Orange County Water District

Final Expansion of the Groundwater Replenishment System Project
Contract No. GWRS - 2017 - 01

TECHNICAL SPECIFICATIONS

Volume 1

Design Submittal 2
August 2018

Prepared by

BLACK & VEATCH

Irvine, California
B&V Project No. 196566
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CALIFORNIA STATE WATER RESOURCES CONTROL BOARD – CLEAN WATER STATE REVOLVING FUND DAVIS BACON REQUIREMENTS (IF APPLICABLE)
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- 15020  Miscellaneous Piping and Accessories Installation
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- 15061  Ductile Iron Pipe
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VOLUME 4

DRAWINGS
General, Demolition, Civil, Corrosion Protection, Yard Piping, Foundation, Architectural, Structural, Mechanical, HVAC, Plumbing

VOLUME 5

DRAWINGS (Continued)
Electrical

VOLUME 6

DRAWINGS (Continued)
Instrumentation and Control

APPENDICES

To be provided in DS3.
DIVISION 1 – General Requirements
Section 01015

PROJECT REQUIREMENTS

1. GENERAL DESCRIPTION OF WORK. The Work to be performed under these Contract Documents involves furnishing all labor, materials, tax, equipment and services in strict compliance with the Contract Documents, for a completed and operating plant expansion as follows:

The existing 100 million gallon per day (mgd) Advanced Water Treatment Facility (AWTF) Expansion owned and operated by Orange County Water District is to be expanded by 30 mgd to a total production capacity of 130 mgd.

The Work includes, but shall not be limited to: demolition, site clearing and preparation, and disposal of excavated materials; installation, assembly and connection of new treatment equipment; modification to existing concrete structures and construction of new concrete structures, hand excavation, sheeting, shoring, and bracing; protection of existing utilities; purchase, installation, assembly, testing, start-up and commissioning of new treatment equipment; installation of a new pump station; prestressed concrete above ground storage tanks, and concrete metering and valve vaults; extension of existing and installation of new site and interior piping, valves, meters, vaults; lining and coatings; installation of new pipe supports; site restoration, paving, and grading; site security and traffic control; modification to existing and installation of new conduit; wiring; and power and control systems; and integration and upgrade of the new process control system.
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The existing AWTF is divided into reference areas requiring expansion or modification as follows:

- Area 100 General/Site Work
- Area 140 Screening Facility
- Area 144 Sitework/Site Structures (OCSD Plant 2)
- Area 144 Secondary Effluent Pump Station (OCSD Plant 2)
- Area 144 Secondary Effluent Equalization Tank (OCSD Plant 2)
- Area 210 Microfiltration Facility
- Area 212 MF Filtrate Pumps
- Area 214 MF Air Compressor/Vacuum Pumps
- Area 216 MF Process Air
- Area 218 MF Backwash Pumps
- Area 235 MF Maintenance Wash Sodium Hypochlorite
- Area 255 RO Transfer Pump Station
- Area 400 Bulk Chemical Storage
- Area 420 Sulfuric Acid Bulk Storage
- Area 450 Cartridge Filters
- Area 470 RO Pretreatment Injection Vault
- Area 510 Reverse Osmosis Building
- Area 610 UV Facility
- Area 710 Decarbonation Facility
- Area 720 RO Flush Feed Pump Station
- Area 725 DPW Pump Station
- Area 730 Polymer Area
- Area 815 Product and Barrier Water Pump Station
- Area 830 Product and Barrier Water Surge Facilities
- Area 910 Switchgear Building

The MF membranes and UV system are being procured by the District under separate contracts. A procurement contract has been negotiated between the District and the MF membrane and UV system suppliers. The procurement contracts for the two systems are assigned to the Contractor on the Project concurrently with the execution of the Agreement.

2. OTHER CONSTRUCTION CONTRACTS. Work at the site performed by others under separate contracts includes the following:

- **Secondary Effluent Pipeline Rehabilitation** (GWRS Final Expansion, Contract 2)
- Low Flow PS and PWPS Junction Structures in Area 144
- Low flow and Plant Water Pump Stations in Area 144

3. COORDINATION. Contractor under each section of the Contract shall plan, schedule, and coordinate its operations in a manner which will facilitate the simultaneous progress of the Work under other sections of this
Contract and work included under other OCWD and OCSD contracts outside the scope of these Contract Documents.

4. WORK BY OWNER. There are no activities identified for Owner to perform in connection with this Work:

5. PROCUREMENT CONTRACTS. The Owner has entered into Procurement Contracts for engineering procurement, delivery of certain equipment, services and components of specialty systems that are to be installed by the selected Contractor in connection with the completed Work. These contracts include a Pre-Selection Contract with Trojan Technologies Inc. for the Ultraviolet Disinfection and Oxidation System; and a Procurement Contract with Scinor for the Groundwater Replenishment System MF/UF Membranes.

The Owner will assign to the selected Contractor the Owner’s rights, and will delegate performance to the selected Contractor of the Owner’s obligations, under the Contract for Procurement, and delivery of the systems as described in the respective Procurement Contracts. The selected Contractor shall accept transfer of such rights and obligations, assume responsibility for payment of the vendor for the systems, and assume responsibility for procurement and delivery of the MF membranes and UV system.

6. SALVAGE OF MATERIALS AND EQUIPMENT. Existing materials and equipment removed and not reused as a part of the Work shall become Contractor's property, unless otherwise stated in the Contract Documents.

Contractor shall carefully remove, in a manner to prevent damage, all materials and equipment specified or indicated to be salvaged and reused or to remain the property of Owner. Contractor shall store and protect salvaged items specified or indicated to be reused in the Work.

Salvaged items not to be reused in the Work, but to remain Owner's property shall be delivered by Contractor in good condition to Owner at OCWD.

Any items specified or indicated to be salvaged which are damaged in removal, storage, or handling through carelessness or improper procedures shall be replaced by Contractor in kind or with new items.

Except where specified as no exception, Contractor may furnish and install new items instead of those specified or indicated to be salvaged and reused, in which case such removed items will become Contractor's property. Contractor may only provide new items instead of those specified where it is allowed in the Technical Specifications.

Existing materials and equipment removed by Contractor shall not be reused in the Work, except where so specified or indicated.
7. **LAND FOR CONSTRUCTION PURPOSES.** Contractor may be permitted to use available land belonging to OCWD and OCSD, on or near the Site, in fee or by agreement, for construction purposes and for storage of materials and equipment.

The locations and extent of the areas so used shall be as indicated on the Drawings.

However, if the space available is not sufficient for Contractor’s activities, the Contractor shall arrange; at Contractor’s cost; for additional space as required for construction purposes.

Contractor shall immediately move stored materials or equipment if any occasion arises, as determined by OCWD or OCSD, requiring access to the storage area. Materials or equipment shall not be placed on the property of OCWD or OCSD until OCWD or OCSD has agreed to the location to be used for storage.

8. **OPERATION OF EXISTING FACILITIES.** The existing treatment plant facilities must be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the degree of service provided. Provided permission is obtained from Owner in advance, portions of the existing facilities may be taken out of service for short periods corresponding with periods of minimum service demands.

Contractor shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period.

9. **USE OF OWNER’S EXISTING EQUIPMENT.** The existing overhead cranes inside the pump stations and facilities shall not be used for installation of new piping and equipment.

10. **NOTICES TO OWNERS AND AUTHORITIES.** Contractor shall, as provided in the General Conditions, notify owners of adjacent property and utilities when prosecution of the Work may affect them.

When it is necessary to temporarily deny access to property, or when any utility service connection must be interrupted, Contractor shall give notices sufficiently in advance to enable the affected persons to provide for their needs. Notices shall conform to any applicable local ordinance and, whether delivered orally or in writing, shall include appropriate information concerning the interruption and instructions on how to limit inconvenience caused thereby.
Utilities and other concerned agencies shall be notified at least 24 hours prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.

11. LINES AND GRADES. All Work shall be done to the lines, grades, and elevations indicated on the Drawings.

Basic horizontal and vertical control points will be established or designated by Engineer to be used as datums for the Work. All additional survey, layout, and measurement work shall be performed by Contractor as a part of the Work.

Contractor shall provide an experienced instrument person, competent assistants, and such instruments, tools, stakes, and other materials required to complete the survey, layout, and measurement work. In addition, Contractor shall furnish, without charge, competent persons and such tools, stakes, and other materials as Engineer may require in establishing or designating control points, in establishing construction easement boundaries, or in checking survey, layout, and measurement work performed by Contractor.

Contractor shall keep Engineer informed, a reasonable time in advance, of the times and places at which it wishes to do Work, so that horizontal and vertical control points may be established and any checking deemed necessary by Engineer may be done with minimum inconvenience to Engineer and minimum delay to Contractor.

Contractor shall remove and reconstruct work which is improperly located.

12. CONNECTIONS TO EXISTING FACILITIES. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities, including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electric. In each case, Contractor shall receive permission from OCWD, OCSD, or the owning utility prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.

Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

13. UNFAVORABLE CONSTRUCTION CONDITIONS. During unfavorable weather, wet ground, or other unsuitable construction conditions, Contractor shall confine its operations to work which will not be affected adversely by such conditions. No portion of the Work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or
precautions are taken by Contractor to perform the Work in a proper and satisfactory manner.

14. **CUTTING AND PATCHING.** As provided in General Conditions, Contractor shall perform all cutting and patching required for the Work and as may be necessary in connection with uncovering Work for inspection or for the correction of defective Work.

Contractor shall perform all cutting and patching required for and in connection with the Work, including but not limited to the following:

- Removal of improperly timed Work.
- Removal of samples of installed materials for testing.
- Alteration of existing facilities.
- Installation of new Work in existing facilities.

Contractor shall provide all shoring, bracing, supports, and protective devices necessary to safeguard all Work and existing facilities during cutting and patching operations. Contractor shall not undertake any cutting or demolition which may affect the structural stability of the Work or existing facilities without Engineer's concurrence.

Materials shall be cut and removed to the extent indicated on the Drawings or as required to complete the Work. Materials shall be removed in a careful manner, with no damage to adjacent facilities or materials. Materials which are not salvable shall be removed from the site by Contractor.

All Work and existing facilities affected by cutting operations shall be restored with new materials, or with salvaged materials acceptable to Engineer, to obtain a finished installation with the strength, appearance, and functional capacity required. If necessary, entire surfaces shall be patched and refinished.

The Contractor shall maintain the existing MF building structure (including structural floor and roof decking), envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material), and interior non-structural elements not indicated to be removed; and shall not cut such existing construction beyond indicated limits.

15. **CLEANING UP.** Requirements for cleaning up are covered in the General and Special Provisions. Adequate clean-up will be a condition for recommendation of progress payment application.
16. **APPLICABLE CODES.** References in the Contract Documents to local codes mean the following:

- International Building Code with California amendments
  - 2016 California Building Code
  - 2016 California Plumbing Code (Title 24 – Part 5)
  - 2016 California Electrical Code (Title 24 – Part 3)
  - 2016 California Mechanical Code (Title 24 – Part 4)
  - 2016 California Fire Code (Title 24 – Part 9)
  - 2016 Title 24 Energy Provisions
- National Electric Code
- State of California Codes
- County of Orange Codes and Standards
- American Water Works Association (AWWA)
- Hydraulic Institute Standards (HIS)
- National Fire Protection Association (NFPA) Recommended Practices and Manuals

Other standard codes which apply to the Work are designated in the Specifications.

17. **REFERENCE STANDARDS.** Reference to standards, 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 at the time of opening of Bids (or on the effective date of the Contract or Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents. However, no provision of any referenced standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Consulting Engineer, Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents. Nor shall any such provision or instruction be effective to assign to Owner, Engineer, Consulting Engineer, or any of Engineer's Consultants, agents, or employees, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

18. **SPECIFICATION DATA SHEETS AND SCHEDULES.** Specifications may have data sheets and schedules as part of specific specification sections. Locations for data entries on the data sheets and schedules may be left blank intentionally. When no data is entered in a respective cell, this indicates that no data is required for that cell of the data sheet or schedule. The Contractor shall be responsible for furnishing and installing all equipment, piping, wires, and devices in the Contract Documents whether or not they are shown in the data sheets and schedules.
19. **PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES.** In accordance with the General Provisions and the Special Provisions, the Contractor shall assume full responsibility for the protection of all buildings, structures and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, on-site wells, sewers, drains and electric and telephone cable, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from damage of any kind. Any damage resulting from the Contractor’s operations shall be immediately repaired by Contractor, at Contractor’s own expense.

20. **SITE ADMINISTRATION.** Contractor shall be responsible for all areas of the Site used by it, by other contractors, and by all Subcontractors in the performance of the Work. Contractor shall exert full control over the actions of all employees and other persons with respect to the use and preservation of property and existing facilities, except such controls as may be specifically reserved to Owner or others. Contractor shall have the right to exclude from the Site all persons who have no purpose related to the Work or its inspection, and may require all persons on the Site (except Owner’s employees) to observe the same regulations as Contractor requires of its employees.

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MEASUREMENT AND PAYMENT

1. **SCOPE.** This section covers methods of measurement and payment for items of Work under this Contract.

2. **GENERAL.** The Contract Price for each section of the Contract shall cover all Work required by the Contract Documents. All costs in connection with the proper and successful completion of the Work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction plant, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the unit and lump sum prices bid. All Work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of Contractor and all costs in connection therewith shall be included in the prices bid.

3. **ESTIMATED QUANTITIES.** All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only (a) as a basis for estimating the probable cost of the Work and (b) for the purpose of comparing the Bids submitted for the Work. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished. Contractor agrees that it will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts therefor.

4. **UNITS OF MEASUREMENT.** A pound is an avoirdupois pound. A ton is 2,000 pounds avoirdupois. The unit of liquid measure is the U.S. gallon.

5. **CERTIFIED WEIGHTS.** When payment is to be made on the basis of weight, the weighing shall be done on platform scales certified and inspected by applicable California State Weights and Measures Department, or when approved by the Engineer, on a completely automated weighing and recording system. The Contractor shall take all measurements, compute all payment quantities, and furnish the Engineer with duplicate licensed weighmaster's certificates showing the actual net weights. The Engineer shall verify and approve measurements.

6. **METHODS OF MEASUREMENT.** Materials and items of work which are to be paid for on the basis of measurement shall be measured in accordance with the method stipulated in the particular sections involved or the description of Bid Items found in 2.2 of this Section. In determining quantities, all measurements shall be made in a horizontal plane unless otherwise specified.
Material not used from a transporting vehicle shall be determined by the Engineer and deducted from the certified tag.

When material is to be measured and paid for on a volume basis and it would be impractical to determine the volume, or when requested by the Contractor in writing and approved by the Engineer in writing, the material will be weighed and converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities will be adopted.

Full compensation for all expense involved in conforming to the above requirements for measuring and weighing materials shall be considered as included in the unit prices paid for the materials being measured or weighed and no additional allowances will be made therefore.

Quantities of material wasted or disposed of in a manner not called for under the Contract; or rejected loads of material, including material rejected after it has been placed by reason of failure of the Contractor to conform to the provisions of the Contract; or material placed outside the lines indicated on the plans or given by the Engineer; or material remaining on hand after completion of the Contract, will not be paid for and such quantities will be deducted from the final total quantities. No compensation will be allowed for hauling rejected material.

2. DESCRIPTION OF BID ITEMS.

2-1. Summary.

The Bid Amounts for each Bid Item will be used for comparative bid analysis. The Bid amounts will also form the basis of monthly progress payments. Each Lump Sum bid amount will undergo further breakdown as described later in this section. Unit prices for any unit price bid items will be the basis for monthly progress payment determinations and for any changes related to that Work item. Bid Item No. 2, Worker Protection and Safety/Shoring, will also demonstrate the Contractor's compliance with the California Labor Code relating to the price for sheeting, shoring, and bracing of excavations. Bid items are not intended to be exclusive descriptions of work categories and the Contractor shall determine and include in its pricing all materials, labor, and equipment necessary to complete each Bid Item (work phase) as shown and specified.

Each lump sum price shall be full compensation for the preparation, demolition, installation, and/or submittal of the materials, and for all labor, equipment, tools and incidentals to complete that Bid Item.

2-2. Description of Bid Items.
BID ITEM NO. 1 MOBILIZATION AND DEMOBILIZATION. Bid Item No. 1 is a lump sum amount for mobilization/demobilization. Sixty (60) percent of the total for Bid Item No.1 shall be applied to mobilization. Forty (40) percent of the total for Bid Item No. 1 shall be applied to demobilization.

Mobilization shall include: the obtaining of insurance, bonds, and other documents; moving of all equipment onto site and setting up field offices; submittal and approval of the complete shop drawing project construction schedule; obtaining and paying for all permits by other agencies as applicable and as required by the Regulatory Requirements and Permits Section to complete all the Work described herein; contacting and coordinating with Underground Services Alert (USA) and other utility owners; furnishing and erecting temporary construction facilities; making connections to temporary utilities (including, but not limited to, power, toilets, water, and fences); installing construction signs; temporary buildings and field office trailer(s); and other pre-construction efforts as required for the proper performance and completion of the work.

Contractor may apply for mobilization/demobilization as follows:

a. When the contract time line reaches Day 30 (Notice-to-Proceed plus 30 calendar days), 40 percent of the portion of this lump sum bid item associated with mobilization shall be included in the progress payment provided the activities identified for mobilization are completed.

b. For each of the following six progress payments, 10 percent of the portion of this lump sum bid item associated with mobilization shall be included in the progress payment (for a total of 100 percent the portion of this lump sum bid item associated with mobilization) provided the activities identified for mobilization are completed.

Demobilization shall include site cleaning and restoration of surfaces within the job site; moving of all equipment away from site and deconstructing field offices’ post-construction meeting, removal of all temporary facilities and equipment from the work area, disconnection of the temporary construction facilities and turnover of project to the Owner, and off-site disposal, handling, and transporting of demolition material not covered in another bid item. Payment for demobilization will be with the Final Progress Payment.

Demobilization also includes the submission by the Contractor of a final payment letter stating that acceptance of the final payment shall operate as and shall be a release of all claims arising by virtue of the Agreement. The Work will not be complete, and final payment cannot be approved or paid, until this letter is received and is acceptable to the Owner.

Contractor may not apply for payment of demobilization until all demobilization items are completed as specified.
BID ITEM NO. 2 WORKER PROTECTION AND SAFETY/SHEETING, SHORING, AND BRACING. Bid Item No. 2 is a bid item for work associated with worker protection and sheeting, shoring and bracing. This bid item includes:

(A) Sheeting, shoring, and bracing associated with the Project
(B) All other worker protection and safety

Measurement of each of these Bid Items is described below. Contractor may apply for payment for these Bid Items on a percent complete basis of the items covered in Worker Protection and Safety/Sheeting, Shoring, and Bracing Bid Item.

(A) All Other Sheeting, Shoring, and Bracing.
This portion of Bid Item No. 2 shall include all costs for providing all sheeting, shoring and bracing or equivalent method for stabilizing excavations and its appurtenances for the completion of other Work as part of the AWPF Expansion. Full compensation for all planning; design; engineering fees, submittal preparation, furnishing and constructing, and removal and disposal of sheeting, shoring, and bracing or other means of excavation stabilization as required by, but not limited to, Labor Code Sections 6700-6708 shall be included. This work shall be completed as required under the provisions of any permits, and in accordance with the requirements of OSHA and Construction Safety Orders of the State of California.

