with ASTM D6938.
- B. Foundation material at subgrade will be inspected by the District's Engineer. No subsequent construction work shall be performed until the foundation material has been approved.

**1.4 SUBMITTALS**

- A. Submit in accordance with the Submittal Procedures.
- B. Submit copy of Cal/OSHA excavation permit prior to excavation work.

## 1.5 JOB CONDITIONS

### A. Existing utilities:

1. Locations of known underground utilities and structures are shown on the drawings as they are supposed to exist. Appurtenances and service laterals are not usually shown if their presence can be inferred from the presence of other visible facilities.
2. Locations shown may be based on information furnished by the utility owners at the time of design, derived from visible surface facilities, or based on subsurface exploration by the District.
3. If a utility facility is encountered which was not shown on the drawings or identified in the specifications, and is in conflict with the work, immediately notify the utility owner and the Engineer in writing and arrange for necessary work.

### B. Excavation safety:

1. All excavation work and all work in the vicinity of an excavation shall be in full conformance to:
  - a. Article 6, Excavations, of the Construction Safety Orders in addition to other applicable safety requirements.
2. No excavation work shall be performed until Contractor has submitted to the Engineer the Contractor's designation of Competent Persons.
3. A designated Competent Person, with authority to inspect the work and supervise conformance with Article 6, shall be on site at all times whenever any excavation work or work in or about an excavation is in progress.

## PART 2 -- PRODUCTS

### 2.1 BACKFILL MATERIALS

#### A. Class I Backfill:

1. Shall be clean, sound, and durable natural or crushed sand, free from organic material and other deleterious substances.
2. Measured resistivity of material passing the No. 4 sieve, using a soil resistivity box in accordance with ASTM G57, shall not be less than 3000 ohm-cm.
3. Soil pH shall be measured in accordance with ASTM G51 and shall not be less than 6.5.

4. The sand equivalent value as determined by California Test 217 shall not be less than 30.
5. Shall conform to the following grading when tested in accordance with ASTM C 136:

Sieve Size	Percent Passing
19.00mm (3/4-inch)	100
4.75mm (No. 4)	70-100
2.36mm (No. 8)	30-100
0.075mm (No. 200)	0-15

B. Class III Backfill:

1. Shall be material free of roots, organic matter, and other deleterious substances, and shall not contain rocks or unbroken masses of soil larger than 3-inch in greatest dimension.
2. Plasticity index shall not exceed 15, determined in accordance with ASTM D 4318.

C. Class I and Class II Drain Rock:

1. Shall be clean and durable gravel or crushed stone.
2. Shall not slake nor decompose with alternate wetting and drying.
3. Class I drain rock shall have a sand equivalent value not less than 75 as determined by California Test 217.
4. Shall conform to the following grading when tested in accordance with ASTM C 136:

<u>Sieve Size</u>	<u>Percent Passing</u>	
	<u>Class I</u>	<u>Class II</u>
1-1/2-inch	-	100
1-inch	100	-
3/4-inch	90-100	95-100
3/8-inch	40-100	-
No. 4	25-40	0-7
No. 8	18-33	0-3
No. 30	5-15	-
No. 50	0-7	-
No. 200	0-3	-

## D. Aggregate Base:

1. Class 2, 3/4 –inch maximum aggregate size free from vegetable matter and other deleterious substances, and of such nature that aggregate can be compacted readily under watering and rolling to form a firm, stable base.
2. Materials derived from processing demolished or removed asphalt concrete are not acceptable.
3. Coarse aggregate material retained in Number sieve shall consist of material of which at least 25 percent by weight shall be crushed particles when tested in accordance with California Test 205.
4. Aggregate shall not be treated with lime, cement, or other chemical material before Durability Index test is performed.
5. Aggregate grading and sand equivalent tests shall be performed to represent not more than 500 cubic yards or one day's production of material, whichever is smaller.
6. Grade within the limits and conform to quality requirements as follows when tested in accordance with California Test 202:

Sieve Sizes (Square Openings)	Percent Weight Passing Sieve	by
1-inch	100	
3/4-inch	90-100	
No. 4	35-55	
No. 30	10-30	
No. 200	2-9	

Quality Requirements		
Description	California Test	Minimum Test Result
Resistance (R Value)	301	78
Sand Equivalent	217	22
Durability Index	229	35

**PART 3 -- EXECUTION****3.1 EXCAVATION**

## A. General:

1. All lines and grades will be established by the Contractor. The Contractor shall carefully preserve all survey stakes and reference points as far as possible. Should any stakes or points be removed or destroyed during the installation, they may be reset at the Contractor's expense.
  2. Notify the District a minimum of three working days prior to work when survey monuments will be disturbed or when the trench edge will be within 3 feet from the closest edge of the monument, so the District can reference the monument. Disturbed monuments will be relocated by the District. Cost for relocation shall be borne by the Contractor.
  3. Remove all materials encountered that would interfere with the completion of the work.
  4. Blasting will not be permitted.
  5. Keep excavation dry throughout construction operations.
  6. Store excavated materials to minimize obstruction to traffic.
  7. Use proper tools and equipment to break pavement to the correct lines. Sawcut existing concrete or asphalt concrete pavement.
  8. Excavated surfaces shall be properly graded to provide good drainage.
- B. Stripping:
1. Topsoil and other materials unsuitable for use in the work shall be removed from excavation and fill areas as required to expose satisfactory material or foundation. Do not remove or damage any trees not specifically shown on the drawings to be removed.
  2. Topsoil and other unsuitable materials shall be offhauled and disposed of off District property.
- C. Excavation:
1. Excavate to the required lines and grades shown on the drawings.
  2. Select material from the excavation, meeting the requirements specified in Article 2.1 A, shall be used for backfill where indicated.
  3. Remove and dispose of excess excavated material and excavated material not approved by the Engineer for use as backfill, in accordance with accepted disposal plan.
  4. Trench excavation shall follow the alignment of the pipe centerline and shall be in accordance with the Drawings.
- D. Excavation shall be supported or excavated so that:

1. Adjoining ground shall be prevented from sliding or settlement.
  2. Existing improvements of any kind shall be fully protected from damage.
  3. Worker protection is provided as required by Cal/OSHA.
- E. Foundation Inspection:
1. Give the Engineer a minimum two workdays notice to schedule an inspection of the foundation material at subgrade.
  2. Clear subgrade of all loose material, blow or broom clean.
- F. Over Excavation:
1. Ordered by Engineer. The Engineer may order overexcavation and backfilling to subgrade where foundation material for structures, pipe, or other work is considered to be unsatisfactory. Limits for overexcavation and backfill will be determined by the Engineer. The Contractor shall remove such unsatisfactory material and shall fill or backfill the overexcavation with lean concrete, select backfill material or imported material as directed by the Engineer. Material other than lean concrete shall be placed and compacted as specified for structure backfill, as directed by the Engineer. Overexcavation and backfill ordered by the Engineer will be paid for as extra work on a force account basis as provided in the General Conditions.
  2. Caused by the Contractor. Potholes or local depressions in the subgrade within the limits of structures and all other overexcavation resulting from the Contractor's operations, and not ordered by the Engineer or shown on the drawings, shall be backfilled as specified in paragraph 1 above, but no additional payment will be made for such overexcavation and backfill.
- G. Excavation required beyond trench limits:
1. Excavation (bell holes) where necessary in the sides and bottom of the trench at pipe joint locations shall be large enough to make joints and permit District inspection.
  2. Excavation to a greater depth than shown on the drawings may be ordered by the Engineer if the native material at the bottom of the trench will not provide proper support for the pipe or if the excavation is in rock.

### 3.2 UTILITIES

#### A. Location:

1. Contractor is responsible for having all underground utilities and structures located in advance of excavation.
  - a. Notify all known owners of underground utilities in the area of proposed work and Underground Service Alert, 800-642-2444 or 800-227-2600, at least two working days before the start of actual excavation.
  - b. Identify the area to be excavated as required by Government Code 4216.2.

#### B. Excavation around utilities:

1. Excavation and other work under or adjacent to utilities shall not interfere with their safe operation and use.
2. Probe carefully to determine the exact location of utility, and hand excavate where necessary to avoid damages. Hand excavation is required within 24" on either side of the exterior surface of any underground utility (except nonpressurized sewers, drain lines, and storm drains) as that utility has been located by the utility owner for the Contractor except:
  - a. Power-driven or power-operated equipment may be used for the removal of pavement if there are no utilities in the pavement.
  - b. Power-driven or power-operated equipment may be used to any depth with agreement of the utility owner.
3. In the event of damage incurred during construction to such structures or property, Contractor shall immediately notify the owners and other authorities, and shall arrange for immediate repairs.
4. Notify the local fire department every time damage to a gas utility results in a leak or suspected leak or when damage to any utility results in a threat to the public.

### 3.3 STRUCTURE AND TRENCH BACKFILL

#### A. General:

1. Prior to backfilling, the excavation shall be cleared of all loose material, wood, and debris.
2. Backfill to level of original ground surface, to underside of pavement base course, or as shown on drawings.

3. Remove sheeting, shoring, and bracing using methods that minimize caving. Metal sheeting, shoring and bracing, may be left in place on approval of Engineer.
- B. Catch basin, inlet, structures, and equipment pad structure backfill:
1. When material beneath the foundation grade for structures is required to be excavated, the excavation shall be backfilled with select backfill or imported backfill as shown, placed and spread in successive, approximately horizontal lifts not exceeding 6" in loose thickness.
  2. The sides of structures shall be backfilled as shown on the drawings.
  3. Backfill material, except CLSM shall be placed and spread in successive, approximately horizontal lifts, not exceeding 8" in loose thickness.
- C. Trench backfill:
1. Pipe bedding shall be placed uniformly and graded to provide a uniform surface on which the sewer pipe is to be laid. The bedding material shall be compacted, rolled, or vibrated into a dense state such that bedding material is in a stable condition. Pipe bedding shall be coarse, clean rock conforming to the following gradation:

Sieve Size	percent passing
2"	100
1 1/2"	90-100
3/4"	5-30
3/8"	0-5
NO. 200	0-2

2. Trench backfill shall be controlled low strength material aggregate base.
3. Backfill material, except CLSM shall be placed and spread in successive, approximately horizontal lifts, not exceeding 8" in loose thickness.
4. Low points along the pipe trench shall not be backfilled until all backfill at adjacent higher elevation has been completed. Water collecting at the low points shall be removed by pumping or other approved means to avoid softening of adjacent ground. Sump pumps shall be supplied to prevent accumulation of water in the trench.
5. If the trench has been excavated below the specified bottom, either through error or by order of the Engineer, that portion of the trench shall be backfilled with the same materials as the portion immediately above. See Article 3.1, this section.



### 3.4 COMPACTION

- A. Relative compaction for non-CLSM backfill shall be as specified below:
1. Relative compaction for the various types of fill or backfill shall be as specified below:
  2. Structural fill or backfill except drain rock:
    - a. For sides of structures, compact each lift to not less than 90% relative compaction.
    - b. For structure foundation material, compact each lift to not less than 95% relative compaction.
  3. Drain rock: Compact each lift with a minimum of two complete coverages of a vibrating roller or plate type of equipment.
  4. Pipe and conduit beddings: 95% compaction.
  5. Pipe and conduit backfill above beddings: Compact to not less than 90% relative compaction up to 3 feet below grade. Compact to 95% relative compaction within 3 feet of grade.
  6. Compaction by saturation with water is not allowed.
- B. At the time of compaction, the moisture content of backfill material shall be such that the required relative compaction will be obtained. Condition material which contains insufficient moisture or excess moisture until the moisture content is such that the required relative compaction will be obtained.
- C. Compaction equipment shall be standard types capable of producing the specified relative compaction with the specified backfill materials.
- D. Hand-operated tampers shall be used only in areas which are inaccessible to self-propelled or towed mechanical compacting equipment, or where damage to existing facilities by the use of self-propelled or towed compacting equipment is probable. Only hand-operated motor driven compacting equipment shall be driven or used over pipelines until the backfill has been compacted to a depth of 24" over the crown of the pipe.
- E. If the compacted backfill material fails to pass the compaction test requirements of these specifications, no additional material shall be placed until the unsatisfactory backfill has been reworked or replaced and satisfactory compaction test results are obtained.
- F. Pipe bedding shall be compacted to 90% relative compaction.

**3.5 MAINTENANCE**

- A. The Contractor shall maintain backfill in a satisfactory manner until the final completion and acceptance of all the work included in the contract.
- B. Any approved material which, after being satisfactorily placed in backfill, is lost before the completion and final acceptance of the work shall be replaced by the Contractor in a manner satisfactory to the Engineer without cost to the District.

**END OF SECTION**

**SECTION 31 50 00  
EXCAVATION SUPPORT AND PROTECTION**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Requirements for designing, furnishing and installing, maintaining, and removing excavation support and protection.
- B. Related Sections:
  - 1. Section 31 23 16 - Trenching.
  - 2. Section 31 00 00 – Earthwork.

**1.02 REFERENCES**

- A. American Institute of Steel Construction, Inc. (AISC):
  - 1. Manual of Steel Construction Allowable Stress Design.
- B. American Society of Civil Engineers:
  - 1. Guidelines of Engineering Practice for Braced and Tied-Back Excavations.
- C. California Code of Regulations (CCR):
  - 1. Title 8 - Construction Safety Orders.
- D. California Labor Code Sections 6705 to 6707 (CLC).
- E. Department of the Navy Naval Facilities Engineering Command (NAVFAC):
  - 1. NAVFAC Design Manual 7.2 - Foundations and Earth Structures.
  - 2. NAVFAC Design Manual 7.3 - Soil Dynamics Deep Stabilization and Special Geotechnical Construction.
- F. International Conference of Building Officials (ICBO):
  - 1. Uniform Building Code (UBC).
- G. State of California Department of Transportation (Caltrans):
  - 1. Caltrans California Trenching and Shoring Manual.
- H. United States Steel Corporation (USS):
  - 1. USS Steel Sheet Piling Design Manual.

**1.03 DEFINITIONS**

- A. General Engineering Design Practice: General engineering design practice in area of the Project, performed in accordance with recent engineering literature on subject of shoring and stability of excavations.
- B. Shoring: A temporary structural system designed to support vertical faces, or nearly vertical faces, of soil or rock for purposes of excavation. Shoring includes internally braced sheet piling, slurry walls, soldier piles and lagging, and other similar shoring systems. Sloping of the soil is not shoring.

**1.04 CONTRACTOR'S RESPONSIBILITIES**

- A. CONTRACTOR assumes full and complete responsibility for excavation support and protection, including shoring design and installation.
- B. The review of CONTRACTOR's shoring system design, submittals and/or installations by the ENGINEER does not relieve CONTRACTOR of his responsibility for excavation safety. This requirement shall apply continuously and is not limited to normal working hours.
- C. CONTRACTOR's reliance upon documents furnished by District does not provide relief from these requirements.

**1.05 SYSTEM DESCRIPTION**

- A. Where General Engineering Design Practice is specified, provide drawings and signed calculations and have design performed by civil or structural engineer registered in California.
  - 1. Provide design calculations that clearly disclose assumptions made, criteria followed, and stress values used for the materials being used.
  - 2. Furnish references acceptable to ENGINEER substantiating appropriateness of design assumptions, criteria, and stress values.
- B. Design Loads:
  - 1. Contractor shall design all shoring elements using the following saturated unit weights of soil:
    - a. Soil = 125 pcf
- C. Design Requirements:
  - 1. General:
    - a. Design means for safe and stable excavations in accordance with general engineering design practice.
      - 1) The preceding requirement shall not apply to trench excavation support conforming to standards set forth in CCR Title 8 - Construction Safety Orders.
    - b. Design steel members in accordance with the Uniform Building Code and the AISC Manual of Steel Design.
    - c. Design shoring involving materials other than steel in accordance with Uniform Building Code.
    - d. When electing to design with material stresses for temporary construction higher than allowable stresses prescribed in the Manual of Steel Construction and the Uniform Building Code, increase in such stresses shall not exceed 10 percent of value of prescribed stresses.
    - e. Minimum safety factor used for design shall not be less than 1.5.
    - f. The calculated minimum depth of penetration of shoring below the bottom of the excavation shall be increased not less than 30 percent if the full value of passive pressure is used in the design.
    - g. The maximum height of cantilever shoring above the bottom of excavation shall not exceed 15 feet. Use braced shoring when the height of shoring above the bottom of excavation exceeds 15 feet.

- h. The location of the point of fixity for shoring shall not be less than half the calculated minimum embedment depth below the bottom of the excavation.
  - i. Generally acceptable references for the design of shoring and excavations are as follows:
    - 1) Caltrans California Trenching and Shoring Manual.
    - 2) NAVFAC Design Manual 7.2 - Foundations and Earth Design.
    - 3) NAVFAC Design Manual 7.3 - Soil Dynamics Deep Stabilization and Special Geotechnical Construction.
    - 4) USS Steel Sheet Piling Design Manual.
    - 5) Guidelines of Engineering Practice for Braced and Tied-Back Excavations published by American Society of Civil Engineers.
  - j. Shoring design shall be performed by a Civil or Structural Engineer licensed to practice in California. Include costs for this shoring design in the bid.
2. Soldier Piles and Lagging:
- a. Soldier pile and lagging systems shall not be used in areas where bay mud soils are present.
  - b. Provide lagging over the full face of the excavation. Joints between pieces of lagging shall be tight to prevent loss of soil.
  - c. Provide full face lagging all around penetrations through the lagging.
  - d. If the soldier piles are installed in predrilled holes, the predrilled holes shall be filled with control density backfill after the soldier piles are installed.
  - e. The effective width of driven soldier piles for passive soil resistance shall not exceed 2 times the width of the pile. The effective width of concrete encased soldier piles for passive soil resistance shall not exceed 2 times the width of the concrete encasement.
  - f. Fill voids behind lagging with gravel or other material acceptable to the ENGINEER.
  - g. Apply loads from tie back soil, rock, or deadman anchors concentrically to soldier piles or wales spanning between soldier piles. Wales shall be back-to-back double channels or other members acceptable to the ENGINEER. Eccentrically loaded with section soldier piles or wales are not acceptable.
  - h. Tie backs shall not be used in bay mud soils.
3. Soil Anchors, Rock Anchors, and Deadmen Anchors:
- a. Design tie back anchors for a safety factor of not less than 2 times the calculated load from the shoring.
  - b. Proof load all production anchors to not less than 125 percent of the calculated load from the shoring. Lock off anchors at the calculated anchor load.
  - c. The length of soil anchors used to calculate resistance to load from the shoring, shall not include any length within the potential active pressure soil failure zone behind the face of shoring.
  - d. Apply load from anchors concentrically to wales and other shoring members.
  - e. Design tie rods for anchors for 130 percent of the calculated load from the shoring.

- f. Design tie rods for anchors for 150 percent of the calculated load from the shoring when tie rod couplers are used and for other conditions where stress concentrations can develop.

D. Performance Requirements:

1. General:
  - a. Support faces of excavations and protect structures and improvements in vicinity of excavations from damage and loss of function due to settlement or movement of soils, alterations in ground water level caused by such excavations, vibration associated with installation and removal of excavation support structures, and related operations.
  - b. Herein Specified Provisions:
    - 1) Complement, but do not substitute or diminish, obligations of CONTRACTOR for the furnishing of a safe place of work pursuant to provisions of the Occupational Safety and Health Act of 1970 and its subsequent amendments and regulations and for protection of the Work, structures, and other improvements.
    - 2) Represent minimum requirement for:
      - a) Number and types of means needed to maintain soil stability.
      - b) Strength of such required means.
      - c) Methods and frequency of maintenance and observation of means used for maintaining soil stability.
2. Provide safe and stable excavations by means of sheeting, shoring, bracing, sloping, and other means and procedures, such as draining and recharging groundwater and routing and disposing of surface runoff, required to maintain the stability of soils and rock.
3. Provide support for trench excavations for protection of workers from hazard of caving ground.
4. Provide Shoring:
  - a. Where, as result of excavation work and analysis performed pursuant to general engineering design practice, as defined in this Section:
    - 1) Excavated face or surrounding soil mass may be subject to slides, caving, or other types of failures.
    - 2) Stability and integrity of structures and other improvements may be compromised by settlement or movement of soils, or changes in soil load on structures and other improvements.
  - b. For trenches 5 feet and deeper.
  - c. For trenches less than 5 feet in depth, when there is a potential for cave-in.
  - d. Where indicated on the Drawings.
5. For safe and stable excavations, use appropriate design and procedures for construction and maintenance to minimize settlement of supported ground and to prevent damage to structures and other improvements, including:
  - a. Using stiff support systems.
  - b. Following appropriate construction sequence.
  - c. Preventing soil loss through or under support system.
    - 1) Provide support system that is tight enough to prevent loss of soil and extend deep enough to prevent heave or flow of soils from supported soil mass into the excavation.

- d. Providing surface runoff routing and discharge away from excavations.
  - e. Where dewatering is necessary, recharge groundwater as necessary to prevent settlement in area surrounding excavation.
  - f. Where sheet piling is used, use interlocking type sheets including interlocking corners. The sheet piles shall be continuous and driven in interlock. If the bottom of the excavation is located below the water table, use "thumb and finger" type interlock.
  - g. Not applying shoring loads to existing structures and other improvements.
  - h. Not changing existing soil loading on existing structures and other improvements.
  - i. Provide welded steel packing between soil retaining members such as sheet piles and wales and similar members when the gap exceeds 1/2 inch before the wales are loaded.
6. Do not use cantilever sheet pile shoring. When sheet piling is used, provide a braced system with a minimum of 2 levels of wales and braces. Locate top level of wales and bracing within 5 feet of the top of the sheets.
  7. Use template for driving sheet piles to minimize need for pulling and redriving sheet piles in the attempt to drive them plumb in areas where bay mud is present.

#### 1.06 SUBMITTALS

- A. Shop Drawings and Calculations:
  1. In accordance with requirements in California Labor Code for trench excavations 5 feet or more in depth and for trenches less than 5 feet in depth when there is potential for cave-in. Submit in advance of excavation work, detailed drawings showing means for safe and stable excavations.
    - a. Where such drawings vary from excavation support standards set forth in California Code of Regulations Title 8 - Construction Safety Orders, submit design calculations pursuant to general engineering design practice.
    - b. Provide means for safe and stable excavations that are not less effective than required in CCR Title 8 - Construction Safety Orders.
  2. For excavations other than trenches, submit, in advance of excavation work, design calculations as performed pursuant to general engineering design practice, as specified in this Section, and detail drawing showing means for safe and stable excavations. In design calculations and detail drawing, cover, as a minimum:
    - a. Excavations adjacent to structures and other improvements, and
    - b. Excavations 5 feet or more in depth, or less than 5 feet in depth when there is potential for cave-in, at other locations.
  3. Submit Following:
    - a. Provide calculations for the different load, support, and other conditions that occur during the sequence of installation of shoring, construction of facilities protected by the shoring, and sequence of removal of shoring.
    - b. Provide sketches showing the condition at various stages of installation and removal of shoring.