(B) All other worker protection and safety.
This portion of Bid Item No. 2 shall include all costs for providing a detailed plan of worker safety and maintaining safety during construction. This plan shall conform to Labor Code Sections 6700-6708 and implement all applicable safety orders and permits.

BID ITEM No. 3 SCINOR MICROFILTRATION MEMBRANES AND PIPING
Bid Item No. 3 includes a lump sum bid for the Scinor Membrane Filtration System Procurement Contract. The pre-negotiated price agreed between Scinor and the Owner has been included on the Bid Form. Costs to install the Scinor Low Pressure Membrane Modules are not included in Bid Item No. 3 and shall be included in Bid Item No. 13.

Contractor may apply for payment for Bid Item No. 3 in accordance with the milestones presented in the agreement from the pre-negotiated contract.

BID ITEM NO. 4 TROJAN ULTRAVIOLET LIGHT SYSTEM EQUIPMENT
Bid Item No. 4 includes a lump sum bid for the Trojan Ultraviolet Light System Procurement Contract. The pre-negotiated price agreed between Trojan and the Owner is included on the Bid Form. Costs to install the Trojan Ultraviolet Light System are not included in Bid Item No. 4 and shall be included in Bid Item No. 13.
Contractor may apply for payment for Bid Item No. 4 in accordance with the milestones presented in the agreement from the pre-negotiated contract.

**BID ITEM NO. 5 DEWATERING.** Bid Item No. 5 is a lump sum bid item for the design, furnishing, installation, operation, maintenance, monitoring, reporting, and abandonment of a dewatering system including, but not limited to, extraction wells, pumps, discharge piping, treatment and disposal systems. Specifications for the abandonment of a construction dewatering well are included in the Dewatering Section.

**BID ITEM NO. 6 PILE INSTALLATION.** Bid Item No. 6 is a unit price bid item for the design, furnishing, and installation of piles. Payment for this bid item shall be based on actual length of pile (as determined from the load testing program) installed in the ground. The unit price shall include all labor, tools, and equipment for excavating/drilling, placing, and terminating each linear foot of pile. No additional payment will be made for temporary works, such as pile to be wasted and other incidentals, and costs for such shall be included in the unit price.

No payment shall be made for production test piles damaged. No payment shall be made for removal and replacement of rejected piles, or for any other piles not shown on the Drawings.

**BID ITEM NO. 7 CUT PILES FIVE FEET BELOW FINISHED GRADE.** Bid Item No. 7 is a unit price bid item for the cutting, removal, handling, and disposal of existing piles. This bid item is a stipulated bid allowance and will be only utilized as needed, upon approval by Owner, and at the agreed upon unit price. The unit price includes all labor, tools, materials and equipment required for the cutting and removal of the pile.

For the purposes of estimating, Bidder shall assume that piles are driven taper type and are 24 inches in diameter. Finished grade shall be defined as the nearest adjacent finished surface.

**BID ITEM NO. 8 ALLOWANCE – WITNESSING FACTORY TESTING.** Bid item No. 8 is a bid allowance for travel related expenses from the project site and to the factory inspection site, including travel arrangements, transportation to and from airport, air fare, rental vehicles, toll or parking fees, and lodging and meals for the Owner’s representative(s) conducting the factory inspection or witness testing. Although this bid item is a stipulated bid allowance, the allowance will be only utilized on actual travel completed upon prior approval by Owner.

**BID ITEM NO. 9 PROCESS CONTROL SYSTEM INTEGRATION.** Bid Item No. 9 is a lump sum bid item that includes all Work performed by the Process Control System Integrator (PCS1) associated with upgrading and expanding the existing Process Control System (PCS) as specified in the Process Control
System section. This bid item includes Upgrade of the PCS from Version **XX.X** to **XX.X**.

Measurement of Bid Item No. 9 is described below. Contractor may apply for payment for Bid Item No. 9 on a percent complete basis of the items covered in PCS Integration.

The PCS upgrade from version **XX.X** to **XX.X** includes upgrading the DeltaV software and firmware from version **XX.X** to version **XX.X**; replacement of PCS servers and operator stations; programming and configuration of the PCS for the modifications and expansion of the existing facilities; integration of the Scinor Membrane Filtration System into the PCS; testing of all PCS communications including fieldbus communications; and furnishing instrumentation and control panels.

The Work associated with the replacement of computer hardware associated with MF or UV System Supplier control packages is included in Bid Item Nos. 3 and 4.

**BID ITEM NO. 10 RO ELEMENTS.** Bid Item No. 10 is a unit price bid item for the design, manufacturing, and delivery FOB to the project site of the RO elements. Payment for this bid item shall be based on actual number of elements delivered to the project site. The unit price shall include all labor, tools, equipment, storage costs; Contractor profit, overhead, sales tax, bonds, and insurance associated with the RO elements. The price for installing and testing the RO elements shall not be included in Bid Item No. 10.

**BID ITEM NO. 11 SECONDARY EFFLUENT FLOW EQUALIZATION FACILITIES:** Bid Item No. 11 consists of all the work associated with the Secondary Effluent Flow Equalization Facilities at Plant No. 2.

**BID ITEM NO. 12 NEW PLANT NO. 2 PIPELINE FROM 66” TO SCREENINGS FACILITY:** Bid Item No. 12 consists of all the work associated with the connection of the new Plant No. 2 pipeline connection to the Screenings Facility at Plant No. 1. The 66-inch pipeline rehabilitation work is included in a separate contract.

**BID ITEM NO. 13 FURNISH ALL EQUIPMENT, LABOR AND MATERIALS TO CONSTRUCT THE FINAL EXPANSION OF THE GROUNDWATER REPLENISHMENT SYSTEM, INCLUDING ALL WORK NOT INCLUDED IN OTHER BID ITEMS, COMPLETE IN PLACE.** Bid Item No. 13 is a lump sum bid item that includes all Work required to construct the Final Expansion of the Groundwater Replenishment System not included in other bid items. Contractor shall furnish all equipment, labor, and materials necessary to complete the Work. Contractor may apply for payment on Bid Item No. 13 on a percent complete basis of all items not included in other bid items.
End of Section
1. **LIST OF ABBREVIATIONS.** Abbreviations for standards and organizations used in the Contract Documents are defined as follows:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Aluminum Association</td>
</tr>
<tr>
<td>AABC</td>
<td>Associated Air Balance Council</td>
</tr>
<tr>
<td>AAMA</td>
<td>Architectural Aluminum Manufacturers Association</td>
</tr>
<tr>
<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
</tr>
<tr>
<td>ABMA</td>
<td>American Bearing Manufacturers Association</td>
</tr>
<tr>
<td>ACI</td>
<td>American Concrete Institute</td>
</tr>
<tr>
<td>ACPA</td>
<td>American Concrete Pipe Association</td>
</tr>
<tr>
<td>AEIC</td>
<td>Association of Edison Illuminating Companies</td>
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<tr>
<td>AFBMA</td>
<td>Antifriction Bearing Manufacturers Association now recognized as the ABMA</td>
</tr>
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<td>AFPA</td>
<td>American Forest &amp; Paper Association</td>
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<td>AGA</td>
<td>American Gas Association</td>
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<tr>
<td>AGMA</td>
<td>American Gear Manufacturers Association</td>
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<tr>
<td>AHA</td>
<td>American Hardboard Association</td>
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<tr>
<td>AHRI</td>
<td>Air Conditioning, Heating and Refrigeration Institute</td>
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<tr>
<td>AISC</td>
<td>American Institute of Steel Construction</td>
</tr>
<tr>
<td>AISI</td>
<td>American Iron and Steel Institute</td>
</tr>
<tr>
<td>AITC</td>
<td>American Institute of Timber Construction</td>
</tr>
<tr>
<td>AMCA</td>
<td>Air Movement and Control Association International</td>
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<td>ANSI</td>
<td>American National Standards Institute</td>
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<tr>
<td>APA</td>
<td>Engineered Wood Association (formerly American Plywood Association)</td>
</tr>
<tr>
<td>API</td>
<td>American Petroleum Institute</td>
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<tr>
<td>APWA</td>
<td>American Public Works Association</td>
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<tr>
<td>AREMA</td>
<td>American Railway Engineers and Maintenance-of-Way Association</td>
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<tr>
<td>ASAHC</td>
<td>American Society of Architectural Hardware Consultants</td>
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<tr>
<td>ASCE</td>
<td>American Society of Civil Engineers</td>
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<tr>
<td>ASHRAE</td>
<td>American Society of Heating, Refrigerating, and Air-Conditioning Engineers</td>
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<td>ASME</td>
<td>American Society of Mechanical Engineers</td>
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<td>ASSE</td>
<td>American Society of Sanitary Engineers</td>
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<td>ASTM</td>
<td>ASTM International</td>
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<td>AWG</td>
<td>American Wire Gauge</td>
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<td>AWI</td>
<td>Architectural Woodwork Institute</td>
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<td>AWPA</td>
<td>American Wood-Preservers' Association</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<td>AWS</td>
<td>American Welding Society</td>
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<td>BHMA</td>
<td>Builders Hardware Manufacturers Association</td>
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<td>BIA</td>
<td>Brick Institute of America (formerly SCPI)</td>
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<td>CDA</td>
<td>Copper Development Association</td>
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<td>CISPI</td>
<td>Cast Iron Soil Pipe Institute</td>
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<td>CMAA</td>
<td>Crane Manufacturers Association of America</td>
</tr>
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<td>CRA</td>
<td>California Redwood Association</td>
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<tr>
<td>CRSI</td>
<td>Concrete Reinforcing Steel Institute</td>
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<td>CS</td>
<td>Commercial Standard (U.S. Department of Commerce)</td>
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<td>DHI</td>
<td>Door and Hardware Institute</td>
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<td>DIPRA</td>
<td>Ductile Iron Pipe Research Association</td>
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<td>EEI</td>
<td>Edison Electric Institute</td>
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<td>EJCDC</td>
<td>Engineers’ Joint Contract Documents Committee</td>
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<td>EPA</td>
<td>Environmental Protection Agency</td>
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<td>FCC</td>
<td>Federal Communications Commission</td>
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<td>Fluid Controls Institute</td>
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<td>Fed Spec</td>
<td>Federal Specification</td>
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<td>FHWA</td>
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<td>HMI</td>
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<td>HPMA</td>
<td>Hardwood Plywood Manufacturers Association</td>
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<td>Hand Tools Institute</td>
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<td>I-B-R</td>
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<td>IEEE</td>
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<td>IBC</td>
<td>International Building Code</td>
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<td>Illuminating Engineering Society</td>
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<td>Industrial Fasteners Institute</td>
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<td>IPCEA</td>
<td>Insulated Power Cable Engineers Association</td>
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<td>IRI</td>
<td>Industrial Risk Insurers</td>
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<tr>
<td>ISA</td>
<td>International Society of Automation</td>
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<td>LEED</td>
<td>Leadership in Energy and Environmental Design</td>
</tr>
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<td>Abbreviation</td>
<td>Full Name</td>
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<tr>
<td>MHI</td>
<td>Materials Handling Institute</td>
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<td>Military Specification</td>
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<td>Monorail Manufacturers Association</td>
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<td>Manufacturers Standardization Society of Valve and Fitting Industry</td>
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<td>NAAMM</td>
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<td>NCSPA</td>
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<td>NEBB</td>
<td>National Environmental Balancing Bureau</td>
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<td>NEC</td>
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<td>National Institute of Standards and Technology (formerly NBS)</td>
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<td>OCSD</td>
<td>Orange County Sanitation District</td>
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<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
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<td>Portland Cement Association</td>
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<td>PCI</td>
<td>Precast/Prestressed Concrete Institute</td>
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<td>PPI</td>
<td>Plastic Pipe Institute</td>
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<td>PS</td>
<td>Product Standard</td>
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<td>RIS</td>
<td>Redwood Inspection Service</td>
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<td>SAE</td>
<td>SAE International</td>
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<td>SDI</td>
<td>Steel Door Institute</td>
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<td>SFPA</td>
<td>Southern Forest Products Association</td>
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<td>Abbreviation</td>
<td>Full Name</td>
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<tr>
<td>--------------</td>
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<tr>
<td>SI</td>
<td>Système International des Unités (International System of Units)</td>
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<td>SIGMA</td>
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<td>Steel Joist Institute</td>
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<td>SMA</td>
<td>Screen Manufacturers Association</td>
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<tr>
<td>SMACNA</td>
<td>Sheet Metal and Air Conditioning Contractors National Association</td>
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<td>SPFA</td>
<td>Steel Plate Fabricators Association</td>
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<td>SPI</td>
<td>Society of the Plastics Industry</td>
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<tr>
<td>SPTA</td>
<td>Southern Pressure Treaters Association</td>
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<tr>
<td>SSFI</td>
<td>Scaffolding, Shoring &amp; Forming Institute, Inc</td>
</tr>
<tr>
<td>SSPC</td>
<td>SSPC: The Society for Protective Coatings</td>
</tr>
<tr>
<td>SSPWC</td>
<td>Standard Specification for Public Works Construction</td>
</tr>
<tr>
<td>SWPPP</td>
<td>Storm Water Pollution Prevention Plan</td>
</tr>
<tr>
<td>TABB</td>
<td>Testing, Adjusting, and Balancing Bureau</td>
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<tr>
<td>UL</td>
<td>Underwriters' Laboratories</td>
</tr>
<tr>
<td>USBR</td>
<td>U.S. Bureau of Reclamation</td>
</tr>
<tr>
<td>USGBC</td>
<td>U.S. Green Building Council</td>
</tr>
<tr>
<td>WEF</td>
<td>Water Environment Federation</td>
</tr>
</tbody>
</table>

End of Section
PART 1 – GENERAL

1-1. DESCRIPTION. The Contractor shall provide for each piece of equipment supplied, a 316-stainless steel or non-corrosive asset nameplate firmly attached and permanently engraved with the “asset tag” directed by the Owner. In addition, a separate equipment nameplate with the Owner’s standard equipment number shall be permanently affixed to each piece of equipment. The Owner shall assign a block of equipment numbers to be assigned by the Contractor for each piece of equipment.

The unique equipment number used by the manufacturer shall be consistent with the number used to identify the equipment in parts listings and other O&M documentation. Equipment numbers shall be provided and affixed to the equipment by the equipment manufacture prior to delivery to the Contractor.

For all devices where nameplates are supplied, the Contractor shall develop an “Equipment Cross Reference Schedule” that matches the asset tag and equipment number to the appropriate equipment manual and parts list. The equipment schedule shall include the pertinent information associated with the equipment including asset tag and equipment number, description, functional name, location, component equipment model, part number, size, materials, accessories, range, equipment cost, replacement cost, purchase order number, warranty information, expected life, etc. The Equipment Cross-Reference Schedule shall be provided in the form of a Microsoft Excel spreadsheet.

The Contractor shall coordinate the identification of all equipment provided with the Owner's asset tagging and management system.

1-2. SUBMITTALS. The Contractor shall provide asset tags as part of the Shop Drawing Submittal.

Submit a complete listing of all equipment furnished along with both equipment identification number and asset tag number for approval.

Submit the “Cross Reference Schedule” approved equipment number and asset tag for each piece of equipment furnished in the same electronic format as that provided by the Owner.

PART 2 – PRODUCTS
2-1. **EQUIPMENT DESIGN AND FABRICATION.** There are two types of tags that are needed for the identification of assets in the field. One is the asset tag and the other is the equipment tag. Asset numbers are already formatted as shown on the P&IDs. Equipment numbers are not going to be available until the assets and the equipment have been entered into Maximo (the CMMS software) and Maximo assigns the equipment its unique identifier. Hence, the submission of tags by the Contractor will be a two-phased activity. First, the Asset Tags will be submitted as set forth below by the Contractor at the same time the assets are delivered and installed by the contractor. Later, at a predetermined time set by the OCWD, and when the equipment numbers are available from the CMMS program, and submitted by OCWD to the Contractor, the Contractor will deliver the equipment tags as set forth below.

Two forms of identification will be used for assets:

**Asset Tag** – will refer to the identification of the asset in the context of the facility, process, site, etc. The Asset Tag will include Area/location, Train/Block Number, Component ID, and Sequence Number (unique identification) of the asset related to the function. The Asset Tag will remain with the location or function.

**Equipment Tag** – will refer to the unique identifier of the specific piece of equipment or asset. The Equipment Number will remain with that asset/equipment and “travel” with it as it is put in service, taken out of service, repaired, overhauled, etc. The Equipment Number will be linked to an Asset Tag when the equipment is in service.

2-1.01. **Asset Tags.** Assets are identified by facility, location / area, process, relative position within a process, and related system using an asset tag. The purpose of having asset tags is for operations and maintenance personnel to be able to identify the asset in the field.

Asset tags are assigned to the placement of the asset and remain if the actual equipment in replaced. The asset tags are mounted adjacent to the equipment on slabs, mounting stands, conduit and similar locations closely associated with the asset.

All process equipment, valves, instruments and controls will be given an asset tag. All process plant assets, non-fixed equipment, and furnishing assets shall be given an asset tag.

Pipe and appurtenances are associated with a process and flow steam/system. Pipes and appurtenances shall receive asset numbers but shall not be tagged in the field.

Asset tags shall match the format and tagging shown on the P&IDs unless noted otherwise.
The asset register contains the complete relationship an asset has within the facility. The asset tag is derived from the information contained in the register. The asset tagging conventions define what elements of the asset register are used for each asset tag type.

An example of an asset register is shown below:

<table>
<thead>
<tr>
<th>Facility Code</th>
<th>Area/Location Code</th>
<th>Equipment/Component Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility Unit</td>
<td>Location/Area</td>
<td>Train/Block Number</td>
</tr>
<tr>
<td>AWTF</td>
<td>Location/Area</td>
<td>Train/Block Number</td>
</tr>
<tr>
<td></td>
<td>Location/Loc Code</td>
<td>Train/Block Number</td>
</tr>
<tr>
<td>610 A01</td>
<td>DPW</td>
<td>FV</td>
</tr>
<tr>
<td></td>
<td>3310</td>
<td></td>
</tr>
</tbody>
</table>

The asset tag will comprise of the Location/Area, Train/Block Number, Component ID, and Sequence Number as shown below:

<table>
<thead>
<tr>
<th>Area/Location Code</th>
<th>Equipment/Component Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location/Area</td>
<td>Train/Block Number</td>
</tr>
<tr>
<td>Location/Loc Code</td>
<td>Component ID</td>
</tr>
<tr>
<td>610 A01</td>
<td>FV</td>
</tr>
<tr>
<td></td>
<td>3310</td>
</tr>
</tbody>
</table>

All component, Sequence Number, and Sub-Process Sequence Number for equipment contained as part of a duplicated process shall be the same component, sequence and sub-process designation. For example, all the UV Discharge Valves shall carry the final designation as FV 3310. The designator for the Unit in contained in the Train or Block Number.

Tagging schedules shall be obtained form the PCSS and the ISS.

2-1.02 **Equipment Number:** Unique equipment identification numbers are assigned to a specific equipment item for the life of the item. When the equipment item is moved from the process, the equipment identification number goes with the equipment item.

Each device shall bear a nameplate to identify its equipment identification number both in text and bar code formats. Equipment numbers shall be displayed on the outside of equipment enclosures and panels. Bar codes shall reflect the equipment number using Code 39 and printed in a minimum of 18-point font size. Bar codes shall be printed on adhesive backed labels designed for exterior applications for both adhesion and fading for a minimum of seven years exposure, affixed to the permanent nameplates.
The equipment number will be assigned by Maximo, the CMMS software and will be a random sequential number. This number shall be unique. Contractor shall use this equipment number as part of the equipment cross-reference schedule for each equipment item. Equipment numbers shall be represented with a bar code as part of the equipment identification engraved on the equipment number nameplate. Codes shall be printed with the minimum 18pt font in Code 39 or as specified herein.