- c. Show structures, pipelines, and other improvements located near the shoring, and the shoring on a plan.
  - d. When utilities penetrate the shoring, submit an elevation of all sides of the shoring showing the locations of the penetrations. Submit details on ground support and sealing around utility penetrations.
- B. Control Points and Schedule of Measurements:
  - 1. Submit location and details of control points and method and schedule of measurements in accordance with requirements of this Section.
  - 2. Promptly upon constructing control points and making measurements at such control points, as specified in this Section, submit copy of field notes with such measurements. The field notes shall show the current measurement and the change in measurement from the first measurement taken.
- C. Detailed Sequence of Installation and Removal of Shoring:
  - 1. Consider effects of ground settlement in the sequence of installation and removal of shoring.
  - 2. Provide sketches showing the conditions at various stages in the sequence of installation and removal of shoring.
  - 3. Clay and silt may stick to sheet piles when sheet piles are removed.
- D. Submit submittals for stability of excavations as a complete package and include all items required in this section. Incomplete submittals will not be reviewed and will be returned for resubmittal as a complete package. Complete submittal shall include all necessary information regarding the dewatering system as specified in Section 31 00 00.

### **1.07 SEQUENCING AND SCHEDULING**

- A. Do not begin work on excavations, trenches, and means for providing stability of excavation and trenches until submittals have been accepted by ENGINEER and until materials necessary for installation are on site.
- B. Submit submittals a minimum of 30 days prior to the scheduled date to begin excavation work.
- C. Do not begin construction of any shoring or excavation operations until:
  - 1. Control points as specified in this Section and as indicated on the Drawings on existing structures and other improvements have been established and surveyed to document initial elevations and locations.

### **PART 2 PRODUCTS**

Not Used.



**PART 3 EXECUTION****3.01 INSTALLATION AND REMOVAL**

- A. Install means for providing safe and stable excavations as indicated in the submittals section above.
- B. Except for concrete encased soldier piles, slurry walls, and similar shoring systems, remove shoring by completion of the Work. Select shoring system and method of removal, which will minimize soil that sticks to shoring from creating large voids and causing settlement. To prevent settlement caused by pulling shoring, fill voids with sand, pea gravel, or pressure injected grout. The methods used shall prevent settlement. Pressure preservative treated wood lagging may be left in place when acceptable to the ENGINEER.

**3.02 MAINTENANCE**

- A. Where loss of soil occurs, plug gap in shoring and replace lost soil with fill material acceptable to ENGINEER.
- B. Where measurements and observations indicate possibility of failure or excessive movement of excavation support, determined in accordance with general engineering design practice, take appropriate action immediately.

**\*\*END OF SECTION\*\***

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**SECTION 32 11 23  
AGGREGATE BASE COURSE**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Aggregate base course.

**1.02 REFERENCES**

- A. American Society of Testing and Materials (ASTM):
  - 1. C 117 - Test Method for Material Finer than 75  $\Phi$ M (Number 200) Sieve in Mineral Aggregate by Washing.
  - 2. C 136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
  - 3. D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- B. State of California Department of Transportation.
  - 1. Caltrans - Standard Specifications.

**1.03 SUBMITTALS**

- A. Product Data:
  - 1. Source, gradation, and testing data for aggregate base course.
- B. Quality Control:
  - 1. Test Reports: Reports for tests required by Sections of Caltrans Standard Specifications.
  - 2. Certificates of Compliance: Certificates as required by Sections of Caltrans Standard Specifications.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Storage and Protection: Protect from segregation and excessive moisture during delivery, storage, and handling.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Aggregate Base Course:
  - 1. Class 2, 3/4-inch maximum aggregate size free from vegetable matter and other deleterious substances, and of such nature that aggregate can be compacted readily under watering and rolling to form a firm, stable base.
  - 2. Materials derived from processing demolished or removed asphalt concrete are not acceptable.
  - 3. Coarse aggregate material retained in Number 4 sieve shall consist of material of which at least 25 percent by weight shall be crushed particles when tested in accordance with California Test 205.

4. Aggregate shall not be treated with lime, cement, or other chemical material before the Durability Index test is performed.
5. Aggregate grading and sand equivalent tests shall be performed to represent not more than 500 cubic yards or one day's production of material, whichever is smaller.
6. Grade within the limits and conform to quality requirements as follows when tested in accordance with California Test 202:

Sieve Sizes (Square Openings)	Percent by Weight Passing Sieve
1 inch	100
3/4 inch	90-100
Number 4	35-55
Number 30	10-30
Number 200	2-9

Quality Requirements		
Description	California Test	Minimum Test Result
Resistance (R Value)	301	78
Sand Equivalent	217	31
Durability Index	229	35

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verification of Conditions: Examine conditions upon which the work specified in this Section depends for defects that may influence installation and performance.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

**3.02 PREPARATION**

- A. Subgrade Preparation: Prepare as specified in Section 31 00 00, "Earthwork."

**3.03 INSTALLATION**

- A. Furnish, spread, and compact aggregate base course material to the lines, grades, and dimensions indicated on the Drawings.
  1. Aggregate bases, after compaction, shall be watered in conformance with the provisions in Section 17, "Watering", of the Caltrans Standard Specifications.

2. The relative compaction of each layer of compacted base material shall be not less than 95 percent.
3. The surface of the finished aggregate base at any point shall not vary more than 0.05 foot above or below the grade established by the Engineer.
4. Spreading: Spread in accordance with sections of Caltrans Standard Specifications.
5. Compacting: Compact in accordance with sections of Caltrans Standard Specifications.

#### **3.04 FIELD QUALITY CONTROL**

- A. Tests: Perform tests and meet the requirements within Section 31 00 00-3.06.

**\*\*END OF SECTION\*\***

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## SECTION 32 12 16

### ASPHALTIC CONCRETE PAVING

#### PART 1: GENERAL SUMMARY

##### 1.01 SUMMARY OF SECTION

- A. Section Includes: Asphaltic concrete pavement including open graded (“permeable”) pavement on prepared subgrade or aggregate base course or on existing pavement to lines, grades and compacted thickness as indicated on the Drawings
- B. Related Sections:
  - 1. Section 31 00 00 - Earthwork
  - 2. Section 32 11 23 - Aggregate Base Course

##### 1.02 REFERENCES

- A. State of California Department of Transportation Standard Specifications, latest edition (CALTRANS Standard Specifications).
  - 3. Section 37 - Bituminous Seals.
  - 4. Section 39 - Asphalt Concrete.
  - 5. Section 92 – Asphalt Binders
  - 6. Section 94 - Asphaltic Emulsions.
- C. CALTRANS Standard Test Methods:
  - 1. Calif Test 202 - Sieve Analysis of Fine and Coarse Aggregates.
  - 2. Calif Test 304 - Preparation of Bituminous Mixtures for Testing.
  - 3. Calif Test 362 - Determining Asphalt Content in Bituminous Mixtures by Vacuum Extraction.
  - 4. Calif Test 375 - Determining the In-Place Density and Relative Compaction of AC Pavement.
  - 5. Calif Test 379 - Determining Asphalt Content in Bituminous Mixtures (Troloxer Nuclear Gage Model 3241).
- D. American Society for Testing and Materials (ASTM) Standards:
  - 1. ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
  - 2. ASTM D1561 - Practice for Preparation of Bituminous Mixture Test Specimens by Means of California Kneading Compactor.

##### 1.03 SYSTEM DESCRIPTION

- A. This Work shall consist of furnishing and mixing aggregate and asphalt binder at a central mixing plant, spreading and compaction of the mixtures as specified and as indicated on the Drawings.

- B. In general, asphalt concrete and asphalt concrete base shall conform to Section 39 "Asphalt Concrete" and all applicable referenced sections of the CALTRANS Standard Specifications.

- 1. Where conflicts exist, this specification shall govern.

#### **1.04 DEFINITIONS**

- A. "Asphalt Concrete" as used by CALTRANS shall be considered the "Surface Course," or the final lift of the pavement section.
- B. "Asphalt Concrete Base" as used by CALTRANS shall be the remaining portion of the asphalt pavement section excluding the final lift.
- C. "Asphalt Pavement" shall be the total pavement section of asphalt including Asphalt Concrete and Asphalt Concrete Base.

#### **1.05 SUBMITTALS**

- A. Proposed Mix Design and Gradation of Materials.
- B. Shop Drawings.
- C. Product data:
  - 1. Asphalt.
  - 2. Asphalt aggregate
  - 3. Pavement reinforcing fabric.
- D. Quality Control Submittals:
  - 1. Test Results.
  - 2. Certificate of Compliance.
  - 3. Certificate of Competence.
- E. Equipment List.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Asphalt Pavement Delivery:
  - 1. Transport the mixture from the mixing plant to the point of use in vehicles having tight bodies previously cleaned of all foreign materials.
  - 2. Treat bodies as necessary to prevent material from sticking to the bodies.
  - 3. Cover each load with canvas or other suitable material of sufficient size and thickness to protect the asphalt mixture from the weather.



## 1.07 PROJECT CONDITIONS

### A. Environmental Requirements:

1. Asphalt Concrete:
  - a. Place asphalt concrete only when surface is dry, when atmospheric temperature in the shade is 40 degrees F and rising, or above 50 degrees F if falling.
  - b. Do not place asphalt concrete when weather is foggy or rainy nor when base on which material is to be placed is in wet or frozen conditions or when, in the opinion of the ENGINEER, weather conditions will prevent proper handling, finishing, compaction of the mixtures.
2. Prime Coat:
  - a. Do not apply prime coat when atmospheric temperature is below 60 degrees F.
  - b. Apply prime coat only when base course is dry or contains moisture not in excess of that which will permit uniform distribution and desired penetration.

## PART 2 PRODUCTS

### 2.01 ASPHALT PAVEMENT MATERIALS

#### A. Aggregate Base:

1. As specified in Section 32 11 23 – Imported Backfill and Drain Rock

#### B. Asphalt Concrete:

1. Asphalt concrete mix shall be Type B ½ inch maximum, medium conforming to the Caltrans Standard Specifications.
2. Asphalt binder shall be PG64-10 paving asphalt conforming to Section 92 of the Caltrans Standard Specifications.
3. Mix design shall conform to the Section 39-3 of the Caltrans Standard Specifications.

#### C. Seal and Cover Coat

1. Asphaltic emulsion, Grade SS-1h, conforming to Section 94 of the Caltrans Standard Specifications.

#### D. Concrete

1. Concrete for curbs, sidewalks, pavement, and miscellaneous construction shall conform to Section 03 30 00 and shall have a

design mix proportioned for 3,000 pounds per square inch compressive strength at 28 days.

- a. Concrete Forms: All forms for curbs and sidewalks shall be either, 2-inch dimensioned lumber, plywood, or metal forms. Forms on the face of the curb shall have no horizontal form joints within 7 inches of the top of the curb.
- b. Curing Compound: Commercial grade conforming to ASTM C309, Type I.
- c. Reinforcing Steel Conform to ASTM A615, Grade 40.

## **2.02 SLURRY SEAL**

- A. Slurry seal, Type II, shall be applied in conformance with the provisions in Section 37-3, and all applicable referenced sections of the CALTRANS Standard Specifications, at the following locations:
  1. In all streets and private property easement in which excavation is performed by the CONTRACTOR, slurry seal shall be applied from gutter lip to gutter lip. The slurry seal shall extend 5 feet beyond any excavation in the direction parallel to the gutters.

## **2.03 EQUIPMENT**

- A. Spreading and Compacting Equipment:
  1. Spreading equipment shall conform to Section 39-5.01 and all applicable referenced sections, of the CALTRANS Standard Specifications.
    - a. Only in areas inaccessible to the machine, by approval of the ENGINEER, will hand spreading be permitted.
  2. Compaction equipment shall conform to Section 37 and all applicable referenced sections, of the CALTRANS Standard Specifications.

## **2.04 SOURCE QUALITY CONTROL**

- A. The ENGINEER will perform sampling and tests of materials in accordance with California Test Method Number 304 and California Test Method Number 362 or 379, as applicable. Samples will be taken from materials as delivered to the site.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verification of Conditions: Verify surfaces and site conditions are ready to receive work. If unsatisfactory conditions exist, do not commence installation until such conditions have been corrected. Beginning application means acceptance of existing conditions.

**3.02 PREPARATION**

- A. Protection:
1. Protect concrete pavements and walks, curbs and bases, and other improvements adjacent to the operations with suitable materials.
  2. Building and other surfaces shall be covered with paper or other protection, when required.
  3. CONTRACTOR shall be responsible for any damage caused by CONTRACTOR's employees. All damage caused by the CONTRACTOR's operations shall be repaired to the satisfaction of the ENGINEER at no additional cost to the District.
- B. Subgrade Preparation:
1. Immediately prior to applying prime coat or tack coat, or immediately prior to placing the asphalt pavement when prime coat or tack coat is not required, the subgrade to receive asphalt pavement shall conform to the compaction requirement and elevation tolerances specified for the material involved and shall be cleaned to remove any loose or extraneous material.
  2. If the asphalt pavement is to be placed on an existing base or pavement which was not constructed as part of the contract, the CONTRACTOR shall clean the surface by sweeping, flushing or other means to remove all loose particles of paving, all dirt and all other extraneous material immediately before applying the prime coat or tack coat. If the asphalt pavement is to be placed against a vertical gutter face or other vertical surface, the CONTRACTOR shall roughen and clean vertical surface as required for proper bonding of asphalt immediately before applying prime coat or tack coat.
- C. Removal and Preparation of Existing Pavement:
1. Cut existing asphalt pavement to be removed with wheel cutter or other device capable of making a neat, reasonably straight and smooth cut without damaging the adjacent pavement to remain.

2. Cut and trim existing pavement after placement of specified base course material and just prior to placement of new asphaltic concrete pavement. Trimmed edges shall be coated with prime or tack coat as specified immediately prior to installing new abutting asphalt pavement.
3. All removed aggregate base material and asphaltic concrete pavement and any excess new material shall be removed from the project site and legally disposed of by the CONTRACTOR.

### **3.03 PRIME COAT AND TACK COAT**

#### **A. Prime Coat:**

1. A prime coat of liquid asphalt shall be applied on all surfaces of base course material to be paved.
2. Prime coat shall be applied at a rate of 0.25 gallons per square yard, and shall conform to the CALTRANS Standard Specifications for the distributor application of the grade of liquid asphalt being used.

#### **B. Tack Coat:**

1. A tack coat of asphaltic emulsion shall be applied to all vertical surfaces of existing pavement, curbs, gutters, and construction joints in the surfacing against which additional material is to be placed, or as otherwise specified herein.
2. Tack coat shall be applied in one application at a rate of 0.1 gallons per square yard of surface covered.

### **3.04 ASPHALT PAVEMENT**

- A. Placing materials in a windrow, then picking it up and placing it in the asphalt paver with loading equipment will not be permitted.
- B. Unless lower temperatures are directed by the ENGINEER, asphalt concrete shall be spread, and the first coverage of initial or breakdown compaction shall be performed when the temperature of the mixture is not less than 250 degrees F, and all breakdown compaction shall be completed before the temperature of the mixture drops below 205 degrees F.
- C. Asphalt pavement shall be spread and compacted in the number of layers and of the thicknesses indicated in the following table:
  1. A thickness tolerance of  $\pm 0.1$  inches is allowed for asphalt concrete.
  2. A total thickness tolerance of  $\pm 0.2$  inches is allowed for asphalt concrete base.

Total Thickness Indicated on Drawings <sup>(1)</sup>	Number of Lifts	Top Layer Thickness		Next Lower Layer Thickness		All Other Lower Layer Thicknesses	
		Min	Max	Min	Max	Min	Max
< 2 <sup>3</sup> / <sub>4</sub> "	1	-----	-----	-----	-----	-----	-----
3"	2	1 <sup>1</sup> / <sub>4</sub> "	1 <sup>1</sup> / <sub>2</sub> "	1 <sup>1</sup> / <sub>4</sub> "	1 <sup>1</sup> / <sub>2</sub> "	-----	-----
3 <sup>1</sup> / <sub>4</sub> " - 4 <sup>3</sup> / <sub>4</sub> "	2	1 <sup>3</sup> / <sub>4</sub> "	2 <sup>1</sup> / <sub>4</sub> "	1 <sup>3</sup> / <sub>4</sub> "	3"	-----	-----
> 5"	(2)	1 <sup>3</sup> / <sub>4</sub> "	2 <sup>1</sup> / <sub>4</sub> "	1 <sup>3</sup> / <sub>4</sub> "	3"	1 <sup>3</sup> / <sub>4</sub> "	4 <sup>3</sup> / <sub>4</sub> "
<p>(1) When pavement reinforcing fabric is shown to be placed between layers of asphalt pavement, the thickness of asphalt pavement above the pavement reinforcing fabric shall be considered to be the "Total Thickness Indicated on the Drawings" for the purpose of spreading and compacting the asphalt pavement above the pavement reinforcing fabric.</p> <p>(2) At least two layers shall be placed if the total thickness is less than 5". At least three layers shall be placed if the total thickness is more than 5", and less than 10<sup>1</sup>/<sub>2</sub>". At least four layers shall be placed if the total thickness is greater than 10<sup>1</sup>/<sub>2</sub>".</p>							

- D. A layer shall not be placed over another layer which exceeds 3 inches in compacted thickness until the temperature of the layer which exceeds 3 inches in compacted thickness is less than 160 degrees F at mid depth.
  - 1. If the temperature of any layer drops below 140 degrees F, or if directed by the ENGINEER, apply tack coat before placing next layer.
  - 2. For any pavement thickness exceeding 3 inches, the section shall be placed in equal lifts, not to exceed 3 inches per lift.
  
- E. Unless otherwise indicated on the Drawings, asphalt mixtures shall not be handled, spread or windrowed in a manner that will stain the finished surface of any pavement or other improvements.
  
- F. The completed mixture shall be deposited on the prepared subgrade at a uniform quantity per linear foot, as necessary to provide the required compacted thickness without resorting to spotting, picking-up or otherwise shifting the mixture.
  
- G. Spreading:

1. All layers of asphalt pavement shall be spread with an asphalt paver and shall conform to the applicable referenced sections of the CALTRANS Standard Specifications.
  2. At locations where the asphalt pavement is to be placed over areas inaccessible to spreading and rolling equipment, all layers of asphalt pavement shall be distributed directly out of the back of the dump truck and spread by hand.
    - a. Asphalt pavement spread by hand shall be compacted thoroughly to the required lines, grades and cross-sections by means of pneumatic tampers, or by other methods that will produce the same degree of compaction as pneumatic tampers.
- H. Compaction:
1. Compaction of asphalt pavement shall conform to the applicable referenced sections of the CALTRANS Standard Specifications.
  2. Minimum required density for each layer of asphalt pavement shall be 95 percent of that obtained in the laboratory according to ASTM Test Method D-1561.
- I. Segregation shall be avoided and the surfacing shall be free of pockets of coarse or fine material. Asphalt pavement containing hardened lumps shall not be used.
1. In areas inaccessible to paving and compacting equipment where spreading is done by hand, minimize the amount of segregation.
- J. Location of longitudinal joints in the top layer will be determined by the ENGINEER and shall not adversely affect the quality of the finished product.
- K. At all locations, or as directed by the ENGINEER, the asphalt concrete shall be square and at least 1 inch thick when conforming to existing surfacing. Tapering or feathering is not allowed.

### **3.05 SPECIAL REQUIREMENTS FOR PERMEABLE PAVEMENT**

- A. Bituminous surface course mix shall be laid in one 2.5-inch thick lift directly over aggregate base.
- B. Laying temperature of the mix shall be between 240 and 250 degrees F and ambient temperatures shall not be below 40 degrees F during the duration of paving activities.
- C. Compaction of the surface course shall occur when the surface is cool enough to resist a ten ton roller.

1. No more than two passes shall be made for compaction to preserve surface course porosity.
- D. Install one inch thick choker course evenly over the surface of coarse aggregate base.

### **3.06 FIELD QUALITY CONTROL**

- A. The CONTRACTOR shall control the quality of Work and shall provide adequate testing to assure compliance with these Specifications.
1. The type and size of the samples shall be suitable to determine conformance with stability, density, thickness and other specified requirements. Use an approved power saw or core drill for cutting samples. Furnish all tools, labor, and materials for cutting samples, testing, and replacing the pavement where samples were removed. Take a minimum of 1 sample for every 4000 square feet of asphalt pavement placed.
- B. All asphalt pavement shall match the grades indicated on the Drawings and shall be completely free from unintended hollows and high spots.
1. After completion of paving work, all paving shall be flooded with water. Any ponding that results in standing water greater than 3/4 inches in depth shall be ringed with chalk. Such hollows shall be corrected by removing and replacing the asphalt concrete. The asphalt concrete patch shall be square and at least 1 inch thick when conforming to existing surfacing. Tapering or feathering is not allowed.
- C. CONTRACTOR shall perform in-place density and compaction tests of the completed pavement in accordance with California Test Method Number 375, to determine compliance with the specified requirements. Submit test results to ENGINEER for approval.
- D. Cracks, settling of surface, improper drainage, improper compaction, and sloppy connection to previously laid surfaces will be construed as improper workmanship and will not be accepted.

### **3.07 MAINTENANCE OF PAVEMENT**

- A. Upon completion of final rolling, traffic shall not be permitted on the finished pavement for at least 6 hours, or until the asphalt pavement has cooled sufficiently to withstand traffic without being deformed.

**3.08 WORKMANSHIP AND WARRANTY**

- A. CONTRACTOR shall provide written warranty against defects in materials or workmanship for a period of not less than 1 year upon completion of Work.

END OF SECTION



## SECTION 33 12 01

### BASIC MECHANICAL MATERIALS AND METHODS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes: Basic design and performance requirements for mechanical equipment.

##### 1.02 REFERENCES

- A. American Society of Mechanical Engineers (ASME):
  1. ASME PTC 8.2 - Performance Test Code for Centrifugal Pumps.
  2. ANSI/ASME PTC 10 - Performance Test Code - Compressors and Exhausters.
  3. ANSI/ASME PTC 17 - Performance Test Code - Reciprocating Internal-Combustion Engines.
  4. ANSI/ASME PTC 11 - Performance Test Code - Measurement of Shaft Horsepower - Instruments and Apparatus.
- B. American Bearing Manufacturers Association (ABMA) Standards:
  1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
  2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
- C. American Society for Testing and Materials (ASTM):
  1. A 36 - Standard Specification for Structural Steel.
  2. A 48 - Standard Specification for Gray Iron Castings.
  3. A 526 - Standard Specification for Steel Sheet, Zinc Coated by the Hot Dip Process, Commercial Quality.
  4. B-61 - Standard Specification for Steam or Valve Bronze Castings.
  5. B 62 - Standard specification for Composition Bronze or Ounce Metal Castings.
  6. E 527 - Standard Practice for Numbering Alloys and Metals (UNS).
- D. American National Standards Institute/Hydraulic Institute Standards (ANSI/HI):
  1. ANSI/HI 1.1-1.5 - Centrifugal Pumps - Nomenclature, Definitions, Application and Operation.
  2. ANSI/HI 1.6 - Centrifugal Pump Tests.