Nameplates shall be attached using Type 316 stainless steel self-tapping machine screws where possible or as specified otherwise. If the use of a stainless-steel screw is not possible, provide a 316-stainless steel chain or stainless-steel wire (18-gauge min) and affix to a non-removable part of the device. Where specified, attach the nameplate using permanent Silicon II adhesive as approved by the Engineer.

Equipment number and asset tags shall be provided for all equipment furnished including but not limited to:

1. PCS Computer and Networking Equipment (e.g. Controller Servers, Workstations, and network equipment)

2. Process Controller Component Equipment (i.e. Process Controller Module)

3. Mechanical process equipment, pump, blowers, valves, etc.

4. Field instrumentation

5. Control panel

6. Electrical distribution equipment

7. Facility equipment: Hoists, HVAC equipment, security, fire alarm, communication systems, etc.

8. Steel storage tanks

9. Prestressed Concrete Tanks

10. Miscellaneous items as required.

2-1.03. Equipment Nameplates. Information to be permanently engraved onto the nameplate shall include the identifying equipment number, asset tag, manufacturer, model number, and manufacturer part number.

The asset tag included on the nameplate shall only include the Location/Area,
Train/Block Number, Component ID, and Sequence Number fields.

Nameplate asset tag example:

<table>
<thead>
<tr>
<th>Location/Area</th>
<th>Train/Block Number</th>
<th>Component ID</th>
<th>Sequence Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>610 A01 FV</td>
<td>3310</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2-1.04 Control Components Tagging. All process controller racks mounted on or within control panels and enclosures shall have the equipment identification nameplate installed so that the engravings are easily visible to service personnel.

Equipment nameplates shall be provided for components located in control panel enclosures. Equipment information shall be located on the front of the panels and the complete tag, including bar code identification shall be located on the back of the component.

Tagging shall also be used to denote the function of all panel enclosure electrical devices including switches, lamp indicators, potentiometers and panel-mounted instruments.

Control Panel Nameplates shall be constructed as follows:

1. 3/32-inch thick laminated phenolic for engraving composed of core, laminated on both sides with a matte (non-glare) finish cover sheet.
2. Core to be black; cover sheet to be white.
3. Nameplates shall be engraved with 3/16-inch letters, minimum.
4. Mounting holes to be centered on width and 1/4 inch from each end.
5. Information to be permanently engraved onto the nameplate shall include the identifying asset tag or equipment number with manufacturer, model number, and part number.
6. The nameplates shall be fastened to the control panel device with self-tapping stainless-steel screws. Where fastening with screws is not permitted or impractical the nameplates shall be attached to the device using permanent Silicon II adhesive.
7. Specific Nameplate Material and Installation Requirements
   a. Manufacturer for S1, S2 and S3: Dreiling Manufacturing (Pacoima, CA) or Nu-Way (14744 Richvale Dr., La Mirada, CA Tel: 562-906-0097) or equal.
   b. Holes shall be at least one diameter from all edges and centered.
c. All edges shall be deburred and smooth to the touch.

d. Metal Nameplates, Type S1:

Designation: Type S1  
Material: Stainless steel, alloy 316  
Thickness: 0.040" minimum  
Size: 2-3/8" x 3/4" ± 0.1"  
Holes: 2, DIA=0.12", See Fig. 1 for location.  
Letter size: 3/16" high, 1/8" wide (no more than 12 characters in one line)

Remarks: Characters shall be engraved in the center of the tag with a minimum depth of 0.009 inch or more and filled with black enamel paint.

```
  O   O
```

FIG. 1 (not to scale)

e. Metal Nameplates, Type SB1, SB2, or SB3  
Designation: Type SB1, SB2, or SB3  
Material: Stainless steel, alloy 316  
Thickness: 0.040" minimum  
Size: (B1) 8-1/2" x 5-1/2" ± 0.1"  
(B2)  8 1/2" x 11" ± 0.1"  
(B3) Cut to fit  
Holes: 2, DIA=0.12", See Fig. 2 for location.  
Letter size: 3/16" high, 1/8" wide (no more than 12 characters in one line)

Remarks: Characters shall be engraved in the center of the tag with a minimum depth of 0.009 inch or more and filled with black enamel paint.

```
  O   O
```

FIG. 2 (not to scale)

f. Plastic Nameplates, Type L1, L2, and L3  
Designation: Type L1  
Material: Laminated Plastic with UV inhibitor
Thickness: 1/16"
Color: Black plastic behind and light blue on front.
Size: 2 3/8" x 3/4" ± 0.1"
Letter size: 3/16" high, 1/8" wide and engraved minimum 0.010" deep (one line with 12 characters maximum)

Designation: Type L2
Material: Laminated Plastic with UV inhibitor
Thickness: 1/16"
Color: Black plastic behind and light blue on front.
Size: 2" x 3/8" ± 0.1"
Letter size: 5/32" high, 1/8" wide and engraved minimum 0.010" deep (one line with 12 characters maximum)

Designation: Type L3 (backplate with no lettering)
Material: Laminated Plastic with UV inhibitor
Thickness: 1/16"
Color: Black plastic behind and light blue on front.
Size: 3" x 3/4" ± 0.1"
Letter size: 1, DIA=3/16", See Fig. 3 for location.

FIG. 3 (not to scale)

Plastic Nameplates, Type LB1, LB2, and LB3
Designation: Type LB1, LB2, and LB3
Material: Laminated Plastic with UV inhibitor
Thickness: 1/16"
Color: Black plastic behind and light blue on front.
Size: (LB 1) 8 1/2" x 5 1/2" ± 0.1"
8 1/2" x 11" ± 0.1"
Cut to fit
Holes: 2, DIA=3/16". See Fig. 4 for location

FIG. 4 (not to scale)

h. Adhesive
1) Silicone II from GE (General Electric)

i. Attachment Wire

1) 316 Stainless Steel

2) Nylon coated stranded stainless-steel wire alloy 316 from BRADY Signmark Division Catalog number: 23310. Use Brass wire clamp double ferrule design Catalog number 23312. For this wire use clamping tool Catalog number 23311. Use .030-inch, 2N5 Titanium wire for mounting in chemical storage or feed areas or in areas designated corrosive or NEMA 4X on the Drawings. Provide ESPI Electronic Space Products International, Item KCN3114, or equal. Titanium wire shall be loop, twisted, and tucked down for physical protection when used for mounting nameplates.

j. Material Selection

1) Laminated Plastic nameplates (UV inhibitor) Type L1, L2, or L3 for Asset Tag Numbers for indoor panels, for the inside of panels and for approved chemical areas. Some installations require the Type LB1, LB2 or LB3 nameplates for proper installation when the nameplate cannot be placed next to the devices.

2) SST nameplates (316 stainless steel) Type S1, S2 or S3 for Asset Tag Numbers for panels, valves, and field devices located outdoors or in corrosive environments. Some installations require the Type SB1, SB2, or SB3 nameplates for proper installation when the nameplate cannot be placed next the device.

3) Laminated Plastic nameplates for indoor devices, non-corrosive areas, and inside panels.

i. SST nameplates (316 stainless steel) Type S1, S2 or S3 with Type SB1, SB2 or SB3 for Asset Tags for panels, valves, and field devices located outdoors or in corrosive environments, and for all indoor mechanical equipment.

k. Nameplate Mounting

1) Use Silicone II adhesive for Laminated Plastic Nameplates on panel face.
2) Use plastic ties where metal corrosion is likely. Ties shall have UV inhibitor.

3) SST wire for field device asset tag attachment will be used except where tie

4) Length exceeds 12 inches where a nylon coated stainless steel wire with brass clamps shall be provided.

I. Specific Installation Methods: Following is a list of general attachment methods to be followed for nameplates:

1) Device completely hidden from view — example a valve or device under a trench cover or device submerged in a closed or open tank. Two nameplates would be used for non-submerged devices. One nameplate attached directly to or in close proximity to device. Second nameplate at a visible location. Criteria for remote nameplate location in order of preference:

   i. Above ground attachment to handrail

   ii. Ground level attachment to facility framework.

   iii. Ground or above grade attachment to concrete.

m. Back Plate — A placard or back plate with individual nameplates attached to it. A back plate is used where space is inadequate for attachment of individual nameplates for each device. Examples include a panel, an annunciator, or loop valve controller.

   The Back Plate is then attached to a panel or box with wire or glue depending on the situation. Hole punched in middle top for attachment with SST wire.

   The Back Plate shall be SST 316 for outside locations and plastic for inside locations.

   The individual nameplates are attached to the Back Plate in accordance with the geometric layout of the panel. Writing is assumed to be up. No other indication of layout direction will be put on Back Plate.

n. Nameplates attached to panel face
1) Leave existing descriptive nameplates in place.

2) Attach in location that clearly associates nameplates with device.

3) If there is little space for nameplate, use smaller size nameplate as approved by the Owner.

4) Where space permits the nameplate should touch the descriptive tag.

5) Nameplates for inside of panels, cabinets

6) Use non-metallic nameplate if there is a terminal strip in the panel (possibility of short circuiting)

7) Use plastic ties to attach tag

8) Overhead valve with chain control:

9) One nameplate attached directly to device. Second nameplate at a visible location near eye level.

o. Following is a list of general attachment methods to be followed for Asset tagging:

a. Devices and equipment located outdoors or in corrosive environments Use SST nameplate Use silicon II adhesive to attach nameplate (general location of future rivets where applicable)

b. Inside panel and building Devices Use plastic nameplate Attach nameplate to device with self-adhesive

p. Following is a list of general attachment methods to be followed for asset tag nameplates:

a. The asset tag nameplate is applied directly to the device. Select a location that is visible when the device is installed.

PART 3 – EXECUTION

3.1. Asset Tags. Asset Tags shall be mounted in close proximity to the
asset but not likely to be removed if the asset is removed. Use 316 SS, 0.032-inch wire with 3 full twist (minimum), folded inward to prevent puncture wounds to mount tags to conduit, pipe support stands, or silicone adhesive (preferred) to mount nameplates to flat or large-radius inflexible surfaces such as concrete pad, panels and support stands.

3.2. **Equipment Numbers.** Equipment Numbers shall be mounted directly on the asset so that the equipment number travels with the asset, providing a unique identifier to allow historical asset management of that asset. Use 316 SS #4 screws (preferred) or 0.032-inch wire with 3 full twist minimum folded round to prevent puncture wounds or silicon adhesive.

End of Section
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1. **APPLICABLE CODES.** See Technical Specifications for Applicable Codes.

2. **FEES AND PERMITS**

2-1. **Summary.** Contractor shall comply with all the terms, conditions and requirements attached to all permits, bonds and licenses required by any local, state, or federal agencies to perform work, construct, erect, test and start up of any equipment or facility for this Contract. The Contractor shall give all notices necessary and incidental to the due and lawful prosecution of the Work.

Any permits, bonds, licenses and fees therefore required for the performance of work under this Contract and not specifically mentioned herein as being obtained and paid for by the Owner shall be included in the Contractor's Bid price. The Contractor shall apply for and obtain all safety permits for excavations, tunneling, trenches, construction (building structure, scaffolding, or falsework) and demolition required by CAL/OSHA.

The Contractor shall post at the site of Work all required permits as stipulated by the respective regulatory agency.

2-2. **Local Agency Fees and Permits.** The Contractor shall be responsible for satisfying all code requirements, calling for inspections, and obtaining final approvals on behalf of the Owner. The Contractor shall notify the Engineer of the need and the readiness of all required inspections. All inspections are to be coordinated with the Engineer. The Contractor shall comply with all construction conditions stipulated in the permits. The Contractor shall be responsible for and the Owner shall not provide reimbursement for any costs required for the reinspection of defective work or additional costs due to the Contractor’s failure to properly schedule the inspections. The Contractor shall comply with the provisions of any and all permits obtained by the Owner and/or contained in these Specifications.

The Owner is not responsible for any local agency or utility permits required for temporary facilities during construction such as field office trailers and temporary electrical service for construction operations. Obtaining all such permits and the costs associated with such permits are the responsibility of the Contractor and shall be included in the Contractor's Total Base Bid.

2-3. **Environmental Restrictions.** The Owner has prepared an Environmental Impact Report (EIR) and issued subsequent addenda in response to CEQA comments for the Project in accordance with the California Environmental Quality Act. The Contractor shall comply with the provisions of any and all permits obtained by the Owner and/or contained in these Specifications.
Act (CEQA) and the CEQA Guidelines. A copy of the EIR is available for review at the Owner’s offices. In addition to the requirements in the summary of permits, environmental protection, protection of sensitive habitats, and other actions are required by mitigation measures adopted by the Owner. Mitigation Monitoring and Reporting Plan is included as an appendix to the EIR.

The Contractor shall be responsible for compliance with the environmental controls listed in the Environmental Controls section. The Contractor shall coordinate its work relating to these requirements with the Engineer.

2-4. Summary of Permits. The Contractor shall be responsible for coordination with the Engineer and complying with all the terms, conditions and requirements on the following requirements.

- **South Coast Air Quality Management District (SCAQMD).** The Contractor shall comply with all applicable District Rules and Regulations, particularly Regulation VIII.

- **Orange County Sanitation District (OCSD) Dewatering Permit (Sewer Discharge Requirements).** Direct or indirect discharge of water from dewatering operations into the OCSD’s sanitary sewer system first requires a Contractor application for a no-fee permit issued by the OCSD prior to any discharge. For permit application, the Contractor shall obtain and complete required documents from the Engineer to secure an Authorization to Discharge Letter from the OCSD’s Source Control staff. The Contractor shall allocate a minimum of 10 working days for this process. Additionally, the Contractor must implement the following requirements:

  1. As a part of the permit application process, the Contractor shall analyze a representative sample of the dewatering wastewater, as required, for Total Toxic Organics (TTO’s), Selenium, and other Pollutants of Concern and provide the analytical results and the completed permit application to the Engineer. Pollutants shall mean any constituent, compound, or characteristic of wastewaters on which a discharge limit may be imposed either by the OCSD or the regulatory bodies empowered to regulate the OCSD and as defined in the OCSD’s Wastewater Discharge Regulations (Ordinance).

  2. The permit issued by the OCSD’s Source Control staff may require the Contractor to monitor its discharge for Total Toxic Organics (TTO’s), Selenium, and other Pollutants of Concern and provide the analytical results to the OCSD’s Source Control staff. Typical monitoring frequency is after the commencement of discharge and before the end of discharge. Monitoring frequency shall be specified by the OCSD’s Source Control staff.
3. Monitoring of Dewatering Effluent Discharge Into OCSD’s Collection System: Any discharge of on-site dewatering to OCSD’s collection system shall be monitored by the Contractor, as required, for Heavy Metals, Selenium, Total Toxic Organics (TTO’s), Indicator Bacteria and other Pollutants of Concern to ensure compliance with the OCSD’s NPDES permit ensure compliance with the OCSD’s NPDES permit. In case where chlorine addition is used for disinfection or biological control, the Contractor shall monitor for Chlorine.

4. Any discharge of on-site dewatering directly to OCSD’s ocean outfall (bypassing treatment processes) shall be monitored by the Contractor, as required, for TSS, VSS, BOD, Ammonia, Heavy Metals, Selenium, Toxicity, Total Toxic Organics (TTO’s), and Indicator Bacteria and other Pollutants of Concern to ensure compliance with the OCSD’s NPDES permit effluent requirements. In cases where chlorine addition is used for disinfection or biological control, the Contractor shall monitor for Chlorine.

5. All dewatering operations require the use of a desilting tank with a stainless-steel sampling port and a drip container so that the Engineer may collect periodic dewatering samples. Additionally, the desilting tanks shall be covered with sturdy and air-tight covers so no odors can escape, and no illegal dumping is possible. The air-tight covers shall be maintained throughout the dewatering period, and only removed when necessary for silt removal or other maintenance activities. The desilting tank shall be located in a safe and easily accessible location. The system used for desilting the water shall be a baffled structure and shall provide not less than 5 minutes detention time and have a “flow-through” velocity not exceeding 0.2 feet per second at the anticipated peak flow. The desilting box shall be cleaned as required to maintain the detention time and flow-through limitations specified above. The intent is to avoid any addition of soil materials from dewatering operations into the receiving sewer or storm drain systems. The method of desilting and point of disposal of water shall be subject to the Engineer’s approval.

6. For all dewatering operations, each disposal point must have a calibrated, non-resettable totalizing effluent flow meter with a flow accuracy of ± 5% to track the discharges into the Owner’s facility. The Contractor shall submit weekly reports showing total amount of discharge at each point with meter readings and other data necessary to support the quantity reported. Also, an accessible sample collection point shall be provided immediately upstream of the tie-in point to the sewer or OCSD’s sewerage facilities. The Contractor shall provide OCSD’s SOURCE CONTROL staff and Engineer unrestricted access to the facility and site to inspect, monitor, or verify compliance with OCSD’s Permit and
7. The Contractor is responsible for development and implementation of a detailed contingency plan in the event that it becomes necessary to reduce or cease dewatering flows into the OCSD’s sanitary sewer system.

8. All dewatering operations with detectable levels of pollutants shall be pretreated to reduce the amount of pollutants, eliminate the pollutants, or alter the nature of the pollutant properties in the dewatering water to a level authorized by OCSD prior to, or in lieu of, discharge of the dewatering water into OCSD’s system. The reduction or alteration can be obtained by physical, chemical or biological processes, or process changes, or by other means. The method of pretreatment and point of disposal of water shall be subject to the OCSD’s Source Control staff and Engineer’s acceptance.

9. All dewatering operations with detectable levels of TTO’s, or evidence of TTO’s in the extraction zone, or significant amounts of volatile organics, may require the use of granular activated carbon (GAC) filters in lead-lag arrangement or other suitable technology to meet OCSD’s TTO limit of 0.58 mg/L and mitigate an Lower Explosion Limit (LEL) event. Note that additional particle filtration is typically provided upstream of the GAC filters to prevent fouling and to extend the life of the carbon. The GAC filters shall be equipped with a stainless-steel sampling port and a drip container on the final stage discharge outlet so that the Engineer may collect periodic dewatering samples. Additionally, the GAC filters shall be air-tight so no odors can escape, and no illegal dumping is possible. The air-tight covers shall be maintained throughout the dewatering period, and only removed when necessary for carbon changeout or other maintenance activities. The GAC filters shall be located in a safe and easily accessible location. The each GAC filter shall provide enough detention time to meet OCSD’s TTO limit of 0.58 mg/L. The carbon shall be changed in the lead GAC filter when the TTO as measured in the discharge of the lead GAC filter is at 0.58 mg/L, or as required. The GAC filters and additional particle filtration equipment upstream of the GAC filters shall be cleaned as required to maintain the detention time and flow-through limitations specified above. The intent is to avoid any addition of soil materials from dewatering operations into the receiving sewer system or fouling of the GAC filter carbon media. The method of pretreatment and point of disposal of water shall be subject to the Engineer’s acceptance.
10. Pretreatment of Chlorinated Dewatering Effluent: All dewatering operations that discharge significant levels of chlorine directly to the OCSD’s ocean outfall (bypassing treatment processes), or in areas where fugitive odor emissions may impact local residences, or where chlorine levels may cause a safety concern as a result of disinfection or biological control, require the use of dechlorination dosing and on-stream monitoring to ensure compliance with the OCSD’s NPDES permit effluent requirements. The method of pretreatment and point of disposal of water shall be subject to the Engineer’s approval.