##### 1.03 DEFINITIONS

- A. Special Tools: Tools that have been specifically made for use on unit of equipment for assembly, disassembly, repair, or maintenance.
- B. Resonant Frequency: That frequency at which a small driving force produces an ever-larger vibration if no dampening exists.

- C. Rotational Frequency: The revolutions per unit of time usually expressed as revolutions per minute.
- D. Critical Frequency: Same as resonant frequency for the rotating elements or the installed machine and base.
- E. Peak Vibration Velocity: The root mean square average of the peak velocity of the vibrational movement times the square root of 2 in inches per second.
- F. Rotational Speed: Same as rotational frequency.
- G. Maximum Excitation Frequency: The excitation frequency with the highest vibration velocity of several excitation frequencies that are a function of the design of a particular machine.
- H. Critical Speed: Same as critical frequency.
- I. Free Field Noise Level: Noise measured without any reflective surfaces (an idealized situation); sound pressure levels at 3 feet from the source unless specified otherwise.

#### **1.04 SYSTEM DESCRIPTION**

- A. General:
  - 1. Provisions specified under each technical equipment specification prevail over and supersede conflicting provisions as specified in this Section.
  - 2. Provide equipment and parts that are suitable for stresses which may occur during fabrication, transportation, erection, and operation.
  - 3. Provide equipment that has not been in service prior to delivery, except as required by tests.
  - 4. Like parts of duplicate units are to be interchangeable.
  - 5. When two or more units of equipment for the same purpose are required, provide products of same manufacturer.
  - 6. Equipment manufacturer's responsibility extends to selection and mounting of gear drive units, motors or other prime movers, accessories, and auxiliaries required for proper operation.
  - 7. When necessary, modify manufacturer's standard product to conform to specified requirements or requirements indicated on the Drawings and contained in Laws and Regulations.
- B. Material Requirements:
  - 1. Materials: Suitable for superior corrosion resistance and for services under conditions normally encountered in similar installations.
  - 2. Dissimilar Metals: Separate contacting surfaces with dielectric material.
- C. Vibration:
  - 1. Resonant Frequency: Ensure there are no natural resonant torsional, radial, or axial frequencies within 25 percent above or below the operating rotational frequencies or multiples of the operating rotational frequencies that may be excited by the equipment design.

- D. Equipment Mounting and Anchoring:
1. Mount equipment on cast iron or welded steel bases with structural steel support frames. Utilize continuous welds to seal seams and contact edges between steel members. Grind welds smooth.
  2. Provide bases and supports with machined support pads, dowels for alignment or mating of adjacent items, adequate openings to facilitate grouting, and openings for electrical conduits.
  3. Provide jacking screws in bases and supports for equipment weighing over 1,000 pounds.
  4. Anchor equipment base to concrete pad. Determine number, size, type, and location of bolts, anchor bolts, or other connections.
  5. Provide bolt sleeves for anchor bolts for heavy equipment. Adjust bolts to final location and fill sleeve with non-shrink grout.
- E. Structural Design:
1. For equipment with operating weight of 400 pounds or more provide calculations for:
    - a. Determination of operating weight and centroid of equipment.
      - 1) Operating weight is to be weight of unit plus weight of fluids or solids normally contained in unit during operation.
    - b. Determination of seismic forces and overturning moments.
    - c. Determination of shear and tension forces in connections.
    - d. Design of connection details based on calculated shear and tension forces.
- F. Equipment Units Weighing 50 Pounds or More: Provide with lifting lugs or eyes to allow removal with hoist or other lifting device.

## 1.05 SUBMITTALS

- A. Product Data:
1. For each item of Equipment:
    - a. Design features.
    - b. Load capacities.
    - c. Efficiency ratings.
    - d. Material designations by UNS alloy number or ASTM Specification and Grade.
    - e. Data needed to verify compliance with the Specifications.
    - f. Catalog data.
    - g. Name plate data.
    - h. Clearly mark submittal information to show specific items, materials and accessories or options being furnished.
- B. Shop Drawings:
1. Drawings for Equipment:
    - a. Drawings that include outline drawings, cut-away drawings, parts lists, material specification lists, and other information required to substantiate that proposed equipment complies with specified requirements.
  2. Outline drawings showing equipment, driver, driven equipment, pumps, seal, motor(s) or other specified drivers, variable frequency drive, shafting,

- U-joints, couplings, drive arrangement, gears, baseplate or support dimensions, anchor bolt sizes and locations, bearings, and other furnished components.
3. Installation and checkout instructions including leveling and alignment tolerances, grouting, lubrication requirements, and initial start-up procedures.
  4. Wiring, control schematics, control logic diagrams and ladder logic or similar for computer based controls.
  5. Recommended or normal operating parameters such as temperatures and pressures.
  6. Alarm and shutdown set points for all controls furnished.
- C. Calculations:
1. Calculations and other information to substantiate base plates, supports, and anchor bolts meet minimum design strength requirements and seismic design.
  2. Calculations and other information to substantiate that operating rotational frequencies meet the requirements of this Section.
  3. Torsional Analysis of Power Transmission Systems: When torsional analysis specified in the equipment Sections, provide:
    - a. Sketch of system components identifying physical characteristics including mass, diameter, thickness, and stiffness.
    - b. Results of analysis including first and second critical frequencies of system components and complete system.
- D. Quality Control Submittals:
1. Source quality control reports and certified test data.
  2. Submit factory test reports before shipment.
  3. Certified static and dynamic balancing reports for rotating equipment.
  4. Field quality control reports and test data.
  5. Submit material test reports as specified in the equipment sections.
- E. Operation and Maintenance Manuals:
1. Submit prior to training of District personnel.
  2. Make available at project site complete copy of manuals for use by field personnel and ENGINEER during start-up and testing of equipment.
  3. Include manufacturer and model number of every bearing; include calculated ball pass frequencies of the installed equipment for both the inner and outer raceways.
  4. Include motor rotor bar pass frequencies.

## 1.06 QUALITY ASSURANCE

- A. Qualifications: Equipment manufacturer and system component manufacturers to have a minimum of 5 years experience in the design, manufacture, and assembly of the specified equipment and components with an established record of successful operation of such equipment and components.
- B. References: Provide references from a minimum of 3 installations currently operating the same model equipment in continuous service for a minimum of 2 years under similar operating conditions. Reference information shall include location, service, contact person, and contact phone number.

- C. Manufacturer's Field Service:
  - 1. Furnish services of authorized representative specially trained in installation of equipment.
    - a. Visit project site and perform tasks necessary to certify installation.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Packing and Shipping:
  - 1. Equipment: Pack in boxes, crates, or otherwise protect from damage and moisture, dust, or dirt during shipment, handling, and storage.
  - 2. Bearings: Separately pack or otherwise suitably protect during transport.
  - 3. Spare Parts: Deliver in boxes labeled with contents, equipment to which spare parts belong, and name of CONTRACTOR.
- B. Storage:
  - 1. Equipment Having Bearings: Store in enclosed facilities. Rotate units at least once per month or more often as recommended by the manufacturer to protect rotating elements and bearings.
  - 2. Gear Boxes: Oil filled or sprayed with rust preventive protective coating.
- C. Protection:
  - 1. Equipment: Protect equipment from deleterious exposure.
  - 2. Painted Surfaces: Protect against impact, abrasion, discoloration, and other damage.

### **1.08 PROJECT CONDITIONS**

- A. Environmental Requirements:
  - 1. Equipment for project is to be suitable for performance in a wastewater pumping environment and under following conditions:
    - a. Ambient Temperatures: freezing to 95 degrees Fahrenheit.
    - b. Relative Humidities: 60 to 100 percent.
    - c. Other: Coastal fog.

### **1.09 SEQUENCING AND SCHEDULING**

- A. Equipment Anchoring: Obtain from equipment manufacturers' anchoring material and templates or setting drawings in time for anchors to be cast-in-place when concrete is placed.
- B. Coordinate details of equipment with other related parts of the Work, including verification that structures, piping, wiring, and equipment components are compatible.
- C. General Start-up and Testing of Equipment:
  - 1. Perform general start-up and testing procedures after operation and maintenance manuals for equipment have been received.
  - 2. Conduct functional testing of mechanical or electrical systems when each system is substantially complete and after general start-up and testing procedures have been successfully completed.

**1.10 WARRANTY**

- A. Warranty: Where no specific term of warranty is provided in a technical specification, warrant equipment free of defects in material and workmanship for one year from the date of acceptance or date of first beneficial use of the equipment by the District; cover parts and labor.
- B. Where a warranty exceeds one year, manufacturer's warranty shall be issued in the District's name.

**1.11 MAINTENANCE**

- A. Special Tools:
  - 1. When specified, provide special tools required for operation and maintenance.
  - 2. Mark or tag and list such tools in maintenance and operations instructions. Describe use of each tool.
- B. Spare Belts:
  - 1. When spare belts are specified, furnish 1 spare belt for every different type and size of belt-driven unit.
    - a. Where 2 or more belts are involved, furnish matched sets.
    - b. Identify as to equipment, design, horsepower, speed, length, sheave size, and use.
    - c. Package in boxes labeled with identification of contents.
- C. Spare Parts:
  - 1. Assume responsibility until turned over to the District.
  - 2. Store in enclosed facilities.
  - 3. Furnish itemized list and match identification tag attached to every part.
  - 4. List parts by generic title and identification number.
  - 5. Furnish name, address, and telephone number of supplier and spare parts warehouse.

**PART 2 PRODUCTS****2.01 MATERIALS**

- A. Ferrous Materials:
  - 1. Steel for Members used in Fabrication of Assemblies: ASTM A 36.
  - 2. Iron Castings: ASTM A 48, tough, close-grained gray iron, free from blowholes, flaws, and other imperfections.
  - 3. Galvanized Steel Sheet: ASTM A 526, minimum 0.0635 inch (16 gauge).
  - 4. Expanded Metal: ASTM A 36, 13 gauge, 1/2 inch flat pattern expanded metal.
- B. Nonferrous Materials:
  - 1. Stainless Steel: Type 304 or 316 as specified; provide L grade where welding required.
  - 2. Bronze in Contact with Liquid: Composition of not more than 2 percent aluminum nor more than 6 percent zinc; UNS Alloy C83600, C92200 or

C92700 in accordance with ASTM B 62, B-61, B-505, or B-584, when not specified otherwise.

- C. Dielectric Materials for Separation of Dissimilar Metals:
  - 1. Neoprene, bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or other materials.
- D. Non-Shrink Grout: As specified in Section 03 60 00.

## 2.02 BEARINGS

- A. Type: Oil or grease lubricated, ball or roller antifriction type, of standard manufacture.
- B. Oil Lubricated Bearings: Provide either pressure lubricating system or separate oil reservoir splash type system.
  - 1. Oil Lubrication Systems: Sized to safely absorb heat energy normally generated in bearings under maximum ambient temperature of 15 degree Fahrenheit above the specified maximum ambient temperature specified under article, Project Conditions; provide external cooler when required, air cooled if water cooling source not indicated on the Drawings. Equip with filler pipe and external level gauge.
- C. Grease Lubricated Bearings, Except Those Specified to Be Factory Sealed: Fit with easily accessible grease supply, flush, drain, and relief fittings.
  - 1. Lubrication Lines and Fittings:
    - a. Lines: Minimum 1/4 inch diameter stainless steel tubing.
    - b. Multiple Fitting Assemblies: Mount fittings together in easily accessible location.
    - c. Use standard hydraulic type grease supply fittings.
      - 1) Manufacturers: One of the following or equal:
        - a) Alenite
        - b) Zurk.
- D. Ratings: Rated in accordance with ABMA 9 or ABMA 11 for L<sub>10</sub> rating life of not less than 50,000 hours.
  - 1. Higher ratings, when specified in other Sections, supersede preceding requirement.