11. Other Pretreatment: All dewatering operations with detectable levels of pollutants shall either reduce the amount of pollutants, eliminate the pollutants, or alter the nature of the pollutant properties in the dewatering water to a level authorized by the OCSD prior to, or in lieu of, discharge of the dewatering water into the OCSD’s system. The reduction or alteration can be obtained by physical, chemical or biological processes, or process changes, or by other means. The method of pretreatment and point of disposal of water shall be subject to the OCSD’s Source Control staff and Engineer’s acceptance.

12. Discontinuation of Dewatering Discharge into OCSD’s Sewer System: The Contractor is responsible for development and implementation of a contingency plan in the event that it becomes necessary to reduce or cease dewatering flows into OCSD’s sanitary sewer system for reasons other than a storm event.

13. Discharge During Storm Event: Water may not be discharged into the OCSD’s sanitary sewer during a significant wet-weather storm event without the acceptance of the Engineer. Wet season period is defined in the Work Restrictions section. The disposal system must be equipped with an instant shut off mechanism to protect the OCSD’s facilities in a high flow situation. All costs associated with temporary shut-off of the dewatering system, including protection of the Contractor’s Work, shall be the responsibility of the Contractor. The Contractor will be notified by the Engineer when such a situation is at hand. Failure to provide notification in advance of a high flow situation will not relieve the Contractor of its responsibility to stop discharging all dewatering flows once the high-flow situation is present, and its responsibility to absorb all costs associated with the temporary shut-off of dewatering. When continued discharge into the OCSD’s sanitary sewer system has been disapproved during a wet weather/high flow event, but continued dewatering is desired, the Contractor may elect to discharge into the storm drain system, but must have a pre-approved NPDES permit issued by the RWQCB to discharge and must comply with all provisions of these specifications. Switching of discharge points shall be at no cost to OCSD or the Owner.
- **Southern California Edison (SCE).** SCE owns and operates underground electrical transmission and distribution facilities that are near the site. The Contractor shall assume, in preparing its Bid, that conditions will include:
  
a. The Contractor shall contact Underground Services Alert (USA) at least two (2) working days prior to construction within the vicinity of the underground electric conduits.

b. SCE requires that all construction activities within the vicinity of facilities are in accordance with appropriate OSHA and California Public Utilities Commission regulations.

c. SCE policy requires that all relocation and repair be performed by their own forces. The Contractor shall immediately contact SCE should any damage occur to gas pipelines and appurtenances.

d. All construction activities must be limited to the right-of-way or limits of construction, as designated on the design drawings, unless specifically authorized by the Owner.

- **Southern California Gas Company (SCGC).** SCGC owns and operates underground gas transmission and distribution facilities that are near the site. The Contractor shall assume, in preparing its Bid, that conditions will include:
  
a. The Contractor shall contact Underground Services Alert (USA) at least two (2) working days prior to construction within the vicinity of the underground gas conduits.

b. SCGC requires that all construction activities within the vicinity of facilities are in accordance with appropriate OSHA and California Public Utilities Commission regulations.

c. SCGC policy requires that all relocation and repair be performed by their own forces. The Contractor shall immediately contact SCGC should any damage occur to gas pipelines and appurtenances.

e. All construction activities must be limited to the right-of-way or limits of construction, as designated on the design drawings, unless specifically authorized by the Owner.

- **State of California Department of Industrial Relations Occupational Safety and Health Administration (Cal/OSHA) – Construction Activities Permit.** The Contractor shall obtain a Construction Activity Permit from Cal/OSHA for
excavations and pipeline trenches greater than five (5) feet deep into which construction personnel will enter. This permit will include any confined space entry requirements. To obtain the permit, the Contractor shall schedule and attend a safety permit conference with the nearest Cal/OSHA District office. At the conference, the Contractor shall provide enough project details that Cal/OSHA can make a determination that the work will be performed safely.

The Contractor shall provide the following to Cal/OSHA:

a. Permit Application Form  
b. Activity Notification Form  
c. Copy of Contractor’s IIP Program  
d. Copy of Contractor’s Code of Safe Practices

- State of California Department of Industrial Relations Occupational Safety and Health Administration (Cal/OSHA) – Lead Abatement. Cal/OSHA Consultation Service/California Department of Industrial Relations is the regulatory agency for Lead. Specifically, Section 1532.1 in Title 8 of California Code of Regulations makes construction employers responsible for basic steps in recognizing lead in construction; and Section 36100 Title 17 of CA Code of Regulations covers lead abatement as part of demolition. The fact sheet, found at the website [http://www.dir.ca.gov/dosh/dosh_publications/lead-fct-sheet-rev.pdf](http://www.dir.ca.gov/dosh/dosh_publications/lead-fct-sheet-rev.pdf), summarizes the answers to most questions.

The Owner has conducted a Lead Survey. This survey is available for review at the District or for purchase from OCB Reprographics for a nominal fee per the location and contact details listed in the Notice Inviting Bids.

- Verizon Wireless. Verizon Wireless (Verizon) owns and operates overhead and underground telecommunications facilities near the site. The Contractor shall assume in preparing its Bid, the following conditions:

  a. The Contractor shall contact Underground Services Alert (USA) at least two (2) working days prior to construction within the vicinity of any underground telecommunications lines. The Contractor shall also notify Verizon at least five (5) working days prior to construction in the vicinity of underground or overhead utilities that require support, as defined by Verizon or the Owner.

  b. Verizon requires that all construction activities within the vicinity of overhead electrical facilities be conducted in accordance with appropriate Cal/OSHA and California Public Utilities Commission regulations.
c. Verizon policy requires that all relocation and repair be performed by their own forces. The Contractor shall immediately contact Verizon should any damage occur to cables, appurtenances, or overhead lines.

- **California Division of Drinking Water (DDW).** DDW has the primary responsibility for establishing criteria to protect the public health with regard to recycled water use. DDW requirement for water recycling are contained in the California Code of Regulations, Title 22, Division 4, Chapter 3, Wastewater Reclamation Criteria. The Owner will be preparing an updated Title 22 Engineers Report and Operations Plan for the Project.

- **California Coastal Commission.** The Contractor shall coordinate with California Coastal Commission for permitting related to the Project's Coastal Environment and Aesthetic Impacts. Coordination shall be performed for the Plant 2 work.

- **Orange County Flood Control District (OCFCD).** The Contractor shall coordinate with OCWD and OCFCD prior to the start of construction to obtain an Encroachment Permit. OCFCD shall be notified of all work within its property.

- **Huntington Beach Fire Department (HBFD).** The Contractor shall coordinate with OCWD and HBFD to obtain a Permit to Occupy at the completion of construction.

3. **STORM WATER QUALITY CONTROLS.**

Requirements presented in this section cover stormwater quality controls for the entire project including work on both OCWD and OCSD property. No stormwater within the OCSD property construction area shall leave the site nor shall stormwater be tracked off site. The Contractor shall make all necessary provisions for the capture of stormwater within the OCSD property construction area. For bidding purposes, the Contractor shall assume a Risk Level 2 for determining BMP requirements. The Contractor shall be responsible for retaining a person certified in performing the Risk calculation as required in the permit.

Contractor shall file a Notice of Intent (NOI) to apply for coverage under the General Construction Activities Storm Water Permit (State Water Resources Control Board WQ Order No. 99-08) prior to commencement of construction activity.

3-1. **General.** The 1972 amendments to the Federal Water Pollution Control Act established the National Pollutant Discharge Elimination System (NPDES) permit program to control discharges of pollutants from point sources. The 1987 amendments to the Clean Water Act (CWA) created a new section of the CWA...
devoted to storm water permitting (Section 402(p)). The EPA has delegated permitting authority to the State Water Resources Control Board (SWRCB). The SWRCB issues both general and individual permits. Construction activities including all construction discharges are regulated under the NPDES General Permit for Storm Water Discharges Associated with Construction Activity (General Permit). The appropriate Regional Water Quality Control Board (RWQCB) enforces the General Permit. Coverage under a General Permit requires the submission of a Notice of Intent (NOI) with the appropriate fee, annual compliance reports, a Notice of Termination (NOT) and preparation of a storm water pollution prevention plan (SWPPP).

Construction activity includes, but is not limited to: clearing, grading, demolition, excavation, construction of new structures, pipelines and reconstruction of existing facilities involving removal and replacement that results in soil disturbance. This includes construction access roads, staging areas, storage areas, stockpiles, and any off-site areas, which receive run-off from the construction project such as discharge points into a receiving water.

The Owner has permits from the RWQCB: Recycled Water Order No. R8-2004-0058 and Amending Order No. R8-2008-0002, R8-2014-054, and R8-2016-0051 and SAR discharge permit order number R8-2008-0004 and NPDES Number 8000408. While the Owner will continue to be responsible to the RWQCB for causing the preparation of and compliance with the various management plans called for in the permits, the Owner will require the Contractor to provide the detail planning and compliance activities required insofar as they would potentially affect the Contractor's methods and means of performing the Work.

If a violation of the permits is due to the Contractor's actions or inactions and a fine is assessed, the Contractor shall be responsible for the fine.

A copy of the Fact Sheet for the General Permit and all documents associated with the General Permit are available on the SWRCB web site at http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml.

3-2. Contractor’s Responsibilities. The Contractor shall comply with the SWRCB, RWQCB, County, City, and other local agency requirements regarding stormwater management, inspection, and monitoring.

The Contractor shall be responsible for meeting the requirements of the General Permit except as specifically noted below. The Contractor shall prepare the following documents in accordance with Section C, STANDARD PROVISIONS FOR CONSTRUCTION ACTIVITY, of the General Permit and submit them to the Owner as follows:
• Prepare NOI and provide to Owner for signature, then file NOI.

• Prepare and submit the SWPPP for Owner review at least 30 days prior to any soil disturbing construction in accordance with Section A: STORM WATER POLLUTION PREVENTION PLAN of the General Permit. The Plan shall follow the format presented in the California Storm Water Best Management Practices (BMP) Handbook - Construction Activity volume, available for order from www.cabmphandbook.com. The plan must address all areas outside of the Project site that are disturbed by Contractor for the prosecution of the Work.

• Install, construct, implement, monitor, maintain and remove upon completion all of the BMPs and other pollution prevention measures in accordance with Section A: STORM WATER POLLUTION PREVENTION PLAN of the General Permit.

• Prepare the annual compliance report and submit to the Owner prior to review as required by Section B, Item 4. – Compliance Certification of the General Permit.

• Prepare all inspection and monitoring reports in accordance with Section B, items 3 through 6 of the General Permit and submitting them to the Owner for review.

• Prepare NOT for Engineer and Owner review. The Owner will file the NOT, however, the Contractor shall certify the NOT.

• Provide evidence to the Engineer that the individual responsible for the SWPPP preparation, implementation, and permit compliance has been appropriately trained and has attended training and/or workshops offered by the SWRCB, RWQCB, or other locally recognized agencies or professional organizations in accordance with Section A, item 12. – Training of the General Permit. All workers on-site shall, at a minimum, have received training from the responsible individual.

• Contractor shall provide the Engineer the names and 24-hour phone numbers for parties responsible for implementing, monitoring, inspecting and maintaining the SWPPP.

With the exception of the NOI, all documents prepared by the Contractor shall be routed through the Owner, via the Engineer, for submission to the RWQCB.”

Contractor shall be bound to the conditions on the Notice of Intent (NOI) that will be filed by Contractor and will be responsible for all costs associated with the
implementation of the Plan including all fines, damages and job delays incurred due to failure to implement the requirements of the Permit.

Contractor shall maintain a copy of the NOI, Plan and Permit at the Project Site at all times, and shall make the Plan available to Owner, Engineer, Engineer, and the State Water Quality Control Board during construction activities. Contractor shall allow authorized agents of the Water Quality Control Board, State Water Resources Control Board, U.S. Environmental Protection Agency, and local storm water management personnel upon the presentation of credentials and other documents as may be required by Laws and Regulations to accomplish the following.

a) Enter, at reasonable times, upon the construction site and Contractor’s facilities pertinent to the Work.

b) Have access to and copy, at reasonable times, any records that must be kept as specified in the permit.

c) Inspect, at reasonable times, the construction site and related erosion and sediment control measures.

d) Sample or monitor, at reasonable times, for the purpose of ensuring compliance with the Permit.

e) Contractor shall notify the Engineer immediately following a request from any regulatory agency to enter, inspect, sample, monitor or otherwise access the Project Site or its records.

The Contractor shall be responsible for taking the proper actions to prevent stormwater coming into contact with contaminants and sediments from migrating offsite or entering storm sewer drainage systems. The Contractor shall take immediate action if directed by the Engineer or if the Contractor observes contaminants and/or sediments entering the storm drainage system, to prevent further stormwater from entering the system.

The Contractor shall update the SWPPP whenever there is a change in construction or operations which may affect the discharge of pollutants to storm water.

The Contractor’s attention is directed to the following requirements:

- The Contractor shall clean and maintain the construction sites free from excess construction materials, spoils, and dust daily during construction operations. The Contractor shall also prevent spillage of soil on haul routes and immediately remove any spilled materials. Near creeks or drainage ways, the Contractor will be required to keep all equipment and materials out of the drainage path during construction.
• Excavated material not acceptable for use as backfill shall be removed and disposed of by the Contractor.

• Water used for hydrostatic testing may be discharged provided that the water has been tested and determined to be free of contamination, in accordance with the SWPPP, the General Permit, and in accordance with NPDES.

• The Contractor shall use sediment barriers near rivers, creeks, and drainage swales to prevent sediment, construction materials, or fluid spills from construction equipment from entering the rivers, creeks, drainage swales, or drainage canals. If the pollutants or sediments from the construction site enter the rivers, creeks, drainage swales, or drainage canals, the pollutants and sediments shall be removed immediately.

• Mechanical and electrical equipment, pipe, valves, and embankment materials may be loaded, unloaded, and stored at the site with enclosures or flow barriers, which shall be erected by the Contractor. The barriers shall surround the temporary storage areas to prevent storm water flows from entering the areas and to control sediments and other pollutants discharge in storm water flows from leaving the temporary storage areas.

• If storm water flows enter the temporary storage areas and contact the construction material, the Owner shall determine if the storm water has become contaminated or may be allowed to be discharged to the storm drains or steam channels. For the purposes of this paragraph, contamination is defined as any degradation of the storm water quality due to contact with construction materials including but not limited to excavated materials and petroleum products. If the storm water flows have become contaminated due to contact with the construction materials, the Contractor shall provide for disposal of the storm water flows at no additional costs to the Owner in a manner acceptable to the Owner and the Regional Water Quality Control Board.

• If spills occur in the temporary storage areas or at the site, the Contractor shall immediately notify the Owner and, at the Contractor's expense, contain and clean up the spill to prevent spilled material from entering storm drains, creeks, stream channels, drainage canals, or groundwater, or from being absorbed by the underlying pavement or soil.

• The Contractor shall immediately clean up spills of fuel, hydraulic fluid, or oil from construction equipment or vehicles, including spills on the construction site, and at the Contractor's yard. The Contractor shall include containment areas for these materials, and provide for disposal of these materials, their
containers, and pavement or soil that may be contaminated with fuel, hydraulic fluid, or oil in accordance with all applicable laws and regulations.

- Backfill material stored at the construction site shall be protected from storm water flows with solid barriers. If a potential for erosion due to storm water exists, covers shall be provided. The purpose of these barriers and covers shall be to prevent the backfill material from flowing into water courses.

- Water from equipment washing shall not be discharged to creeks, drainage swales, or drainage canals or allowed to percolate into the ground. The Contractor shall not sweep, grade, or flush surplus materials, rubbish or debris into creeks, drainage swales, or drainage canals.

- Fueling, maintenance, and parking of vehicles and vehicle maintenance equipment are prohibited within 0.20 mile of any river, creek, drainage canal, drainage swale, or stream.

3-3 Owner Responsibilities. The Owner shall be responsible for the following:

- Review and sign Notice of Intent (NOI) for Contractor to file.

- Furnish the Contractor with base maps of a suitable scale in order to satisfy the requirements of Section A, items 5 through 10 of the General Permit.

- The Owner will submit to the RWQCB an annual summary report and pay the associated fee. This annual summary report will require the submission of the annual certification and update as required in Contractor’s responsibilities above.

- Furnish text and calculations for Section A, item 10. – Post-Construction Storm Water Management of the General Permit.

- Signatory responsibility as defined in Section C, item 9. a. – Signatory Requirements of the General Permit.

4. DEWATERING.

Construction dewatering is regulated by the California Regional Water Quality Control Board- Santa Ana Region and is governed by the National Pollutant Discharge Elimination System (NPDES) Permit No. CAG998001 adopted by the Regional Water Quality Control Board (RWQCB) to regulate construction dewatering. Should the Contractor need to control groundwater by dewatering and/or depressurization of water bearing soil and rock formations, or other low
threat discharges, the Contractor must comply with this NPDES Permit, or any updated NPDES Permit, and all other laws and regulations having jurisdiction over construction dewatering. The Contractor is responsible for obtaining all permits from agencies with control over all dewatering matters including well installation/abandonment, water discharge, use of existing storm drains and natural water sources. Contractor can refer to copy included herein as an appendix. The Contractor will be held responsible for any fines or penalties from regulatory agencies resulting from its dewatering system.

Before dewatering is commenced, the Contractor shall obtain acceptance of OCSD and Engineer for the method, installation, monitoring, testing, removal, discharge point(s) and other system details of the Contractor’s proposed dewatering system. To that end, the Contractor is to submit to the Engineer all the requirements specified in the Dewatering Specification.

Water may not be discharged into OCSD’s sanitary sewer during a wet-weather storm event.

End of Section
WORK RESTRICTIONS

1. GENERAL SEQUENCING AND CONSTRAINTS. The Advanced Water Treatment Facility (AWTF), operated by the Orange County Water District (Owner/District), is a component of the Groundwater Replenishment System (GWRS) and it is a critical source for supplementing existing water supplies by providing reliable, high-quality source of water to recharge the Orange County Groundwater Basin and protects the Basin from further degradation due to seawater intrusion. The Secondary Effluent Flow Equalization Facilities support GWRS by providing more total flow and allowing operation at a more constant flow rate into the AWTF.

The facility operates under the terms of the District’s Producer/User Water Recycling Requirements from the California Regional Water Quality Control Board – Santa Ana Region. The Owner maintains a rigorous testing and monitoring schedule to assure compliance. A copy of the permit is on file available for review at the Owner’s offices. Except where outages or bypasses have been approved by the Owner, the Contractor is to conduct the Work such that the Owner’s ability to produce water shall not be impaired or reduced. The Contractor’s work must never prevent the OCWD facilities from complying with the water requirements established by State and Federal regulations.

The Orange County Sanitation District (OCSD) owns and operates Plant No. 1 and 2. Plant No. 1 and 2 are critical means of treating wastewater for reclamation purposes, including feed to the AWTF, and for conveying treated wastewater to the ocean for safe disposal. Impairing the operational capabilities of this treatment plant will result in serious environmental damage and monetary fines. Bypassing of untreated or partially treated wastewater to surface waters or drainage courses is prohibited. When accidental bypassing occurs, the Owner is entitled to take appropriate action and costs incurred will be deducted from progress payments, if deemed appropriate by the Owner.

The Contractor shall conduct work in a manner that will not impair the operational capabilities of the AWTF and Orange County Sanitation District’s Plant Nos. 1 and 2 or reduce the capacity of the AWTF or treatment plants, except as provided in Section 01140 Work Restrictions.

The Contractor is to employ personnel knowledgeable and experienced in treatment plant construction including knowledge of treatment processes, facility operations and chemical systems. Examples of required knowledge include, but are not limited to, treatment terminology, functions of treatment plant facilities, and actions that would adversely impact water treatment and water quality.
Work Sequence and Constraints described hereinafter are critical events in work sequence, which are presented to underscore the importance of proper sequencing, scheduling and coordination so that it is integrated with the required OCWD facility production. The work sequence and constraints presented do not describe all items affecting the completion of the Work, but are intended to describe important events necessary to minimize disruption of the existing facilities and to ensure compliance with water quality permit requirements.

The existing facility where Contractor's work is to be done will be occupied by the Owner throughout the construction period. The existing facility where Contractor's work is to be done within OCSD’s Plant No. 1 and 2 sites will be occupied by OCSD staff throughout the construction period. Coordination with OCSD and OCWD will be required to maintain Plant No. 1 and GWRS in operation. The Contractor shall provide all necessary access to the Owner’s and OCSD’s personnel as required to safely and efficiently operate/maintain the facilities. At all times during the Contract duration, the Contractor is to provide the Owner’s and OCSD’s personnel and representatives safe and immediate access to all process control equipment. Additionally, the Contractor is to provide for unimpeded access for all delivery vehicles transporting materials, chemicals and equipment to the facility for the Owner’s and OCSD’s operations.

CONTRACTOR shall inform OCSD’s Public Information Officer (PIO) of construction activities impacting residents, businesses, schools, and general public a minimum of two (2) weeks prior to performing any Work. These requirements are in addition to already included in the Contract Documents.

The tie-ins and outages discussed in this section do not represent all required tie-ins or outages for the Work. It shall be the contractor’s responsibility to identify additional tie-ins and outages and provide required planning documents and coordination.

2. **INTERUPTION OF FACILITY OPERATIONS.**

2-1. **General Requirements.**

The Work shall be bid, scheduled and constructed in such a manner as to result in the least possible disruption to the operations and staff of the existing facility. Modifications that affect or may affect the operation of the facility shall not be made without first obtaining written permission from the Engineer. Disruptions or interference to one portion of the facility will likely affect other facility processes since they are interrelated and dependent on one another. The Contractor must fully understand any and all possible reductions on facility production and/or water quality as they plan the Work.
The Contractor shall note that not all valves and gates that may be used to isolate lines and facilities will completely seal. The Contractor shall allow for leakage in planning its work and may, with the Owner's concurrence, test certain valves and gates before work involving isolation has begun. The Contractor shall provide adequate temporary pumping and piping facilities to properly clear the work areas as necessary of water, chemicals, sludge and/or sewage. The Contractor shall clean the work areas as required to perform the work. Shutdown and isolation of existing facilities by closing existing valves/gates and operating electrical control panels, or as specifically provided for in the Contract Documents, will be performed by Owner personnel in conjunction with Contractor’s staff upon preapproval by Engineer or according to approved schedule.

Prior to any shutdown or flow diversion all materials, fittings, supports, equipment and tools shall be on the site and all necessary skilled labor scheduled prior to starting any connection work. The Contractor shall provide staff following shutdowns to monitor and ensure the proper operation of systems.

The Contractor is advised that any shutdown of facilities will place a considerable burden on the Owner's staff before, during and after the shutdown. If through inadequate planning, lack of preparedness, faulty or inefficient workmanship or other causes controllable by the Contractor, delays, excessive time, or additional shutdowns are required that cause the Owner to incur extra cost, said extra cost will be assessed against the Contractor. To minimize impact on plant staff, all outages shall be limited to the periods specified herein unless a different shutdown time is otherwise required in the Contract Documents.

Planned utility service shutdowns to any service area or process unit of the project shall be accomplished during periods of minimum use. In some cases, this will require night or weekend work, which shall be at no additional cost to the Owner. The Contractor shall program work so that service will be restored in the minimum possible time and shall cooperate with the Owner in reducing shutdowns of the utility to a minimum. No utility shall be disconnected without prior written approval from the utility owner and Engineer. When it is necessary to disconnect a utility, the Contractor shall give at least two (2) weeks' notice to the utility owner and to the Engineer for approval of the proposed schedule. When outages require electrical switching procedures, Contractor shall schedule a final work plan review meeting a minimum of 48 hours prior to the outage. Downtime for piping, power interruptions, and other utility services requiring taps or connections will require prior written acceptance seven (7) days in advance, starting on a Thursday, of the requested downtime.

The Contractor shall note that only certain structures, tie-ins and constraints are addressed in this section. All work, whether or not addressed here, shall be governed by applicable parts of this section, and schedules and procedures further submitted for approval.
When construction includes temporary or permanent modifications to systems conveying or potentially conveying hazardous materials such as chemical systems, valves shall not be considered a sufficient means of isolation during construction. A positive isolation and sealing method such as caps, plugs, blind flanges, pancake flanges and/or spectacle flanges shall be used in addition to isolation valves.

2-2. Outage or Bypass Submittal Requirements.

An outage is defined as a complete shutdown of facilities that eliminates the ability to produce FPW water from the existing AWTF. A bypass is defined as a partial shutdown of some equipment to facilitate construction that enables the AWTF to remain operational but reduces the operable production of the existing AWTF below 70 MGD. A minimum production capacity of 45 MGD is associated with the AWTF remaining operational.

The Contractor shall submit to the Engineer, for review and acceptance, a detailed outage or bypass plan and time schedule for operations not less than sixty (60) days in advance of each scheduled outage or bypass. The detailed plan shall meet the restrictions and conditions found in the Contract Documents. A System Outage Request (SOR) form shall accompany each outage or bypass plan. The outage plans shall be coordinated with the construction schedule and shall meet the Contractor's planned method; describe the proposed points of isolation; the length of time required to complete said operation; any necessary temporary power, controls, instrumentation or alarms required to maintain control, monitoring and alarms; and the manpower and equipment which the Contractor shall provide in order to ensure proper operation of affected facilities. In addition, the outage plan shall describe the Contractor's contingency plan that shall be initiated in the event that its temporary facilities fail or it becomes apparent that the time constraints described in the approved SOR cannot be met. The contingency plan shall conform to all specified outage requirements. All costs for preparing and implementing both the outage and contingency plans shall be borne by the Contractor.

The Contractor shall attend a meeting with the Engineer, OCSD, and the Owner two (2) weeks before the scheduled outage to review the SOR. Any changes to the SOR must be approved by the Engineer and the Owner prior to the outage.

Contractor shall demonstrate readiness to begin outage at a Go/No-Go meeting no less than forty-eight (48) hours prior to outage. Contractor shall demonstrate that all required equipment, materials, and personnel will be on-site and operational for the outage.
2-3. Work Constraints, Sequencing and Planned System Outages Specific to This Project.

The Contractor shall note that during the construction of the Project, the existing OCWD and OCSD facilities will remain in service except where outages or bypasses have been approved by the Owner. The Contractor is responsible for sequencing the Work so that the Work is completed on or prior to the Substantial Completion dates. The Work shall be sequenced in stages and scheduled to accommodate the Owner’s operational requirements during the construction period. The Contractor is responsible for coordinating the construction schedule and operations with the Owner to allow the plant operations to function properly during the Work.

2-3.01 Sequence of Work

A suggested sequence of work is specified below for project construction. The list below does not relieve the Contractor of responsibility of providing a complete outage sequence including all components of the work. The work sequence shall include but not be limited to:

Note that steps 4 through 14 are only required for facilities in which new structures will be constructed.

1. Clearing and grubbing, trailer set-up, staging area construction, traffic control features.

2. Make utility arrangements. While clearing and grubbing, excavating, and grading, the General Contractor will make any temporary utility arrangements required for construction, such as routing temporary power lines and including temporary structure support systems. The Contractor will also provide support systems to protect existing utilities.

3. Identify and shut off existing utilities serving the facilities.

4. Design and install excavation support system (shoring system).

5. Perform structural excavation within excavation support system.

6. Set up pile template.

7. Perform predrilling. All pile locations will be predrilled.

8. Place reinforcement cage and concrete for cast piles at an assumed average of ten piles per day.

9. Install subgrade materials underneath slabs/foundations/pile caps.
10. For scheduling purposes, it was assumed that production of the base slab and pile caps construction will be realized at approximately 50 cubic yards per week.

11. After foundation is complete, commence construction of wall sections.

12. After wall placement is underway, construct the network of suspended slabs and walkways.

13. The walls will be stripped and cured for 21 days. Following curing, hydrostatic leakage testing of the new water-containing structures will commence for a minimum of 48 hours.

14. Place backfill once the structures have successfully passed the hydrostatic leakage testing.

15. **Install P2 pipeline in AWTF and connect to Screenings Facility.**

16. Install process equipment once the structures have been backfilled and tested (where required).

17. Perform miscellaneous site work and remaining site utilities work will commence after backfilling operations.

18. Integrate I&C systems (Delta V) for each facility.

19. Perform disinfection, start-up, and testing. Once tie-ins are completed, start up and testing and performance testing can commence. The duration for startup and testing and performance testing will be assumed to be approximately 40 working days.

20. Restore site and remove temporary access road, if required.

Any deviations from the specified work sequence must be reviewed and approved by the Engineer prior to commencement of the Work.

2-3.02 **Time Constraints**

The following time constraints will affect the Contractor’s work sequence, site access and construction schedule. The listing of time constraints in this section and elsewhere in the Contract Documents shall not mean that all time constraints or special conditions have been identified. The list does not substitute for the Contractor’s coordination and planning for completion of Work within the specified Contract time.
The following requirements shall be incorporated into Contractor’s CPM Construction Schedule.

- Preconstruction surveys shall be performed to address any required mitigation measures as required in the Field Engineering section.

- The Contractor shall maintain the access road(s) as a condition of their use. The Contractor shall minimize any interruptions to all access gates including the OCWD access via Ward Avenue and the OCSD accesses via Garfield Avenue and Brookhurst Avenue.

- Project construction involves earthwork activities that include making excavations and placing and compacting engineered fills. Because of the nature of the onsite soils, such earthwork activities will expose slopes and other surfaces that are susceptible to the effects of erosion. Slopes and other surfaces that are exposed shall be protected from the effects of erosion, and shall receive permanent protection as soon after the earthwork activities are completed. Refer to additional requirements specified herein and in the technical specifications.

- The existing facilities are used to provide water service to Owner’s customers and cannot be out of service for more than the limits indicated without jeopardizing the Owner’s ability to provide continuous service to its customers.

- The existing facilities within Plant No.1 are used to provide treated effluent to Owner and cannot be out of service for more than the limits indicated without jeopardizing the OCSD’s ability to provide continuous service to Owner.

- The existing facilities within Plant No. 2 cannot be out of service for more than the limits indicated without jeopardizing the OCSD’s ability to provide continuous service to Owner.

- Maximum time for AWTF shutdown or reduction in AWTF treatment capacity is 48 hours. Any shutdowns greater than 48 hours will only be allowed with prior permission from the Owner, OCSD, and the Engineer. Any shutdowns greater than 48 hours that have not been previously approved by the Owner and Engineer shall be assessed liquidated damages at the same rate as that defined for Substantial Completion in the Bid Form.

- If multiple plant shutdowns are determined to be needed to complete the outages, the shutdowns shall be separated by at least 14 calendar days, unless otherwise approved by the Owner and/or OCSD.

- Contractor shall plan, coordinate, schedule and complete work for as many outages as possible within the period. Contractor will not be
permitted to exceed the time limits specified unless authorized by the Owner to do so.

- One AWTF shutdown of up to XX weeks will be scheduled for work associated with XX. Contractor should plan accordingly and have all preparation work completed and materials in hand prior to initiating work.
- The Contractor shall be allowed a total outage duration for all tie-ins of up to twenty eight (28) 24-hour days. Any outage duration in excess of this allowance shall be assessed liquidated damages at the rate of Substantial Completion defined in the Bid Form.
- The PCS hardware and software upgrade to DeltaV version XX.X shall be completed within 5 consecutive, 24-hour days. Refer to the Process Control System section and the Distributed Control System section for requirements.
- OCSD depends on the GWRS for peak flow relief during the wet season which is from October 15 through April 15. During this period, shutdowns shall not be allowed unless authorized by the Owner to do so.
- Shutdowns requiring the use of OCSDs outfall shall be coordinated with OCSD at all times.
- HVAC modifications to existing Electrical Rooms shall be coordinated with AWTF shutdowns.

2-3.03 Owner Facilities Out of Service.

The Work under this Contract requires the Contractor to connect to or to permanently or temporarily modify, the existing Owner’s facilities as well as OCSD's facilities listed below. Such facilities may be taken out of service only when the proposed outage plan has been reviewed and accepted (after being submitted for review not less than sixty (60) days prior to the outage), requested by the Contractor with fifteen (15) days advance notice, and approved in writing by the Owner.

The time limits presented above begin when the Owner’s crew begins to close in-line valves, and ends when the Owner’s crews have completed all procedures for putting a facility back in service. Work by the Contractor within the time limits include; but are not limited to; draining, installing, testing, refilling, and acceptance by Engineer of the installation completed within the outage period.

The Owner has the option of requiring Contractor to terminate its work and restore the facility back to full service at the end of the specified time period, or may allow Contractor to continue to work beyond the time limits specified, subject to the liquidated damages provisions stated in the Bid Form.
The outage description below represents major outages that the Owner has identified in advance for the Contractor. The Contractor shall coordinate outages with all trades to achieve the maximum work. The table does not include all outages that are necessary for completion of the Work. Additional outages may be required as determined by Contractor for performing the work associated with demolition and utility relocation as specified in the Contract Documents.

The Contractor shall employ sufficient labor, superintendence, and equipment continuously during the outage to complete the designated work within the specified periods. The Contractor shall have available and provide as required temporary pumps, piping, valves, tanks, lighting, controls, instrumentation, and safety devices. Once initiated, the work during the outage may proceed on an extra shift or around-the-clock basis as necessary and approval from the Owner. Contractor shall note that to complete the required tie-ins during the specified outage periods, all required and related submittals shall have been submitted and accepted early in the construction phase.

The following outages include a suggested sequence of construction and work that should be completed and shall be taken into consideration when preparing the proposed schedule of construction. The suggested sequences and work contained herein are not inclusive and may require additional steps to provide a complete facility or system.

**Major Outages (not listed in chronological order):**

**Outage A**

**Name of Facility:** Microfiltration

**Nature or Type of Work:**

**Connections to:**
- 60-inch MFF (Train F)
- 54-inch MFF (Train E at 2 locations)
- 54-inch MF BWW (Train F)
- 60-inch MFE (Train F)
- Small pipe connections at compressors, blowers, and vacuum pumps
- 6-inch CIP Feed (MCR)
- New BWW pump tie-in
- 42-inch and 16-inch MF Backwash supply line

The existing MF system is critical for AWTF operation and must be kept operational during construction of the new facilities. Removal or stoppage of any part of the existing MF system from service will result in an outage. Efforts shall be made to keep existing piping intact and in operation during
construction. Barriers such as plastic sheets or other means shall be temporarily installed around construction areas to minimize dust and debris from entering the existing MF system.

**Points of Isolation and Considerations:**

- Installation of the 60-inch MFF (Train E) requires isolation of the 60-inch MFF to allow removal of the 30-inch line and butterfly valve. The 60-inch MFF can be isolated by closing the 60-inch butterfly valve on the branch off the 96-inch MFF. Water in the piping can be drained through the existing MF cells or pumped out through use of a Contractor supplied temporary pump.

- Installation of the 54-inch MFF (Train E) requires isolation of the 54-inch MFF upstream of the tie-in location to allow removal of the blind flange. The line can be isolated by closing the 36-inch control valve upstream of the tie-in location. Water in the piping can be drained through the existing MF cells and pumped out through use of a Contractor supplied temporary pump.

- Installation of the 54-inch MF BWW (Train F) requires isolation of the 66-inch BWW header downstream of the tie-in location to allow removal of the blind flange. Level in the MF Backwash Waste Pump Station (east side) shall be lowered to an elevation below the connection point to facilitate connection and maintain the pipe drained.

- Installation of the 60-inch MFE (Train E and F) requires isolation of the 60-inch MFE downstream of the tie-in location to allow removal of the blind flange. The line has to be isolated by closing the individual valves at each cell. Water in the piping can be drained by pumping out through use of a Contractor supplied temporary pump.

- Installation of small pipe connections at compressors, blowers, and vacuum pumps requires stoppage of the individual system to allow tie-ins to take place. Equipment shall remain out of service until connections are completed.

- Installation of small plumbing and fire piping connections shall be completed as indicated on the drawings. Piping shall be drained through use of Contractor supplied temporary pump as necessary.

- Installation of the 6-inch CIP Feed (MCR) requires isolation of the header pipe through closure of the isolation valves upstream of the tie-in location. This tie-in does not require a shut down.

- Installation of the 42-inch MF BW Supply requires isolation upstream to allow removal of the blind flange.

- Installation of the MF Backwash Waste Pump requires isolation of the discharge manifold at each pump on the east side. Water in the
manifold can be drained back into the west wetwell through temporary piping through the future MF Backwash Waste Pump discharge location.

- Close isolation valves (by Owner) and drain existing piping as noted above. Water drained from pipelines can be disposed of through contractor supplied temporary piping inserted into the west backwash waste wetwell (in MF basement) through the future MF Backwash Waste Pump discharge location. Contractor shall be responsible for removing existing seal plate and providing all required temporary appurtenances.
- Remove existing blind flanges at connection points, or, cut and remove piping for insertion of new fitting. Clean and prepare existing pipe surface.
- Install mechanical connection as indicated on Drawings.
- Perform pressure and leakage testing
- Perform disinfection of pipe. Contractor to include in plan methods of protection for membranes.
- Modify ductwork and temperature controls in East and West Electrical Room to allow lead-lag air conditioning unit operation as indicated on drawings.

**Proposed Sequencing**

**Maximum Time Facility Shall Be Taken Out of Service**

The anticipated tie-in period will be approximately 72 hours (3 days) for the tie-ins required for the remaining Train E cells and the new Train F on the West side of the MF Facility.

**Outage B**

Name of Facility: Transfer Pump Station (for MF Backwash Supply Pumps)

Nature or Type of Work:

Removal of existing blind flanges and installation of portion of pump discharge piping and discharge isolation valves for the MF Backwash Supply Pumps to the existing discharge manifold piping.

Points of Isolation and Considerations:

- Installation of valves and piping will require that the discharge manifolds of each pumping system be isolated and dewatered
• For the installation of the MF Backwash Supply Pumps isolation valves, isolate the discharge manifold at each pump, and at upstream of each MF train. Water in the manifold can be drained back into the North and South MF Break Tanks through temporary piping from one of the future MF Backwash Supply Pump discharge connections back into the wetwell through the pump discharge piping. Alternatively, if approved by Owner, water can be drained into the GAP clearwell.

• Remove blind flange and install piping and valves
• Perform pressure and leakage testing
• Disinfection of pipe

Maximum Time Facility Shall Be Taken Out of Service
The anticipated tie-in period for both pumps will be approximately 24 hours (one day or two 12-hour days).