## 2.03 FABRICATION

- A. Nameplates: Engraved or stamped on Type 304 stainless steel and fastened to equipment at factory in an accessible and visible location.
  - 1. Indicate Following Information as Applicable:
    - a. Manufacturer's name.
    - b. Equipment model number and serial number.
    - c. Maximum and Normal rotating speed.
    - d. Horsepower.
    - e. Rated capacity.
    - f. Service class per applicable standards.
  - 2. Nameplates for Pumps: Include:
    - a. Rated total dynamic head in feet of fluid.

- b. Rated flow in gallons per minute.
- c. Impeller, gear, screw, diaphragm, or piston size.
- 3. Gear Reduction Units: Include:
  - a. AGMA Class of service.
  - b. Service factor.
  - c. Input and output speeds.
- B. Bolt Holes in Equipment Support Frames: Do not exceed bolt diameter by more than 25 percent, up to limiting maximum diameter oversize of 1/4 inch.
- C. Shop Finishing:
  - 1. Provide factory and field coating.
    - a. Bases and Support Frames in Contact with Concrete or Other Material: Paint contacting surfaces with minimum of 2 coats of zinc chromate primer before installation or grouting.
    - b. Shop Primer for Steel and Iron Surfaces, Unless Specified Otherwise:
      - 1) Manufacturers: One of the following or equal:
        - a) Ameron, Amercoat 185 Universal Primer.
        - b) Cook, 391-N-167 Barrier Coat.
        - c) Kop-Coat, Pug Primer.
        - d) Tnemec, 37-77 Chem-Prime.
        - e) Valspar, 13-R-28 Chromox Primer.
    - c. Coat machined, polished, and nonferrous surfaces which are not to be painted with rust-preventive compounds.
      - 1) Manufacturers: One of the following or equal:
        - a) Houghton, Rust Veto 344.
        - b) Rust-Oleum, R-9.
    - d. Coating for Ferrous Metal Surfaces, Except Stainless Steel: High solids polyamine epoxy.
    - e. Finish Painting of Motors: Shop finish paint with manufacturer's standard coating, unless otherwise specified.

## 2.04 SOURCE QUALITY CONTROL

- A. As specified in the individual equipment sections of the Specifications.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Inspect all components for shipping damage, conformance to specifications, and proper torques and tightness of fasteners.

### 3.02 PREPARATION

- A. Metal Work Embedded in Concrete:
  - 1. Accurately place and hold in correct position while concrete is being placed.
  - 2. Clean surface of metal in contact with concrete immediately before concrete is placed.



- B. Concrete Surfaces Designated to Receive Grout:
  - 1. Give surfaces heavy sandblasting treatment.
  - 2. Clean surfaces of sandblasting sand, grease, oil, dirt, and other foreign material that may reduce bonding of grout.
  - 3. Concrete Saturation: Saturate concrete with water. Concrete surface shall be damp concrete at time grout is placed.
- C. Field Measurements:
  - 1. Prior to fabrication of equipment, take measurements for installation of equipment and verify dimensions indicated on the Drawings. Ensure equipment and ancillary appurtenances fit within available space.

### 3.03 INSTALLATION

- A. Install equipment in accordance with manufacturer's installation instructions and recommendations.
- B. Lubrication Lines and Fittings:
  - 1. Lines from Fittings to Point of Use: Support and protect.
  - 2. Fittings:
    - a. Bring fittings to outside of equipment in manner such that they are readily accessible from outside without necessity of removing covers, plates, housings, or guards.
    - b. Mount fittings together wherever possible using factory-mounted multiple fitting assemblies securely mounted, parallel with equipment lines, and protected from damage.
    - c. Fittings for Underwater Bearings: Bring fittings above water surface and mount on edge of structure above.
- C. Alignment of Drivers and Equipment:
  - 1. Where drive motors or other drivers are connected to driven equipment by flexible coupling, disconnect coupling halves and align driver and equipment after complete unit has been leveled on its foundation.
  - 2. Comply with procedures of appropriate Hydraulic Institute Standards, AGMA Standards, alignment tolerances of equipment manufacturers and the following requirements to bring components into angular and parallel alignment:
    - a. Maximum Total Coupling Offset (not the per plane offset): Not to exceed 0.5 mils per inch of coupling length for spacer couplings based on coupling length (not dial separation).
    - b. Utilize jacking screws, wedges, or shims as recommended by the equipment manufacturer and as specified in the equipment sections.
  - 3. Use Reverse-indicator Arrangement Dial Type or Laser Type Alignment Indicators: Mount indicators on the driver/coupling flange and equipment/coupling flange. Alignment instrumentation accuracy to be sufficient to read angular and radial misalignment at 10 percent or less of the manufacturer's recommended acceptable misalignment.
  - 4. Alignment and calculations to include measurement and allowance for thermal growth, spacer coupling length, indicator separation and axial spacing tolerances of the coupling.

5. When alignment satisfies most stringent tolerance of system components, tighten anchor bolts and grout between base and foundation. Allow minimum 48 hours for grout to harden. After grout hardens, remove jacking screws, fully tighten anchor bolts, and recheck alignment. Correct alignment as required.
  6. After operational testing is complete, dowel motor or drivers and driven equipment. Comply with manufacturer's instructions.
- D. Grouting Equipment Bases:
1. Comply with manufacturer's installation instructions for grouting spaces, type of grout, and tolerances for level and alignments, both vertical and horizontal.
  2. Grout base when piping connections are complete and in alignment with no strain transmitted to equipment.
  3. Grout base when equipment is leveled and in alignment.
  4. Place grout, filling voids under equipment bases including recesses between anchor bolts and sleeves.
    - a. Extend grout to edge of bases or bedplates and bevel at 45 degrees around units.
    - b. Finish surfaces with slope that prevents ponding water within grouted areas.
- E. Special Techniques: Use applicable special tools and equipment, including precision machinist levels, dial indicators, and gauges as required in equipment installations.
- F. Completed Equipment Installations: Comply with requirements for intended use and specified vibration and noise tolerances.
- G. Warning Signs: Mount securely with stainless fasteners at equipment which can be started automatically or from remote locations.

### **3.04 FIELD QUALITY CONTROL**

- A. Test equipment as required by product manufacturer.

### **3.05 MANUFACTURER'S REPRESENTATIVE**

- A. Field Checkout: Before field testing and start-up, provide services of factory-trained field service representative to certify the equipment has been installed, aligned and checked in accordance with the manufacturer's instructions and the Specifications.
- B. Testing: Provide services of factory trained representative to observe and advise the CONTRACTOR during field quality control testing.
- C. Training: When training is specified, provide services of factory-trained representative to perform training.

**\*\*END OF SECTION\*\***

**SECTION 33 31 00**  
**BASIC PIPING MATERIALS AND METHODS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Basic piping materials and methods.
- B. Related Sections:
  - 1. Section 33 31 13 - Piping and Fittings.
  - 2. Section 33 31 15 - Piping Systems Testing.

**1.02 REFERENCES**

- A. American National Standards Institute
  - 1. B 1.20.1 - Specifications of International Thread Standards
- B. American Society of Testing and Materials (ASTM):
  - 1. D 2240 - Test Method for Rubber Property B Durometer Hardness.
  - 2. D 3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
  - 3. D 3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fitting for Polyethylene (PE) Plastic Pipe and Tubing
- C. American Water Works Association
  - 1. AWWA C115 - Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges
  - 2. AWWA C116 - Protective Fusion-bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile Iron and Gray Iron Fittings

**1.03 DEFINITIONS**

- A. Aboveground Piping: Piping within buildings, tunnels, or other structures without regard to elevation of piping, or exposed piping outside buildings and structures.
- B. Underground Piping: Piping buried in soil or cast in concrete.
- C. Underwater Piping: Piping below tops of walls in basins or concrete tanks containing water.
- D. Wet Wall: Wall with water on at least one side.

**1.04 SYSTEM DESCRIPTION**

- A. Piping Drawings:
  - 1. Except in details, piping is indicated diagrammatically. Not every offset and fitting, or structural difficulty that may be encountered has been indicated on the Drawings. Sizes and locations are indicated on the Drawings.
  - 2. Perform minor modifications to piping alignment where necessary to avoid structural, mechanical, or other type of obstructions that cannot be removed or changed.

- a. Modifications are intended to be of minor scope, not involving a change to the design concept or a change to the Contract Price or Contract Times.
- B. Performance Requirements:
1. Restraining Piping:
    - a. Restrain piping at valves and at fittings where piping changes direction, changes sizes, and at ends.
      - 1) When piping is underground use mechanical restraints.
      - 2) When piping is aboveground or under water, use mechanical or structural restraints.
      - 3) Determine thrust forces by multiplying the nominal cross sectional area of the piping by 2.5 times the pump shutoff head.
    - b. Provide underground mechanical restraints at all valves, fittings, and where specified in the Piping Schedule or shown on the Drawings.
  2. Connections to Existing Piping:
    - a. Expose existing piping to which connections are to be made with sufficient time to permit, where necessary, field adjustments in line, grade, or fittings.
    - b. Provide sleeves, flanges, nipples, couplings, adapters, and other fittings needed to install or attach new fittings to existing piping and to make connections to existing piping.
  3. Connections at Dissimilar Metals:
    - a. Connect ferrous and nonferrous metal piping, tubing, and fittings with dielectric couplings especially designed for the prevention of chemical reactions between dissimilar metals.
    - b. Nonferrous metals include aluminum, copper, and copper alloys.
- C. Piping Alternatives:
1. Provide piping in accordance with this Section, unless indicated on the Drawings or specified otherwise.
  2. Alternative Pipe Ratings: Piping with greater pressure rating than specified may be substituted in lieu of specified piping without changes to the Contract Price. Piping of different material may not be substituted in lieu of specified piping.
  3. Valves in Piping Sections: Valves shall have the same pressure rating as the adjacent piping.
  4. For flanged joints, where one of the joining flanges is raised face type, provide a matching raised face type flange for the other joining flange.

## **PART 2 PRODUCTS**

### **2.01 PIPE AND FITTINGS**

- A. Ductile Iron Pipe and Fittings
1. Ductile Iron Pipe and fittings shall conform to AWWA C-151.
- B. High Density Polyethylene (HDPE) DR 17
1. HDPE DR 17 shall meet or exceed requirements per ASTM F3035. Butt Heat Fusion Welds shall meet ASTM D3261.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verification of Existing Conditions:
1. Locate and expose existing structures, piping, conduits, and other facilities and obstructions that may affect construction of underground piping before starting excavation for new underground piping and appurtenances.
  2. Verify sizes, elevations, locations, and other relevant features of existing facilities and obstructions. Determine conflicts for the construction of the new underground piping and appurtenances.
  3. Make piping location and grade adjustments to resolve conflicts between new piping and existing facilities and obstructions.