Outage C
Name of Facility: Reverse Osmosis Facility including RO Flush Feed Pump Station and DPW Pump Station

Nature or Type of Work:

Connections to:
• 30-inch connection to existing 78-inch RO Permeate header (2 locations)
• 30-inch connection to existing 84-inch RO Feed header (2 locations)
• 12-inch connection to existing 36-inch RO Waste header (2 locations)
• 24-inch connection to existing 24-inch RO Concentrate header
• 12-inch connection to existing 12-inch CIP manifold (2 locations)
• 8-inch connection to existing 36-inch DPW header (DPW Pump)
• 8-inch connection to existing 30-inch DPW header (RO Flush Feed Pump)
• 4-inch connection to existing 4-inch CIP manifold
• Train A-E – BFV installation, piping modifications, and flowmeter installation
• Train F-G – pump isolation

The existing RO system is critical for AWTF operation and must be kept operational during construction of the new facilities. Removal or stoppage of any part of the existing RO system from service will result in an outage. Efforts shall be made to keep existing piping intact and in operation during
Barriers such as plastic sheets or other means shall be temporarily installed around construction areas to minimize dust and debris from impacting operations of the existing system. It is noted that connections to be made at existing headers in the existing RO building basement have very small tolerances. Contractor shall survey and measure all connections prior to ordering pipe and fittings for connections and prior to scheduling tie-in work. Connections to be made outside of the RO building will require potholing to verify/confirm location of connection points prior to ordering pipe, fittings, and appurtenances and scheduling tie-in work.

Points of Isolation and Considerations:

- Both the 84-inch RO feed and 78-inch RO permeate lines will be isolated between the cartridge filters and the UV facility. They shall be drained from the 2” drain connections, located along the two headers in the basement, to the RO building sump. The drainage water will then be pumped to the sump waste junction manhole using the existing sump pumps. Existing blind flanges at the connection points are to be removed and reused in the new RO building. Connections to the headers will be made in the existing RO building basement. Contractor to confirm capacity of the RO sump onsite in development of the outage plan.

- The 12-inch connection to existing 36-inch RO Waste header
- The 24-inch connection to existing 24-inch RO Concentrate header

- The 12-inch CIP manifolds will be drained at the connection points when the blind flanges are removed. They will be drained to the existing RO building sump by way of the basement drainage trenches. The drainage water will then be pumped to the sump waste junction manhole using the existing sump pumps. Existing blind flanges at the connection points are to be removed. Connections to the CIP manifolds will be made in the existing RO building basement.

- The 8-inch RO flush water feed header will be isolated at the existing common feed header butterfly valves. The header will be drained at the connection point to the existing RO building sump. The drainage water will then be pumped to the sump waste junction manhole using the existing sump pumps. Existing blind flange will be removed from the connection point and reused at the end of the header extension. Connection to the header will be made in the existing RO building basement.

- The 4-inch CIP manifold will be drained to the existing RO building sump at the connection point. The drainage water will then be pumped to the sump waste junction manhole using the existing sump pumps. Connection to the manifold will be made in the existing RO building basement.
building. Cut and remove piping and clean and prepare existing pipe surface for insertion of new fittings.

- Install mechanical connection as indicated on Drawings.
- The ERDs on Train F and G will be isolated for a motor replacement.
- Trains A – E will be isolated and shutdown on a train-by-train basis to connect new booster pumps and perform piping modifications.
- Install valves at or near connection points as indicated on Drawings.
- Perform pressure and leakage testing per specifications.
- Disinfection of pipe per specifications. Contractor to include in plan methods of protection for membranes.

**Proposed Sequencing**

**Maximum Time Facility Shall Be Taken Out of Service**

The anticipated tie-in period will be approximately 48 hours (2 days) for the RO Permeate, approximately 48 hours (2 days) for the RO Feed, and approximately 48 hours (2 days) for the RO Waste, RO Concentrate, and CIP connections. The anticipated shutdown period for the Train A – E pump installation is approximately 72 hours (3 days). The anticipated shutdown period for the Train F and G work is approximately 24 hours. Refer to the electrical outage section for shutdown of the electrical equipment.

**Outage D**

**Name of Facility:** Ultraviolet Light Facility

**Nature or Type of Work:** Connections to:

- Three (3) 20-inch connections at the supply header (Trains N, O, and P)
- Three (3) 20-inch connections at the discharge header (Trains N, O, and P)

**Points of Isolation and Considerations:**

- For the discharge header, special instructions are described in the UV Disinfection Installation System Section.
- Isolation valves are not available and both headers (supply and discharge) must be isolated and dewatered for the work.
- Disinfection of pipe per specifications. Contractor to include in plan methods of protection for membranes.
Maximum Time Facility Shall Be Taken Out of Service
The anticipated period required for this tie-in sequence is approximately 24 hours (1 day or 2-12 hour days), assuming the Contractor completes the tie-ins and shutdowns as described above.

**Outage E**
**Name of Facility:** Polymer System

**Nature or Type of Work:**
Removal and replacement of four polymer feeder blenders and one polymer storage tank.

**Points of Isolation and Considerations:**

**Maximum Time Facility Shall Be Taken Out of Service**
A maximum continuous 8-hour shutdown will be allowed.

**Outage F**
**Name of Facility:** Decarbonation Facility

**Nature or Type of Work:**
- Addition of seventh decarbonation tower, installation of new flow meters, and valve actuators.
- Bypass modifications
- Bypass line addition

**Connections to:**
- 60-inch A02 Decarb Header
- 30-inch A01 Bypass Line

**Points of Isolation and Considerations:**
- Extend headers to isolation valves and new decarbonation tower.
- Isolation valves are not available on the supply header, which must be isolated and dewatered for the work.
- Bypass System:
- Isolate 36-inch bypass header (710-BFV-7110) and relocate valves (A01-BFV-7120 & A02-BFV-7100). All bypass during this time will go through the 60-inch to 30-inch bypass line.
- Isolate 30-inch bypass line (710-BFV-7110) and install new 30-inch bypass line.

- Disinfection of pipe per specifications.

Maximum Time Facility Shall Be Taken Out of Service
The anticipated period required for this tie-in sequence is approximately 24 hours (2 12-hour days), assuming the Contractor completes the tie-ins and shutdowns as described above.

Outage G
Name of Facility: Product/Barrier Pump Station
Nature or Type of Work:
Removal of existing blind flanges and installation of portion of pump suction and discharge piping and isolation valves for the Product Water Pump to the existing suction and discharge manifold piping.

Points of Isolation and Considerations:
- Installation of valves and piping will require that the suction and discharge manifolds be isolated and dewatered
- On the suction side of the pump station, the discharge gates at the Decarbonation Facility can be closed and the existing underground flume/channel drained and/or dewatered through an existing blowoff and pumped out through existing access hatches. Water can be pumped with dewatering pumps back into the Decarbonation Facility. Remaining water can be drained into the existing valve chamber on the west side of the Product/Barrier Pump Station. On the discharge side, isolate with isolation valve upstream of Finished Product Water Bypass Structure. The discharge manifold centerline is lower in elevation than the pump discharge centerline, thus the discharge manifold cannot be completely drained. Water above the spring line can be drained into the existing valve chamber on the west side of the Product/Barrier Pump Station.
- Remove blind flange and install piping and valves
- Perform pressure and leakage testing
- Disinfection of pipe
Maximum Time Facility Shall Be Taken Out of Service
A maximum continuous 4-hour shutdown will be allowed.

**Outage H**

**Name of Facility:** Product Water Surge Facilities  
**Nature or Type of Work:**

Addition of one new surge tank and appurtenances. Modifications to five existing surge tanks.

**Connections to:**
- 18-FPW

**Points of Isolation and Considerations:**

- Isolate the product water side of the surge facilities by closing the two isolation valves, either shutting down the AWTF or shutting down the FPW pumps.
- Remove the 18-inch blind flange to install the 24-inch harnessed double flange adaptor, butterfly valve, and tank.

Maximum Time Facility Shall Be Taken Out of Service
The anticipated period required for this tie-in sequence is approximately 12 hours (1 12-hour day), assuming the Contractor completes the tie-ins and shutdowns as described above.

**Outage I**

**Name of Facility:** Electrical Shutdowns for GWRS work  
**Nature or Type of Work:**

- Connections for MF West Electrical Room
- Connection to RO Electrical Building to new electrical enclosure
- Replacement of Train F and G motors and VFDs

**Points of Isolation and Considerations:**
Maximum Time Facility Shall Be Taken Out of Service

Outage J
Name of Facility: Process Control System (PCS) upgrade and integrations for GWRS work

Nature or Type of Work:

Two areas of work that will require outages:

- Upgrade of the entire existing PCS, shown in the Contract drawings, which will involve software and firmware upgrades.
- Modification of existing PCS software, including (but not limited to) PCS controllers, operator workstations, server computers, and field device networks.

Points of Isolation and Considerations:

The PCS hardware and software upgrade shall be completed within 90 consecutive calendar days after the Notice to Proceed is issued. The Contractor shall submit a schedule and update plan, including outages, for this upgrade within 30 consecutive calendar days after the Notice to Proceed is issued.

Except for certain process sub-units, the existing AWTF cannot operate with any PCS controllers out of service due to water quality or equipment operation. Controllers critical to the operation of the facility are as follows: CHM_HP_SBS, CHM_SA_TI, CHM_SHC, FPW, GAP_CTL01, GAP_MS, LIME, MF_COM, MF_MST, PWPS_BPS, RO_MST, RO_PRE_TRT, RO_PRM, SCR_CTL01, UV_MST. Sub-process controllers may be individually isolated for modification: MF_TRA1, MF_TRA5, MF_TRB1, MF_TRB5, MF_TRD1, MF_TRD5, MF_TRE1, RO_TRA, RO_TRB, RO_TRC, RO_TRD, RO_TRE, UV_TRA, UV_TRB, UV_TRC, UV_TRD, UV_TRE, UV_TRF, UV_TRG, UV_TRH, UV_TRJ, UV_TRK, UVTRL.
**Maximum Time Facility Shall Be Taken Out of Service**

**Outage L**

Name of Facility: Cartridge Filters and Static Mixer Inspection

Nature or Type of Work:
Two areas of work:

- Installation of two new cartridge filters, isolation valves, pipes, and fittings.
- Inspect static mixer upstream of Cartridge Filters

Points of Isolation and Considerations:

Blind flanges are available for connection of new cartridge filters and isolation valves. The existing system cannot isolate each individual pipe for installation of new cartridge filters to maintain service.

Either an outage is required by isolating the main supply header and dewatered to perform the installation or flows could be bypassed around the cartridge filters to maintain service.

The inspection of the existing static mixer will occur concurrently with the new cartridge filter influent/effluent and isolation valves. The existing static mixer has one flanged end and connected to a dismantling joint on the other end.

**Maximum Time Facility Shall Be Taken Out of Service**

The anticipated period required for this tie-in sequence is approximately 8 hours (1 8-hour day), assuming the Contractor completes the tie-ins and shutdowns as described above.

**Outage M**

Name of Facility: Screenings Facility

Nature or Type of Work:

Construct connection box with sluice gate and connect Plant 2 pipeline. Shut down of Screenings Facility required for core drilling / removal of existing wall sections.
Points of Isolation and Considerations:

At Screenings Facility close: trickling filter influent gate (140-GAT-0135), AS1 and AS2 influent gate (140-GAT-0130), and filters 1, 2, 3, 4, and 5 gates (A01-GAT-0160, A02-GAT-0160, A03-GAT-0160, A04-GAT-0160, A05-GAT-0160).

At OCWD trickling filter influent metering box close butterfly valve.

At SEJB6 close OCSD gates which feed the Screenings Facility (12LGAT739 and 12LGAT741) open gates that feed SEJB7 (12LGAT742 and 12LGAT743).

At SEJB4 close OCSD gates which feed the Screenings Facility

Coordinate with OCSD for potential lowering of weir at SEJB1 and opening of gates at SEJB3.

Shut down OCSD plant water supply to screens (location of shutoff valve to be determined).

Maximum Time Facility Shall Be Taken Out of Service

The maximum time the Screenings Facility shall be taken out of service is three (3) consecutive 24-hour periods.

Proposed Sequencing

Core drilling / demolition of the existing Screenings Facility wall shall occur after completion of connection box and gate installation, including testing and acceptance of the pipeline and features from the point of connection to new Screenings Facility connection box to the Plant 2 pump station.

Outage N

Name of Facility: Diversion Structure (OCSD Plant 2)

Nature or Type of Work:
Construction of a new Diversion Structure, sluice gate, and 84-inch SE pipe stub that will tie-in to the 108-inch TFSC SE line near TFSC Secondary Clarifier F.
Points of Isolation and Considerations:
- Stop plate at OOBS (24GGAT104)
- **Strategy for temporary shutdown of TFSC flow to be discussed with OCSD.**

Maximum Time Facility Shall Be Taken Out of Service
Work shall be performed during dry season. The shutdown period shall be coordinated and concurrent with the required shutdown for the Weir Box work. The TFSC plant shutdown shall be limited to a single maximum continuous duration of nine (9) hours. If in the event the Contractor fails to complete the work within the 9 hours, a full week of normal TFSC operation is required to allow process recovery and stabilization prior to another 9-hour shutdown event.

Proposed Sequencing
1. Reroute existing 12” HDPE POTW, 18” HDPE SW, and 8” STL SCUM pipelines.
2. Install auger cast piles
3. Implement dewatering.
4. Remove sheet piles, as needed, to construct new Diversion Structure.
5. Install shoring and bracing required for Diversion Structure work and excavate.
6. Install wall flanges on existing 108-inch pipeline.
7. Construct Diversion Structure.
10. Contractor shall dewater the existing 108-inch pipeline as required for construction of the Diversion Structure.

**Outage O**
Name of Facility: Weir Box (SEFE Plant 2)
Nature or Type of Work:
Construction of a new Weir Box and sluice gate that will tie-in to the 120-inch TFSC SE line south of Trickling Filter C. Installation of a 36-inch plant water pipeline from the Weir Box to the LOFLO PS / PWPS Junction Structure.
Points of Isolation and Considerations:

- Stop plate at OOBS (24GGAT104)
- Stop plate for 24-inch plant water pipeline connection at LOFLO PS / PWPS Junction Structure.
- Strategy for temporary shutdown of TFSC flow to be discussed with OCSD.

Maximum Time Facility Shall Be Taken Out of Service

Work shall be performed during dry season. The shutdown period shall be coordinated and concurrent with the required shutdown for the Weir Box work. The TFSC plant shutdown shall be limited to a single maximum continuous duration of nine (9) hours. If in the event the Contractor fails to complete the work within the 9 hours, a full week of normal TFSC operation is required to allow process recovery and stabilization prior to another 9-hour shutdown event.

Proposed Sequencing

1. Reroute existing SCE power pole brace pole.
2. Reroute existing XXXXXXXXXX ductbanks.
3. Install auger cast piles.
4. Implement dewatering.
5. Install shoring and bracing required for Weir Box work and excavate.
6. Install wall flanges on existing 120-inch pipeline.
7. Construct Weir Box.
8. Connect plant water pipeline at
10. Install removable Weir Box concrete covers.
11. Contractor shall dewater the existing 120-inch pipeline as required for construction of the Weir Box.

Outage P

Name of Facility: 12-inch PVC Reclaimed Water (RW) east of Equalization Tanks (Plant 2)

Nature or Type of Work:
Connection to the existing 12-inch PVC RW pipeline. Work requires installation of tapping saddle and isolation valve.
Maximum Time Facility Shall Be Taken Out of Service
• A maximum continuous shutdown period of **4-hours** shall be allowed.

Points of Isolation and Considerations:
• Shutdown and lockout of the valves serving the 12-inch RW.
• Perform pressure and leakage testing per specifications.

**Outage Q**
Name of Facility: 12-inch HDPE Potable Water (POTW) near Diversion Structure (Plant 2)
Nature or Type of Work:
Connection to the existing 12-inch HDPE POTW pipeline. Work requires installation of tee and isolation valve.

Maximum Time Facility Shall Be Taken Out of Service
• A maximum continuous shutdown period of **4-hours** shall be allowed.

Points of Isolation and Considerations:
• Shutdown and lockout of the valves serving the 12-inch POTW.
• Perform pressure and leakage testing per specifications.

**Outage R**
Name of Facility: Electrical Shutdowns for SEFE
Nature or Type of Work:
•

Points of Isolation and Considerations:
•

**Outage S**
Name of Facility: Plant Control System (PCS) integrations for SEFE
Nature or Type of Work:

Modification of existing PCS software, including (but not limited to) operator workstations and server computers.

Points of Isolation and Considerations:

Maximum Time Facility Shall Be Taken Out of Service

2-4. Work Under Other Contracts.

The Owner anticipates potential construction activities will be performed in the area of the project site by other forces or by other contractors for Orange County Sanitation District. Multiple construction contracts may be occurring during the construction of the Project including but not limited to the following:

1. Existing 66-inch Pipeline Rehab (GWRSFE Contract 2)
2. OCSD P2-98

The projects will impact the use of Orange County Sanitation District property adjacent to and encompassing some of the property required to construct project facilities. Contractor shall coordinate the Project construction with the construction of these projects.

3-0. OTHER WORK RESTRICTIONS AND COORDINATION REQUIREMENTS.

3-1. Work Hours.

See the General Provisions “Working Hours” section for restrictions.

3-2. Rights of Way.

The Owner will acquire all grants for easements shown on the Drawings to allow the Contractor to perform the Work. Within the terms of the easement, the Contractor may use the easement only for accessing the Site, performing survey staking, storing equipment, materials and supplies for this Project only, and performing the required Work. Once work is completed the Contractor is to leave the easement area in a neat and clean condition. The Contractor is not allowed to use the easement for any other purposes without written approval of the Owner.
3-3. **Existing Utilities.**

A minimum of forty-eight (48) hours in advance of excavation activities, the Contractor shall contact the following parties to ascertain and verify the existence and location of utility lines and facilities and shall coordinate all work in accordance with the information obtained from such inquiries in order to prevent damage to such lines and facilities.

**Underground Service Alert (USA) (811)**

Prior to conducting any excavation, the Contractor shall contact the appropriate regional notification center as required by Government Code Section 4216. In accordance with Government Code Section 4215, the Contractor shall be compensated for the costs of locating, repairing damage not due to the failure of the Contractor to exercise reasonable care, and removing or relocating existing main or trunkline utility facilities not indicated in the Contract Plans and Specifications with reasonable accuracy, and for the equipment on the project necessarily idled during such work; provided that the Contractor shall first notify the Agency before commencing work on locating, repairing damage to, removing or relocating such utilities.

All sewer crossings shall conform to the State Health Department regulations for water/sewer separation and materials. Cost for special pipeline materials to meet Health Department regulations, and repair of services damaged shall be included in the cost of the bid items to which the work is appurtenant. No separate payment will be made.

The Engineer or his representative has endeavored to determine the existence of utilities at the work site from the records of the owners of known utilities in the vicinity of the work. The positions of these utilities, as derived from such records, are shown on the Plans. The service connections to these utilities may not be shown on the Plans.

The Contractor shall make his own investigations, including exploratory excavations, to determine the locations and type of existing service laterals or appurtenances when their presence can be inferred from the presence of other visible facilities, such as buildings, meters and junction boxes, on or adjacent to the work site.

3-3.01 **Hand Excavation.** Contractor's attention is directed to the work in the new MF Facility and new RO Building Areas at OCWD’s AWTF site and the South Perimeter Road at OCSD’s Plant No. 1. For Plant No. 2, Contractor's attention is directed to work at the north end of the plant. Existing utilities have been shown in these areas which have been identified from other records. As indicated above, Contractor shall identify all existing utilities prior to beginning...
work and obtain approval from Engineer that Contractor has conducted all its investigations. Contractor shall hand excavate to depth shown on the Drawings prior to installation of shoring support system.

3-4. **Trench Excavation.** No trench in shall be left open during periods when the Contractor is not at the site of work. Trenches in roadways shall be backfilled and temporarily paved, where applicable, or if trench shall be left open, covered with steel trench plates as specified in the technical specifications.

3-5. **Curtailment in Power Usage.** The Owner has entered into a three-year agreement with North American Power Partners whereby NAPP may curtail power usage with 2.5-hour notice. The plant is subject to an 11-megawatt curtailment in power usage during times when the SCE electric grid is in jeopardy (usually on hot summer days). During these shutdowns, it might be possible to continue with construction activities, but the various energy-intensive water treatment processes and pumps will be shut down in accordance with the AWTF’s Demand Response (DR) plan requirements. The following table lists the curtailment in power requirements as part of the DR. The Contractor shall incorporate this concept into the planning of the project and shall not receive any change orders or extra time for these events.

<table>
<thead>
<tr>
<th>Demand Response Program Parameters</th>
<th>D.R. Vendor, North American Power Partners (A-4 Program)</th>
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</thead>
<tbody>
<tr>
<td>Notification</td>
<td>2.5 hrs</td>
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<tr>
<td>Load Curtailment</td>
<td>11 Megawatts</td>
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<tr>
<td>Maximum interruption hours per day</td>
<td>4 -hrs / day</td>
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<tr>
<td>Max Interruptions per month</td>
<td>16 hours per month</td>
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<td></td>
<td>4 events / mo</td>
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<td>Max interruptions per year</td>
<td>192 hrs / yr</td>
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<td></td>
<td>48 events per year</td>
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<td></td>
<td>Maximum summertime curtailments of 96 hours per year</td>
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<tr>
<td>Contract Term</td>
<td>2010, 2011, and 2012</td>
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</tbody>
</table>

3-6. **Contractor’s Use of Premises.** Owner and OCSD’s operating personnel will be responsible for operating the existing facilities throughout the execution of this contract. Equipment presently installed in the facility must be available to Owner and OCSD personnel at all times for use, maintenance, and repair. If it is necessary in the course of operating the facility, for the Contractor to move his equipment, materials, or any material included in the work, he shall do so promptly and place that equipment or material in an area which does not interfere with the facility operation. The Contractor shall not adjust or operate serviceable or functioning equipment or systems.
All of the existing facilities at Plant No. 1 and 2 will remain in operation throughout this Contract except as specifically identified for temporary shutdowns and bypasses. The Contractor shall schedule and conduct his work to minimize necessary shutdowns and interference with operations and maintenance.

The Contractor shall notify the Engineer whenever it is necessary to take out of service any pump, pipeline, wet well, channel, electrical circuit, equipment, or structure. The Contractor shall be responsible for providing whatever temporary piping, pumping, power, and control facilities as are required to maintain continuous facility operation except as otherwise specified. The Contractor shall maintain the integrity of the existing facility utilities at all times.

End of Section
**SYSTEM OUTAGE REQUEST FORM**

**System to be Shutdown:**

**Date of Shutdown:** __________ Beginning at __________ a.m. p.m.

**Duration of Shutdown:** __________ Critical Path Activity? ( ) yes ( ) no

---

**Owner:** Orange County Water District

**Project:** FINAL EXPANSION OF THE GROUNDWATER REPLENISHMENT SYSTEM

**Contract No.:** GWRS-2017-01

**Contractor/CM:** CM/OCWD Operations

**Engineer/CM:** OCWD Operations/CM

**CM/Contractor:** CM/Engineer

**Regulatory Agency Notification Required?** ( ) yes ( ) no

**Is a Dry Run Required?** ( ) yes ( ) no

**Confined Space Entry?** ( ) yes ( ) no

**Combustible/Hazardous Gases Present?** ( ) yes ( ) no

---

**Outage Contact Information**

<table>
<thead>
<tr>
<th>Outage Contact Information</th>
<th>Name of Person on Call/Duty</th>
<th>Home Phone</th>
<th>Cell Phone and/or Pager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor</td>
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<tr>
<td>Construction Manager</td>
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<td>OCWD Operations</td>
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</tr>
<tr>
<td>Engineer</td>
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</tbody>
</table>

**CM / OCWD / Engineer Review Action**

( ) SOR Acceptable with comments noted on attached.

( ) SOR Not Acceptable with reasons noted on attached. Re-Submittal is required.

---

**Additional Contractor Comments:**

**Certified by:** ________________________________

(Contractor’s Signature)

(Construction Manager’s Signature)
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1. **GENERAL.**

1-1. **Security Program.**

A. The Contractor shall:

1. Protect the area associated with completion of the Work including all field office trailers and their contents from theft, vandalism, and unauthorized entry. The Contractor is not responsible for monitoring actions or procedures of staff, deliveries, or other visitors associated with the existing facility or other work occurring at the site.

2. The Contractor shall maintain a secure project site 24 hours per day, every day beginning on the first day of construction and ending at Final Completion. The Contractor shall make adequate provisions for protection of the Work against fire, theft, vandalism and for the protection of public against exposure to injury. If in the opinion of the Owner, the Contractor is not taking adequate steps to secure the site, the Owner will require that additional protective measures are immediately taken. The Owner shall not have any liability for loss of, and damage to, materials, tools, and equipment of the Contractor or of those employed by him, by contract or otherwise.

3. The Contractor shall initiate a site security system and program, at the time of mobilization onto the work-site, which provides adequate security for site stored and installed material, product, and equipment. The Engineer will approve the security system. Considerations for the security program shall include, but not be limited to, the following:

   - The Contractor shall attempt to use, if available, the existing security entrance on Garfield Avenue for all Contractor and Subcontractor construction traffic. This entrance shall be coordinated with the other entrance on Garfield Avenue for 1) Orange County Sanitation District staff, and 2) Contractors and subcontractors associated with the Orange County Sanitation District. If the gate is not available, the Owner shall provide a location for an alternate entrance and the Contractor shall provide security as noted in this Section.
• The Contractor shall attempt to use, if available, the existing security entrance on Brookhurst Street for all Contractor and Subcontractor construction traffic to OCSD’s Plant 2 site. This entrance shall be coordinated with the other entrance on Brookhurst Street for 1) Orange County Sanitation District staff, and 2) Contractors and subcontractors associated with the Orange County Sanitation District. If the gate is not available, the Owner shall provide a location for an alternate entrance and the Contractor shall provide security as noted in this Section.

• The Contractor shall provide in advance of starting construction, a list of all employees and vehicles that need access to the site. This list would include employees of subcontractors at all tier levels. The Contractor shall provide periodic updates to this list as needed or required by the Engineer.

• The Contractor should be aware that the site may not have adequate space to allow all employee vehicles to be parked on the Project site. All costs associated with off-site employee parking and shuttle to site shall be included in the Contractor’s bid.

• The Contractor shall be responsible for furnishing to each employee engaged on the Work, and for requiring each employee engaged on the Work to display, such identification as may be approved and directed by the Engineer. All prescribed identification shall immediately be delivered to the Engineer for cancellation upon the release of any employee.

• The Contractor shall ensure that no alcohol, firearm, weapon or controlled substance enters or is used during the completion of the Work. The Contractor shall immediately remove from the site and terminate the employment at this site of any employee found in violation of this provision.

• The Contractor’s employees, agents and subcontractors shall be restricted from entry to existing buildings and structures except as may be required by the Work.

• All property owned by the Owner is fenced. While it may be necessary for the Contractor to remove some of the existing fencing for construction of the new improvements, the Contractor’s operations shall not reduce the present protection and security. If the present fences are removed, an equivalent temporary continuous perimeter protection shall be provided and new fence,
which matches the existing fence, shall be installed to replace the existing fence prior to the completion of the work.

- In the event all or a part of the site is to be permanently fenced, this permanent fence or a portion thereof may be built to serve for protection of the Work site, provided however, that any portions damaged or defaced shall be replaced prior to final acceptance. Temporary openings in existing fences shall be protected to prevent intrusion by unauthorized persons. During night hours, weekends, holidays, and other times when no work is performed at the site, the Contractor shall provide temporary closures during the working hours defined in Work Restrictions Section.

- Provide a security bonded guard and security shack at the second entrance on Garfield Avenue and the first entrance on Brookhurst Street.

- Provide high security locked box containers in the fenced area for material storage, or off-site approved, bonded storage area required for the Work.

- Ensure that structures associated with the improvements designed with security locks must be capable of being secured with temporary or permanent high security locks prior to installation.

4. Maintain the security program throughout the Contract duration.

5. Be responsible at all times for security of the storage compound and lay-down areas, and for all Contractor plant, material, equipment, and tools, as well as, for those belonging to subcontractors.

6. Provide OCWD, OCSD, and the Engineer with a list of 24-hour emergency phone numbers.

7. Submit to the Engineer an up-dated progressive inventory of materials, equipment, and tools when received on-site.

1-2. **Entry Control.**

A. The Contractor shall:

1. Be assigned one point of entry and exit at the AWTF project site on Garfield Avenue. This access gate is to remain closed and locked at all times that traffic is not using the gate. If the requirement for a closed and locked manual gate is not deemed practical by the
Contractor, the Contractor can employ a full-time guard at the gate as a suitable alternative.

2. **Be assigned one point of entry and exit to OCSD’s Plant 2 on Brookhurst Street.** This access gate is to remain closed and locked at all times that traffic is not using the gate. If the requirement for a closed and locked manual gate is not deemed practical by the Contractor, the Contractor can employ a full-time guard at the gate as a suitable alternative.

3. Restrict entry through that entrance to only authorized personnel and vehicles with proper identification associated with the Work.

4. Maintain copies of vehicle insurance cards or other proof of insurance on-site for vehicles permitted on-site from that entrance.

5. Require vehicle passes when vehicles are on-site.

6. Maintain an Employee/Visitor Log, and make the log available to the Engineer on request. The log shall be submitted to the Engineer every two weeks or as necessary.

7. Give jobsite security orientation training to all affected employees including subcontractor employees in accordance with Orange County Water District requirements. Employee participation in the security orientation shall be acknowledged by their respective individual signatures affixed to an orientation roster.

8. Implement security badge system approved for the Site by the Engineer.

9. The Contractor shall be responsible for gate repairs. If repairs are not made within four hours and the gate remains open, OCSD reserves the right to close and barricade the gate at the Contractor’s expense.

B. The Engineer has the right to refuse access to the site or request that a person or vehicle be removed from the site if found violating any project security rules.

1-3. **Restrictions**

A. The Contractor shall not allow cameras on site, or photographs to be taken except with prior approval of the Owner or Engineer.

1-4. **Project Site Security Services**
A. Specific Requirements

1. Security guard(s) shall be neat in appearance and dressed in company uniform at all times. Guard personnel shall be provided by a licensed security company. Each guard shall receive security orientation training from the Engineer and Owner prior to start of work on this project. New guards shall not commence duties on site before receiving this orientation. All guards must be trained vehicle flaggers.

2. During working hours, the post security guard shall be stationed continuously at the Garfield Avenue and Brookhurst Street site entrances to monitor Project-related traffic entering and leaving that entrance. The guard shall inspect all Project-related traffic to ensure that all personnel, vehicles, and equipment possess a current project identification badge approved for entry to the Site. At the direction of the Engineer, the security guard shall perform lunch box and/or vehicle inspections.

B. Other Duties

At the request of the Engineer, the security guard shall perform additional duties as follows:

1. Direct emergency vehicles or equipment to a pre-designated on-site location.

2. Direct personnel, vehicles, materials, and equipment to the proper gate in the event a multiple gate system is implemented.

3. Direct traffic as requested by the Engineer including off-site traffic as may be required.

4. Monitor security for equipment and/or material temporarily stored along the access road or in the parking area.

5. Maintain records of insurance files for all vehicles permitted on-site.

6. Notify the Engineer of security violations on a daily basis, and enter all facts regarding the incident in a Security Log. The Security Log shall be transmitted to the Engineer.

7. Upon approval by the Owner, the guard shall assist the Engineer to remove personnel denied access to the site for violation of site regulations.
8. Enforce construction related parking area regulations and site speed limit, and obtain the name/vehicle license number of violators and report violators to the Engineer.

9. Inspect area lighting in construction areas on a daily basis and report deficiencies to the Engineer.

10. Call the Engineer to report a fire, hazardous material spill, or medical emergency. Report the emergency to the fire department as directed by the Engineer.

11. Notify the Engineer of all unusual activities/occurrences.

D. Contractor – Provided Facilities/Equipment

1. The Contractor shall provide a potable self-contained security office to be placed at the entrance to the site as directed by the Engineer.

2. The security shack shall have a cellular telephone until a regular telephone line is installed in the security shack by the Contractor.

3. The security shack shall be equipped with interior and exterior lights. In the event of a power outage, a portable generator shall be provided by the Contractor until a temporary power line is installed by the Contractor or full power is returned to the site.

4. A potable toilet with external hand washing station shall be provided and maintained by the Contractor in the vicinity of the Security Office for use of the security guard.

5. The Contractor shall provide a portable, hand-held radio for on-site communications. If a radio is provided by the Engineer, the Contractor shall be responsible for the radio and the equipment for its charging. Cost of damage or loss while in the Contractor’s control shall be paid by the Contractor.

6. Contractor shall provide a vehicle, if necessary, for the security guard to use after normal working hours to patrol the project area.

2-1. CONTRACTOR SECURITY PLAN.

A. Prior to the performance of any work the Contractor shall submit to OCSD, Owner, and the Engineer for review and comment two copies of the security plan commensurate with the needs of the project, and signed by
an officer of the Contractor. Adequacy of the security plan is the responsibility of the Contractor.

OCSD, Owner, and the Engineer will not review the Contractor security plan for adequacy.

The security plan shall:

1. Include employee site security orientation program.

2. Include security measures to protect Contractor employees and other persons from injury, prevent material damages, or avoid financial losses.

3. Cover security procedures related to Contractor tools and equipment that shall be mobilized for the Work.

End of Section
Section 01160

FIELD ENGINEERING

1. **DATUM.** Vertical and horizontal datum is based on the coordinates and benchmarks shown on the Drawings. The Contractor is to locate and protect control points prior to starting the Work and preserve control points during construction. The Contractor shall re-establish all control points disturbed by its operations at no cost to Owner.

The Contractor shall establish other vertical and horizontal control from these Owner and OCSD furnished reference points as required to properly layout and construct the Work. All connections shall be installed based on actual elevations of existing structures to which connections are made.

The Contractor's layout shall be based upon existing structures and the vertical and horizontal datum established by the Owner and OCSD. Contractor shall note that OCWD and OCSD have different coordinate systems and survey control points as discussed in paragraph 3 of this Specification.

The Contractor shall be responsible for the preservation of all existing survey monuments or permanent bench marks. Any monuments or bench marks disturbed or destroyed by Contractor shall be referenced and replaced by a licensed land surveyor. A corner record or record of survey, as appropriate, shall be filed by the licensed land surveyor as required by the Land Surveyor’s Act with the appropriate local government agencies.

2. **QUALITY ASSURANCE.**

The Contractor’s Surveyor shall be a land surveyor registered in the State of California with at least five (5) years surveying experience of similar sized projects.

Dimensions for all existing structures, piping, paving, and other nonstructural items are taken from the available information during the Owner’s planning and design. The Contractor shall field verify all dimensions and conditions in advance of any construction in the area. Any discrepancy between the field survey by the Contractor and the information indicated in the Contract Documents shall be immediately brought to Construction Manager's attention by written notification. In all questions arising as to proper location of lines and grades, the Engineer's decision will be final.

Accuracy of the Contractor's stakes, alignments and grades may be periodically and randomly checked by the Engineer. If requested by Engineer, the Contractor
shall supply field labor as required, at no extra charge to Owner, to aid and assist the Engineer in checking location and grades of the work as set by the Contractor. This shall include postponing parts of the Work affected by survey check, moving materials and equipment that interfere with a clear line of sight between horizontal control points and the construction work. The Contractor is not to assume that Engineer’s check substitutes or complements the Contractor’s required field quality control procedures.

The Contractor’s registered land surveyor shall check the line and grade of the slab or footing concrete forms prior to the first slab or footing pour at each structure and building.

3. PROJECT SURVEY REQUIREMENTS.

As part of the bid price for the construction of the improvements the Contractor shall provide and be responsible for the layout of all work specified in the contract. The Contractor shall provide all necessary surveys, field staking, and positioning for the construction of all components at the proper alignment, elevations, grades, and positions, as indicated on the Drawings and as required for the proper operation and function.

Existing benchmark for Contractor use within OCWD property boundary is shown on Contract Drawing XXX-X-XXX in Volume 4.

Existing benchmark information for Contractor use within OCSD property boundary is provided on Contract Drawing XXX-X-XXX in Volume 4.

The Contractor shall stake the work limits and right-of-way lines prior to the start of sitework.

The Contractor shall lay out all work, including structures and pipelines, and shall be solely responsible for executing the Work in accordance with the lines and grades indicated.

A preconstruction survey shall be performed prior to the start of Work. Survey shall indicate limits of existing features, including, but not limited to, buildings, piping, and utilities within the limits of the Work. Survey shall indicate any areas of potential future mitigation of lead paint, asbestos, or other hazardous items within the limits of the Work.

3-1. Submittals.

Contractor to furnish Engineer one copy of all land surveyor notes, calculations, sketches and drawings within 48 hours after completion of each survey task.
Calculations shall be signed and sealed by a land surveyor registered in the State of California.

4. **RECORD DOCUMENTS.**

The Contractor is to prepare, maintain and submit Record Documents as specified in the Closeout Procedures section. The Contractor's land surveyor is to affix his signature and registration number to applicable record drawings certifying the accuracy of lines and grades shown.

End of Section
Section 01300

SUBMITTALS

1. GENERAL

Shop Drawings and engineering data (submittals) covering all equipment and all fabricated components and building materials which will become a permanent part of the Work under this Contract shall be submitted to Engineer for review, as required. Submittals shall verify compliance with the Contract Documents, and shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and the operation of component materials and devices; the external connections, anchorages, and supports required; the performance characteristics; and dimensions needed for installation and correlation with other materials and equipment.

Each submittal shall cover items from only one section of the specification unless the item consists of components from several sources. Contractor shall submit a complete initial submittal including all components. When an item consists of components from several sources, Contractor's initial submittal shall be complete including all components.

Submittal review shall be only for general conformance with the design concept and general compliance with the information given in the contract documents. It shall not include review of quantities, dimensions, weights or gages, fabrication processes, construction safety precautions, all of which are the sole responsibility of the Contractor. Review of a specific item shall not indicate acceptance of an assembly of which the item is a component. The Engineer shall not be required to review and shall not be responsible for any deviations from the contract documents not clearly noted by the Contractor, nor shall the Engineer be required to review partial submissions or those for which submissions for correlated items have not been received.

2. CONTRACTOR RESPONSIBILITIES

All submittals, regardless of origin, shall be approved by Contractor and clearly identified with the name and number of this Contract, Contractor's name, and references to applicable specification paragraphs and Contract Drawings. Each copy of all submittals, regardless of origin, shall be stamped or affixed with an approval statement of Contractor. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified and inapplicable data crossed out. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.
Contractor shall be solely responsible for the completeness of each submittal. Contractor's stamp or affixed approval statement of a submittal, per Transmittal Form, is a representation to Owner and Engineer that Contractor accepts sole responsibility for determining and verifying all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto, and that Contractor has reviewed and coordinated each submittal with other Shop Drawings and with the requirements of the Work and the Contract Documents.