**3.02 WALL AND SLAB PENETRATIONS**

- A. Provide sleeves for piping penetrations through concrete walls, floors, ceilings, roofs, pilasters, columns, piers, and beams unless specified or otherwise indicated on the Drawings.
- B. For piping 1 inch in nominal diameter and larger, provide sleeves with minimum inside diameters of 1 inch plus outside diameter of piping. For piping smaller than 1 inch in nominal diameter, provide sleeve of minimum twice the outside diameter of piping.
1. Arrange sleeves and adjacent joints so piping can be pulled out of sleeves and replaced without disturbing the structure.
  2. Cut ends of sleeves flush with surfaces of concrete, masonry, or plaster.
  3. Conceal ends of sleeves with escutcheons where piping runs through floors, walls, or ceilings of finished spaces within buildings.
  4. Seal spaces between pipes and sleeves with link-type seals when not otherwise specified or indicated on the Drawings.
- C. Cast couplings or wall pieces in walls for penetrations of buried rigid piping including steel and vitrified clay through structures.
1. Provide couplings or wall pieces with mechanical push-ons, or similar flexible joints at outside faces of walls.
  2. Provide additional similar joints in piping at transition points between trenches and structure excavations.
  3. For steel piping, single joints may be used in lieu of 2 joints. Locate single joints outside within 2 feet from outside faces of walls. Link Seal: Use 2 link seals where seal is used to seal at wet wall sleeves. Mount one seal on the inside face of the wall and the other on the outside face of the wall. Coordinate the inside diameter of the wall sleeve with the size of the seal to provide watertight sealing.
- D. Where not indicated on the Drawings, penetrations for conditions other than those specified under the preceding subparagraphs shall be 1 of the 3 types specified in such subparagraphs found by ENGINEER to be the most suitable for the particular conditions.

**3.03 EXPOSED PIPING**

- A. Install exposed piping in straight runs parallel to the axes of structures, unless indicated otherwise.
  - 1. Install piping runs plumb and level, unless otherwise indicated on the Drawings. Slope plumbing drain piping with 1/8 inch per foot downward in the direction of flow. Slope digester gas piping to drip traps or low-point drains at minimum 1/2 inch per foot where condensate flows against the gas, or 1/4 inch per foot where condensate flows with gas.
- B. Install exposed piping after installing equipment and after piping and fitting locations have been determined.
- C. Do not transfer pipe loads and strain to equipment.
- D. In addition to the joints indicated on the Drawings, provide unions, flexible couplings, flanged joints, and other types of joints or means which are compatible with and suitable for the piping system, and necessary to allow ready assembly and disassembly of the piping.
- E. Assemble piping without distortion or stresses caused by misalignment.
  - 1. Match and properly orient flanges, unions, flexible couplings, and other connections.
  - 2. Do not subject piping to bending or other undue stresses when fitting piping. Do not correct defective orientation or alignment by distorting flanged joints or subjecting flange bolts to bending or other undue stresses.
  - 3. Flange bolts, union halves, flexible connectors, and other connection elements shall slip freely into place.
  - 4. Alter piping assembly to fit when proper fit is not obtained.
  - 5. Install eccentric reducers or increasers with the top horizontal for pump suction piping.

**3.04 BURIED PIPING**

- A. Bury piping with minimum 3-foot cover without air traps, unless otherwise indicated on the Drawings.
- B. Where 2 similar services run parallel to each other, piping for such services may be laid in the same trench. Lay piping with sufficient room for assembly and disassembly of joints, for thrust blocks, for other structures, and to meet separation requirements of public health authorities having jurisdiction.
- C. Laying Piping:
  - 1. Lay piping in finished trenches free from water or debris. Begin at the lowest point with bell ends up slope.
  - 2. Place piping with top or bottom markings with markings in proper position.
  - 3. Lay piping on an unyielding foundation with uniform bearing under the full length of barrels.
  - 4. Where joints require external grouting, banding, or pointing, provide space under and immediately in front of the bell end of each section laid with sufficient shape and size for grouting, banding, or pointing of joints.

5. At the end of each day's construction, plug open ends of piping temporarily to prevent entrance of debris or animals.

### 3.05 CLEANING

- A. Piping Cleaning:
  1. Upon completion of installation, clean piping interior of foreign matter and debris. Perform special cleaning when required by the Contract Documents.

### 3.06 PIPING SCHEDULE

- A. Abbreviations:
  1. The following abbreviations used in the column of test method refer to the respective methods specified in Section 33 31 15.

GR	Gravity method
HH	High head method
  2. Abbreviations to designate piping include the following:

BF	Butt fusion
BS	Bell and Spigot
CI	Cast iron
CL	Class, followed by the designation
DIP	Ductile iron piping
FL	Flanged
Ga	Gauge, preceded by the designation
GE	Grooved end joint
HDPE	High Density Polyethylene
NPS	Nominal pipe size, followed by the number in inches, pounds per square inch, or pounds per square inch, gauge.
PEE	Polyethylene encasement
PVC	Polyvinyl Chloride
Sch	Schedule, followed by the designation
SCRD	Screwed
SS	Stainless steel
	Sanitary Sewer
SS FM	Sanitary Sewer Force Main
STL	Steel
SW	Solvent Weld
VCP	Vitrified clay piping

WLD      Weld

\*\*END OF SECTION\*\*



**SECTION 33 31 13  
PIPING AND FITTINGS**

**PART 1 - GENERAL**

**1.01 DOCUMENTS**

The General Conditions and all other Contract Documents for this project are complementary and applicable to this section of the Specifications.

**1.02 SCOPE OF WORK**

A. **Work Included:** Pipe, fittings, connections, supports, anchors and all other necessary appurtenances as shown, specified, and/or required.

B. **Related Work Specified Elsewhere**

1. Coating Systems: Section 09 90 00.
2. Valves: Section 33 31 14.
3. Submersible Pumps: Section 22 13 29.
4. Basic Piping Materials: Section 33 31 00.
5. Piping System Testing 33 31 15

**1.03 REFERENCE STANDARDS**

Standards listed below are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of listed standards, the requirements of this section shall prevail.

- |    |            |  |
|----|------------|--|
| A. | ANSI B16.1 | <i>Cast Iron Pipe Flanges and Flanged Fittings</i>   |
| B. | AWWA C104  | <i>Cement-Mortar Lining for Ductile Iron Pipe and Fittings</i>   |
| C. | AWWA C110  | <i>Ductile Iron and Gray Iron Fittings, 3-inch through 48-inch</i>   |
| D. | AWWA C111  | <i>Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings</i>  |
| E. | AWWA C115  | <i>Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges</i>   |
| F. | AWWA C116  | <i>Protective Fusion-bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile Iron and Gray Iron Fittings</i> |
| G. | AWWA C151  | <i>Ductile Iron Pipe, Centrifugally Cast</i>   |
| H. | AWWA C207  | <i>Steel Pipe Flanges for Waterworks Service</i>   |

#### 1.04 QUALITY ASSURANCE

- A. The Contractor shall furnish all labor necessary to assist the Engineer in inspecting pipe upon delivery. The Contractor shall remove rejected pipe immediately.
- B. All pipe of any manufacturer may be rejected if there are unsatisfactory joint assembly operations, even if the pipe conforms to ANSI and AWWA Specifications. The Contractor shall remove all unsatisfactory pipe of that manufacturer of same shipment from work and shall furnish pipe from another manufacturer conforming to these specifications.
- C. All tests shall be made in conformance with methods prescribed by ASTM and AWWA specifications, and acceptance or rejection is based on the test results.

#### 1.05 SUBMITTALS

- A. **Product Data:** The Contractor shall submit shop plans, manufacturer's product data and installation instructions demonstrating that the proposed pipe and fittings are in compliance with the referenced standards as well as the intended service. If plans are returned disapproved or not stamped, they shall be revised or corrected as necessary and resubmitted for review, approval, and stamping.
- B. **Certification:** Certified test reports with each delivery that pipe complies with this specification.

### PART 2 - PRODUCTS

#### 2.01 PIPE AND TUBE

- A. **General:** Pipe sizes are nominal inside diameter unless otherwise noted. All sizes shall be as called out on the plans and specified herein. All pipe and fittings delivered to the job site shall be clearly marked to identify the material, class, thickness, and manufacturer. All material shall be new and free of blemishes.

The Contractor is responsible for furnishing and installing all items necessary to make a complete and workable piping system. These include, but are not limited to, valve boxes, manholes, insulating couplings and gaskets, piping specialties and all other items required by the nature of the installation. Any item not specified herein but required by the nature of the installation shall be of the first quality and equal in grade to similar materials specified herein.

- B. **Ductile Iron Pipe:** All ductile iron pipe shall be pressure class 350. ANSI/AWWA C115, Class 53 ductile iron pipe with threaded flanges. Straight sections of pipe may have "push-on" type joints with dimensions and gaskets as specified in AWWA C111. All ductile iron pipe shall be lined and coated per Section 09 90 00 of these specifications. Flanges shall be factory assembled.
- C. **High Density Polyethylene (HDPE) Pipe:** HDPE pipe shall be DR 17 and meet or exceed requirements per ASTM F3035. Butt Heat Fusion Welds shall meet ASTM D3261.

- D. **Steel:** Schedule 40. Flanges shall be ANSI B16.1 Class 125 standard pattern. All steel pipe shall be coated and lined per Section 09 90 00.

## 2.02 FITTINGS

- A. **Material:** Fittings for ductile iron pipe shall conform to AWWA C110 and shall be pressure class 350.
- B. **Pattern:** All fittings shall be flanged to ANSI B16.1 Class 125 standard pattern.
- C. **Coating and Lining:** Flanged fittings shall be fusion bond epoxy lined and coated at the factory in conformance with AWWA C116.

## 2.03 PLASTIC FILM WRAP

All ductile-iron pipe and fittings buried underground shall be protected with plastic film wrap in accordance with AWWA C105, unless noted otherwise below. Wrap shall be a loose 8-mil-thick polyethylene tube. All joints between plastic tubes shall be wrapped with 2-inch-wide polyethylene adhesive tape, Polyken 900, Scotch wrap 50, or approved equal.

## 2.04 PIPE JOINTS

- A. Discharge pipe shall be joined by flanged, mechanical or grooved joints as shown on the Drawings. All discharge pipe fittings, joints, and connections shall be restrained against thrust.
- B. **Flanged Joints:** Provide full face gaskets per AWWA C111.
- C. **Flanged Adapters:** Flange coupling adapters shall be provided as shown on the Drawings or as deemed necessary by the Contractor for pipe assembly. Couplings shall be EBAA Megaflange Series 2100 for plain end pipe, or approved equal. Adapter material shall be ductile iron coated with fusion bond epoxy in conformance with AWWA C116.
- D. **Thrust Restraint Glands:** All fittings, joints, and connections shall be restrained against thrust. Thrust restraint glands shall be EBAA Iron MEGALUG Series 1100 or approved equal. Cast gland bodies shall be coated with MEGA-BOND. The wedge assemblies and all nuts and bolts shall be coated with Xylan Fluoropolymer coating, Tripac 2000 or equal.
- E. **Gaskets, Bolts and Nuts:** Gaskets shall be rated for wastewater service, made of synthetic rubber such as Buna-N not less than one-eighth (1/8) inch thick. All gaskets shall be the full width of the flange to which applied. Bolts and nuts shall be ASTM A316 stainless steel, and shall have sound well-fitting threads. Bolts shall be provided with hexagonal chamfered heads and nuts. The underside of all bolt heads and nuts shall have true surfaces at right angles to the axis of the bolts. The lengths of the bolts shall be such that after joints are made up, the bolts shall protrude through the nuts, but in no case shall they protrude more than one-half (1/2) inch. Anti-galling compound shall be used in installation.

**2.05 SUPPORTS, ANCHORS, AND SEALS**

- A. Support for the pump discharge piping shall be provided as detailed on the Drawings.
- B. Link-seal shall be used as shown on the Drawings.

**PART 3 - EXECUTION****3.01 PREPARATION**

- A. Foreign material, scale and dirt, inside and outside, shall be removed from pipe and fitting materials before assembly.

**3.02 CONNECTIONS**

- A. Pipe connections shall be made in accordance with applicable standards and manufacturer's recommendations.
- B. Non-conducting connections shall be provided wherever jointing dissimilar metals.

**3.03 INSTALLATION**

- A. **General:** Pipe shall be installed in accordance with good trade practice and AWWA C600. The methods employed in the handling and placing of pipe, fittings, and equipment shall be such as to insure that after installation and testing they are in good condition. Should damage occur to the pipe, fittings, or equipment, repairs satisfactory to Stanford shall be made prior to final acceptance at no additional cost to Stanford.
- B. **Handling and Storage of Pipe:** During loading, transportation, and unloading, every precaution shall be taken to prevent pipeline damage. Any damaged pipe shall be replaced or repaired to the satisfaction of Stanford. Where pipe is placed in stockpiles, it shall be neatly piled and blocked with strips between tiers.

\*\* END OF SECTION \*\*

## SECTION 33 31 14 VALVES

### PART 1 - GENERAL

#### 1.01 DOCUMENTS

The General Conditions and all other Contract Documents for this project are complementary and applicable to this section of the Specifications.

#### 1.02 SCOPE OF WORK

- A. **Work Included:** All work necessary to furnish and install all valves as shown on the drawings and specified herein.
  
- B. **Related Work Specified Elsewhere**
  - 1. Coating Systems: Section 09 90 00.
  - 2. Piping and Fittings: Section 33 31 13.

#### 1.03 REFERENCE STANDARDS

Standards listed below are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of listed standards, the requirements of this section shall prevail. Where two or more standards are at variance, the most restrictive requirement shall apply.

- A. ANSI B16.1            *Cast Iron Pipe Flanges and Flanged Fittings*
  
- B. ASTM A536           *Specification for Ductile Iron Castings*
  
- C. AWWA C110           *Ductile Iron and Gray Iron Fittings, 3-inch through 48-inch*
  
- D. AWWA C508           *Swing Check Valves for Waterworks Service, 2-inch through 24-inch*
  
- E. AWWA C509           *Resilient-Seated Gate Valves for Water and Sewerage Systems*
  
- F. AWWA C550           *Protective Epoxy Interior Coatings for Valves and Hydrants*

#### 1.04 QUALITY ASSURANCE

- A. **Acceptable Manufacturers:**
  - a. Gate Valves: Mueller Co. or approved equal
  - b. Check Valves: APCO or approved equal
  
- B. **Valve Connections:** Suitable valves shall be provided to connect to adjoining piping as specified for pipe joints.

### 1.05 SUBMITTALS

- A. **Product Data:** The Contractor shall submit shop plans, manufacturer's product data and installation instructions demonstrating that the proposed valves are in compliance with the referenced standards as well as the intended service. If plans are returned disapproved or not stamped, they shall be revised or corrected as necessary and resubmitted for review, approval, and stamping.
- B. **Certification:** Certified test reports with each delivery that the valve(s) comply with this specification.

## PART 2 - PRODUCTS

### 2.01 GATE VALVES

- A. Gate valves for non-buried service shall be non-rising stem resilient wedge gate valves meeting AWWA C515 standards with flanged ends drilled to ANSI B16.1 Class 125 standards.
- B. Provide rising stem for all gate valves installed in valve cans.
- C. Provide gate operators with each valve.
- C. Resilient wedge gate valves shall have a cast iron wedge fully encapsulated in molded rubber complying with ASTM D2000, with extended wedge guides molded as part of the wedge. Resilient seat shall affect a bubble-tight seal across the wedge at a full differential of 200 psi. The wedge shall be designed to minimize solids build-up and stem binding. Internal working parts shall be corrosion resistant and accessible without removing the main body from the discharge line.
- D. Valves shall be epoxy lined and coated with a 10 mil minimum and 20 mil maximum thickness fusion epoxy prepared from a 100% dry epoxy resin applied by the fluidizing bed method in conformance with AWWA C550. Lining materials shall not be applied to valve stems, wedges or wedge seats; nor build up in thickness to interfere with joint assembly or with the operation of the lined unit.

### 2.02 AIR-CUSHIONED SWING CHECK VALVES

- A. Check valves shall be flanged air-cushioned swing check valves specifically designed for wastewater service.
- B. The valve shall have a heavy duty body shall be constructed of ductile iron conforming to ASTM A536 with integral flanges, faced and drilled per ANSI B16.1 Class 125 and be suitable for horizontal installation.
- C. The valve body shall be the full waterway type, designed to provide a net flow area equal to at least the nominal inlet pipe size when swung open no more than 25 degrees. The valve shall have a replaceable stainless steel body seat.
- D. Valve disc shall be ductile iron and faced with a renewable resilient seat ring of rubber or other suitable material, held in place by a follower ring and stainless steel screws.

- E. The disc arm shall be ductile iron or steel, suspended from and keyed to an austenitic stainless steel shaft which is completely above the waterway and supported at each end by heavy bronze bushings. The shaft shall rotate freely without the need for external lubrication. The shaft shall be sealed where it passes through the body by means of a stuffing box and adjustable packing. Simple O-ring shaft seals are not acceptable.
- F. The valve shall be supplied with an outside lever and adjustable counterweight to initiate valve closure. Final closure shall be dampened by means of a single, side-mounted bronze air-cushion assembly directly mounted to the valve body on machined pads. The amount of cushioning shall be easily adjustable without the need for pre-charged air chambers. Commercial air cylinders which pivot and/or are attached with fabricated brackets are not acceptable.
- G. The valve shall swing open smoothly at pump start and close quickly and quietly upon pump shutdown to prevent flow reversal. When closed, the valve shall seat drop tight
- H. The valve shall be APCO Series 250 air-cushioned swing check valves, or approved equal, certified by the manufacturer for wastewater service in a horizontal position.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

Foreign material, scale and dirt, inside and outside, shall be removed from valve materials before assembly.

### **3.02 CONNECTIONS**

- A. Valve connections shall be made in accordance with applicable standards and manufacturer's recommendations.
- B. Non-conducting connections shall be provided wherever jointing dissimilar metals.

### **3.03 INSTALLATION**

- A. **General:** Valves shall be installed in accordance with good trade practice to insure that after installation and testing they are in good condition. Should damage occur to pipe, valves, fittings, or equipment, repairs satisfactory to the City shall be made prior to final acceptance at no additional cost to the City.
- B. **Handling and Storage of Valves:** During loading, transportation, and unloading, every precaution shall be taken to prevent valve damage. Any damaged valves shall be replaced or repaired to the satisfaction of the City.

### **3.04 TESTING**

- A. Valves shall be tested at the same time that the adjacent pipeline is tested. Joints shall show no visible leakage under test. Joints that show signs of leakage shall be repaired prior to final acceptance. If there are any special parts of control systems or operators that might be damaged by the pipeline test, they shall be properly protected. The Contractor shall be held responsible for any damage caused by the testing.
- B. If requested by the City, the valve manufacturer shall furnish an affidavit stating that the materials and options furnished comply with these specifications.

\*\* END OF SECTION \*\*



## SECTION 33 31 15

### PIPING SYSTEMS TESTING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes: Test requirements for piping systems.
- B. Related Sections:
  - 1. Section 33 31 00 - Basic Piping Materials and Methods.
  - 2. Section 33 31 13 – Piping and Fittings

##### 1.02 REFERENCES

- A. Uniform Plumbing Code (UPC).
- B. National Fuel Gas Code: ANSI Z 223.1 or NFPA 54.
- C. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME):
  - 1. B31.8 - Gas Transmission and Distribution Piping Systems.
  - 2. B31.1 - Power Piping.
  - 3. B31.3 - Process Piping.
- D. Uniform Mechanical Code (UMC).

##### 1.03 TESTING REQUIREMENTS

- A. General Requirements:
  - 1. Testing requirements are stipulated in Laws and Regulations; are included in the Piping Schedule in Section 33 31 00; are specified in the specifications covering the various types of piping; and are specified herein.
  - 2. Requirements in Laws and Regulations supersede other requirements of Contract Documents, except where requirements of Contract Documents are more stringent.
  - 3. Test plumbing piping in accordance with Laws and Regulations, the Uniform Plumbing Code, and UL requirements.
  - 4. When testing with water, the specified test pressure is considered to be the pressure at the highest point of the piping section under test. Lower test pressure as necessary to prevent testing the lowest point above a safe test pressure.
- B. Furnish necessary personnel, materials, and equipment, including bulkheads, restraints, anchors, temporary connections, pumps, water, pressure gauges, and other means and facilities required to perform tests.
- C. Pipes to be Tested: Test only those portions of pressure pipes (force main) that have been installed as part of this Contract. Test new pipe sections prior to

putting new piping into service. Sections of piping, fittings, and valves may be tested before being placed in final location. Furnish and install test plugs, bulkheads, and restraints required to isolate new pipe sections.

- D. Unsuccessful Tests:
  - 1. Where tests are not successful, correct defects or remove defective piping and appurtenances and install piping and appurtenances that comply with the specified requirements.
  - 2. Repeat testing until tests are successful.
- E. Test Water Disposal: Dispose of testing water into sanitary sewer system.

#### **1.04 SUBMITTALS**

- A. Schedule and Notification of Tests:
  - 1. Submit a list of scheduled piping tests 48 hours prior to testing.
  - 2. Notification of Readiness to Test: Immediately before testing, notify the District in writing of readiness, not just intention, to test piping. Have personnel, materials, and equipment specified in place before submitting notification of readiness.

#### **1.05 SEQUENCE**

- A. Clean piping before pressure or leak tests.
- B. Underground pressure piping may be tested before or after backfilling when not indicated or specified otherwise.
- C. Backfill and compact trench, or provide blocking that prevents pipe movement before testing underground piping with a maximum leakage allowance.
- D. Test underground piping before encasing piping in concrete or covering piping with slab, structure, or permanent improvement.

### **PART 2 PRODUCTS**

Not Used.

### **PART 3 EXECUTION**

#### **3.01 TESTING ALIGNMENT AND GRADE**

- A. Alignment and Grade:
  - 1. Visually inspect the interior of gravity piping with artificial light, reflected light, or laser beam.
  - 2. Consider inspection complete when no broken or collapsed piping, no open or poorly made joints, no grade changes that affect the piping capacity, or no other defects are observed.

**3.02 TESTING PRESSURE PIPING**

- A. General:
1. Test connections, fittings, valves, and closure pieces with the piping.
  2. Provide blinds or other means to isolate test sections.
  3. Do not include valves, equipment or piping specialties in test sections if test pressure exceeds the valve, equipment or piping specialty safe test pressure allowed by the item's manufacturer.
  4. During the performance of the tests, test pressure shall not vary more than plus or minus 5 pounds per square inch gauge with respect to the specified test pressure.
  5. Select the limits of testing to sections of piping. Select sections that have the same test pressure.
  6. Test piping for minimum 2 hours for visible leaks test and minimum 2 hours for the pressure test with maximum leakage allowance.
- B. Testing Procedures:
1. Fill piping section under test slowly with potable water while venting air. Temperature of test water shall be no higher than 73 degrees Fahrenheit. Use potable water.
  2. Raise pressure to the test pressure of 150 psi and inspect piping visually for leaks. Consider visible leakage testing complete when no visible leaks are observed.
- C. Pressure Test with Maximum Leakage Allowance:
1. Leakage allowance is zero.
  2. Pressure test piping after completion of visible leaks test.

**\*\*END OF SECTION\*\***

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# **PART V**

# **DRAWINGS**

STEGE SANITARY DISTRICT  
PROJECT NO. 23202  
JULY 2023

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