All deviations from the requirements of the Contract Documents shall be identified as deviations on each submittal and shall be tabulated in Contractor's letter of transmittal using the Transmittal Form. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by Contractor (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.

The Contractor shall coordinate submittals with the work so that work will not be delayed. Contractor shall coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals. The Contractor shall not proceed with work related to a submittal until the submittal process is complete.

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

All shop drawings submitted by subcontractors for approval shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.

The Contractor shall check all subcontractors’ shop drawings regarding measurements, size of members, materials, and details to verify that they conform to the intent of the Drawings and Specifications. Shop drawings found to be inaccurate or otherwise in error shall be returned to the Contractor and subcontractors for correction before submission thereof.

Each shop drawing, sample and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor:

"Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements."
Shop drawings and product data sheet 11-in x 17-in and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package.

3. **SUBMITTAL AND MATERIAL LIST.**

Within fifteen (15) days after the Notice to Proceed, and prior to the submission of the initial shop drawings, the Contractor shall submit a draft Master Submittal List of all required submittals to the Engineer for favorable review. The Master Submittal List shall include a description of each item, Specification or Drawing reference and the anticipated submittal date. The List shall include all items of equipment and materials for architectural, structural, mechanical, piping, electrical, heating and ventilating, equipment piping, and plumbing work; and the names of manufacturers with whom purchase orders have been placed. Items on the List shall be arranged in the same order as in these Specifications, and shall contain sufficient data to identify precisely the items of material and equipment the Contractor proposes to furnish. After the submission is favorably reviewed and returned to the Contractor by the Engineer, it shall become the basis for the submission of detailed manufacturer's drawings, catalog cuts, curves, diagrams, schematics, data, and information on each separate item for review. No work shall proceed on any item until it has been submitted and favorably reviewed. An incomplete submittal list is not a basis for avoiding a submittal required by the specifications.

4. **DEFINITIONS**

A. Manufacturer’s Instructions: Instructions, stipulations, directions, and recommendations issued in printed form by the manufacturer of a product addressing handling, installation, erection, and application of the product; Manufacturer’s Instructions are not prepared especially for the Work.

B. Shop Drawings: As defined in the General Provisions, shop drawings include, but are not necessarily be limited to:

1) Custom-prepared data such as fabrication or erection/installation (working) drawings.

2) Scheduled information, setting diagrams, actual shop work manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the Work.
C. **Product Data:** Illustrations, standard schedules, performance charts, brochures, diagrams and other information to illustrate materials or equipment for some portion of the Work.

1) **Product data as specified in individual Sections, and as applicable to the Work shall include, but not necessarily be limited to:**

   a. Standard prepared data for manufactured products (sometimes referred to as catalog data or "cuts").
   b. Manufacturer's product specifications.
   c. Installation instructions,
   d. Availability of colors and patterns.
   e. Manufacturer's printed statements of compliance and applicability.
   f. Roughing-in diagrams and templates.
   g. Product photographs.
   h. Standard wiring diagrams.
   i. Performance curves and operational-range diagrams.
   j. Production or quality control inspection and test reports and certifications, and mill reports.
   k. Operating and maintenance instructions and recommended spare parts listing and printed product warranties.

D. **Samples:** Physical examples which illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged. Samples specified in individual Sections, include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens of coordination of visual effect, graphic symbols and units of work to be used by the Engineer or others for independent inspection and testing, as applicable to the Work.

5. **PROCEDURES.**

In addition to the requirements in the General Provisions:

   A. The Contractor is encouraged to mark the submittal “high”, “normal” or “low” priority to assist the reviewer in prioritizing the submittal reviews during periods of high volume of submissions.
B. Transmittal Form - Unless otherwise specified, submittals regarding material and equipment shall be accompanied by the Shop Drawing Transmittal Form found at the end of this section. Submittal documents common to more than one piece of equipment shall be identified with all the appropriate equipment numbers. The specification section and subsection or paragraph to which the submittal is related shall be indicated on the transmittal form.

C. A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted. The Contractor shall utilize a 9-character submittal identification numbering system in the following manner:

1) The first five digits shall be the applicable Specification Section Number.

2) The next three digits shall be the numbers 001-999 to sequentially number each initial separate item or drawing submitted under each specific Section number.

3) The last character shall be a letter, A-Z, indicating the submission, or resubmission of the same drawing, i.e., "A=1\textsuperscript{st} submission, B=2\textsuperscript{nd} submission, C=3\textsuperscript{rd} submission, etc. A typical submittal number would be as follows:

   a. 03300-008-B
   b. 03300 = Specification Section for Concrete.
   c. 008 = The eighth initial submittal under this specification section.
   d. B = The second submission (first resubmission) of that particular shop drawing.

D. Submit the number of copies as specified in the General Provisions. Should the Contractor require more returned copies of any particular submittal, the Contractor shall furnish a greater number of copies to the Engineer than is specified.

E. Provide or furnish products and execute the Work in accordance with accepted submittals, unless in conflict with Contract Documents.

F. All deviations from submittals shall be listed in the Bid Form or List of Substitutions as defined in the General and Special Provisions.
G. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention in writing on the Shop Drawing Transmittal Form and on resubmitted shop drawings by use of revision triangle s or other similar methods, to revisions other than the corrections requested by the Engineer on previous submissions. Any such revisions which are not clearly identified shall be made at the risk of the Contractor. The Contractor shall make corrections to any work done because of this type revision that is not in accordance to the Contract Documents as may be required by the Engineer.

Contractor shall accept full responsibility for the completeness of each resubmittal. Contractor shall verify that all corrected data and additional information previously requested by Engineer are provided on the resubmittal. Resubmittals shall be in an organized and consistent format.

H. Partial submittals may not be reviewed. The Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Contractor, and will be considered “REJECTED” until resubmitted. The Engineer may at his/her option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.

6. SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

A. The Contractor shall stamp, sign and date submittals indicating review and approval; and submit to Engineer.

1) Stamp and signature indicates Contractor has satisfied shop drawing review responsibilities and constitutes Contractor’s written approval of shop drawing.

2) Shop drawings without Contractor’s written approval will be returned for resubmission.

B. Paper based submittals shall be provided in:

1) Binders: Commercial quality, 8-1/2 inch by 11 inch (size A4), three D side ring binders with durable plastic covers; 2 inch (50 millimeter) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
2) Cover: Identify each binder with typed project number and name and subject matter of the contents. Titles shall be placed both on the front and binder edge of the binder.

3) Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

4) Text: Manufacturer’s printed data or type written data on 20-pound, minimum, white punched paper. Computer generated data shall be printed by letter quality 150 dpi resolution printers unless approved otherwise.

C. For electronic submittals, drawings and the necessary data shall be submitted electronically to Engineer as specified below. Submittal documents shall be in color to facilitate use of red line markups. All electronic files shall be in Portable Document Format (PDF) as generated by Adobe Acrobat Professional Version 7.0 or higher. The PDF file(s) shall be fully indexed using the Table of Contents, searchable with thumbnails generated. PDF images must be at a readable resolution. For most documents, they should be scanned or generated at 300 dots per inch (dpi). Use of higher resolution is acceptable with Owner and Engineer approval. Optical Character Recognition (OCR) capture must be performed on these images so that text can be searched, selected and copied from the generated PDF file. The PDF documents shall have a bookmark created in the navigation frame for each major entry (“Section” or “Chapter”) in the Table of Contents. Thumbnails shall be generated for each page or graphic in the PDF file.

The opening view for each PDF document shall be as follows:

Initial View: Bookmarks and Page
Magnification: Fit in Window

The file shall open to Contractor’s transmittal letter, with bookmarks to the left. The first bookmark shall be linked to the Table of Contents.

PDF document properties shall include the submittal number for the document title and Contractor’s name for the author.

Electronic submittal file sizes shall be limited to 10 MB. When multiple files are required for a submittal the least number of files possible shall be created.
Facsimiles (fax) will not be acceptable. Submittals will not be accepted from anyone but Contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

D. Product Data and Manufacturer's Instructions: Excise or cross out non-applicable information and clearly mark applicable information with citations to and terminology consistent with Contract Documents.

E. Samples: Label will be returned with reviewer's selection when appropriate, comments and stamp. Samples will not be returned unless return is requested in writing and additional sample is submitted. More details on sample requirements are included in the General Provisions.

F. Electronic Copies of Approved Submittals: All approved submittals shall be provided in electronic format per the requirements set forth in the Operation and Maintenance Data and Manuals section of this Specification for Electronic Approved Submittals and Operation and Maintenance Manuals. Additional requirements are provided in the Closeout Procedures section.

7. MANUFACTURER'S INSTRUCTIONS.

Submit manufacturer's instructions whenever made available by manufacturers and when installation, erection, or application in accordance with manufacturer's instructions is required by the Specifications. Submit manufacturer's instructions prior to installation, erection, or application of equipment and other project components. Submit manufacturer's instructions in accordance with requirements for Product Data.

8. ENGINEER'S REVIEW

The Engineer's review of submittals shall not release Contractor from Contractor's responsibility for performance of requirements of Contract Documents. Neither shall the Engineer's review release Contractor from fulfilling purpose of installation nor from Contractor's liability to replace defective work. The Contractor shall not consider submittals as Contract Documents. The purpose of submittals is to demonstrate how Contractor intends to conform to the Contract documents and design concepts. The Engineer will be entitled to rely upon the accuracy or completeness of designs, calculations, or certifications made by licensed
professionals accompanying a particular submittal whether or not a stamp or seal is required by Contract Documents or Laws and Regulations.

The Engineer's review does not extend to:

1. Accuracy of dimensions, quantities, or performance of equipment and systems designed by Contractor.
2. Contractor's means, methods, techniques, sequences, or procedures except when specified, indicated on the Drawings or required by the Contract Documents.
3. Safety precautions or programs related to safety which shall remain the sole responsibility of the Contractor.
4. As permitting any departure from the Contract requirements.
5. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials.
6. As approving departures from details furnished by the Engineer, except as otherwise provided herein.

9. REVIEW NOTATIONS

A. REVIEW NOTATIONS. The returned submittal shall indicate on the following actions:

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

If the review indicates limited corrections are required, copies will be marked "MAKE CORRECTIONS NOTED." The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in O&M data, a corrected copy shall be provided. Engineer reserves the right to request a complete corrected copy of all submittals.

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

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

If the submittal information does not require a review by the Engineer and/or is submitted for information only, copies of the submittal will be marked "Review not Required" and will be returned as "RECORD COPY".

B. FABRICATION. Fabrication of an item shall not be commenced before the Engineer has reviewed the pertinent shop drawings and returned copies to the Contractor marked either "NO EXCEPTIONS TAKEN," or "MAKE CORRECTIONS NOTED." Revisions indicated on shop drawings shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis of claims for extra work. The Contractor shall have no claim for damages or extension of time due to any delay resulting from the Contractor's having to make the required revisions to shop drawings unless review by the Engineer of said drawings is delayed beyond a reasonable period of time and unless the Contractor can establish that the Engineer's delay in review actually resulted in a delay to the critical path of the Contractor's construction schedule. The review of such drawings by the Engineer will be limited to checking for general conformance with the requirements of the Contract Documents, and shall in no way relieve the Contractor of responsibility for errors or omissions contained therein, nor shall such review operate to waive or modify any provision contained in the Contract Documents. Fabricating dimensions, quantities of material, applicable code requirements, and other contract requirements shall be the Contractor's responsibility.

10. REVIEW COSTS.

The Owner's cost for review of submittals for the same proposed materials, equipment or work shall be apportioned as follows:

1. The cost of review of the initial submittal and the first revised submittal will be borne by the Owner.

2. The cost to review all additional revised submittals after the first revised submittal will be charged to the Contractor. The cost of review shall include, without limitation, administrative, design and engineering activities directly related to review of submittals.

3. If a submittal is approved and the Contractor elects to submit an alternate item for review for the same application, the Contractor shall be responsible for the review costs for the alternate submittal. The cost of review shall include, without limitation, administrative, design and engineering activities directly related to review of submittals.
11. **OPERATION AND MAINTENANCE DATA AND MANUALS.**

Adequate operation and maintenance information shall be supplied for all equipment requiring maintenance or other attention. The equipment Supplier shall prepare a Project specific operation and maintenance manual for each type of equipment indicated in the individual equipment sections or the equipment schedule.

Unless otherwise agreed by Engineer, the operation and maintenance manual for each type of equipment shall only be submitted for review following completion of review of all shop drawings and engineering data pertaining to that equipment.

Parts lists and operating and maintenance instructions shall be furnished for other equipment not listed in the individual equipment sections or the equipment schedule.

Operation and maintenance manuals shall include the following:

A. Table of contents and index (to be included in each volume of multi-volume manuals)

B. Part 1: Equipment record:
   a. Summary: Provide Equipment Record Form indicating the equipment name, equipment number, and process area in which the equipment is installed.
   b. Form: Complete the Equipment Record Form for each item of mechanical, electrical and instrumentation equipment in the Work (provided at end of this Specification).
   c. Include any performance curves, tests or engineering data not specifically listed on the forms.

C. Part 2: Operational procedures:
   a. Equipment function, normal operating characteristics, and limiting conditions
   b. Assembly, installation, alignment, adjustment, disassembly, and checking instructions.
   c. Operating instructions for startup, routine and normal operation, regulation and control, shutdown, and emergency conditions.
   d. Lubrication and maintenance instructions.
   e. Guide to troubleshooting.
   f. Parts lists and predicted life of parts subject to wear.
   g. Outline, cross section, and assembly drawings; engineering data; and wiring diagrams.
   h. Factory test reports, test data and performance curves, where applicable.
i. Testing to determine performance efficiency.

j. Tabulation of proper settings for all pressure relief valves, low and high pressure switches, and other protection devices.

k. List of all electrical relay settings including alarm and contact settings.

l. Safety considerations relating to installation, operation, and maintenance procedures.

m. Calibration procedures

n. Wiring diagrams

o. Operational log sheets and maintenance schedules

p. Material Safety Data Sheets (MSDS) for any applicable item (chemicals, oils, lubricants, etc.)

q. Warranty Information, Bond(s), and Service Contract(s)

D. Part 3: Preventive maintenance procedures:

a. Identify all manufacturer-recommended procedures to be performed on a periodic basis.

b. Provide recommended frequency of preventive maintenance procedures. Include lubrication schedules, lubricant SAE grade, type, and temperature ranges.

E. Part 4: Parts list:

a. Provide a complete parts list, including a generic description and manufacturer’s identification number for each part. Include addresses and telephone numbers of the nearest supplier and parts warehouse.

b. Provide cross-sectional or exploded view drawings with parts list.

F. Part 5: Wiring diagrams:

a. Provide complete, color-coded, internal and connection wiring diagrams for electrical equipment.

b. Provide as-installed control diagrams by controls manufacturer.

G. Part 6: Shop Drawings:

a. Provide approved Shop Drawings for the piece of equipment included. Shop Drawing marked approved as noted: Indicate all changes necessary.

b. Mark each sheet to clearly identify specific products and component parts and data applicable to installation.

c. Delete inapplicable information.

d. Include only those sheets, which are pertinent to the specific product.

H. Part 7: Safety:

a. Include all safety precautions to be taken when operating and maintaining equipment.
I. Part 8: Documentation:
   a. Provide all equipment warranties, affidavits, and certifications required by the Technical Specifications.
   b. Provide proper procedures in event of failure.
   c. Provide instances which might affect validity of warranties.
   d. Provide expiration date of all warranties.
   e. Provide contact information.

J. Part 9: Materials and Finishes
   1. Content for Products, Applied Materials and Finishes:

      a. Manufacturer's data, giving full information on products.
         1) Catalog number, size composition.
         2) Color and texture designations.
         3) Information required for re-ordering special manufactured products.

      b. Instructions for care and maintenance.
         1) Manufacturer's recommendations for types of cleaning agents and methods.
         2) Cautions against cleaning agents and methods which are detrimental to product.
         3) Recommended schedule for cleaning and maintenance.

   2. Content for Moisture-Protection and Weather-Exposed Products:

      a. Manufacturer's data, giving full information on products.
         1) Applicable standards.
         2) Chemical Composition.
         3) Details of installation.

      b. Instructions for inspection, maintenance and repair.

   3. Additional Requirements for Maintenance Data: Respective sections of the Specifications.

The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered, or which may be required by Contractor.

Preliminary copies of operation and maintenance manuals shall be submitted to Engineer for review before shipment of the equipment. Preliminary copies shall be in hardcopy format. The quantity of preliminary copies shall be as required in the Shop Drawings section of the General Provisions.
After review by Engineer, final copies of operation and maintenance manuals shall be delivered to Engineer no later than thirty (30) days prior to placing the equipment in operation and no later than thirty (30) days after approval of the preliminary operation and maintenance manuals. If electronic and hard copies of final operation and maintenance manuals are not submitted within the timeframes specified, progress payments will be withheld until the required information is submitted. The Contractor shall provide four (4) final hard copies and two (2) final electronic copies of all operation and maintenance manuals. All final hard and electronic copies of operation and maintenance manuals shall be reviewed by Engineer for conformance with the specifications of this section and shall be returned for corrections if required.

Shipment of equipment will not be considered complete until all required manuals and data have been received.

- **Hard Copy Operation and Maintenance Manuals.** Hard copies for preliminary and final manuals shall be temporarily bound in heavy paper covers bearing suitable identification. All manuals and other data shall be printed on heavy, first quality 8-1/2 x 11 inch paper, with standard three-hole punching. Drawings and diagrams shall be reduced to 8-1/2 x 11 inches or 11 x 17 inches. Where reduction is not practicable, larger drawings shall be folded separately and placed in envelopes, which are bound into the manuals. Each envelope shall be suitably identified on the outside. Each volume containing data for three or more items of equipment shall include a table of contents and index tabs. The final hard copy of each manual shall be prepared and delivered in substantial, permanent, three-ring or three-post binders with a table of contents and suitable index tabs. Provide indexed, tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment.

- **Electronic Approved Submittals and Operation and Maintenance Manuals.** Each electronic copy shall be delivered on a unique CD-ROM in Adobe Acrobat’s Portable Document Format (PDF). The PDF file(s) shall be fully indexed using the Table of Contents, searchable with thumbnails generated.

File names shall use the “eight dot three” convention (XXXXX_YY.pdf), where X is the five digit number corresponding to the specification section, and YY is a two digit number set in sequential order when there are more than one PDF document (more than one O&M manual) per specification section. The initial filename for the O&M submittal will be provided with the request for final O&M manuals.
Scanned images must be at a readable resolution. For most documents, resolution for scanned documents shall be between 300 dots and 600 dots per inch (dpi). Optical Character Recognition (OCR) capture must be performed on these images. OCR settings shall be performed with the “original image with hidden text” option in Adobe Acrobat Exchange.

One PDF document (PDF file) shall be created for each equipment service manual. The entire manual shall be converted to a single PDF file via scanning or other method of conversion. Drawings or other graphics shall also be converted to PDF format and included into the single PDF document. Pages that must be viewed in landscape format shall be rotated to the appropriate position for easy reading on screen.

The PDF documents shall have a bookmark created in the navigation frame for each major entry (“Section” or “Chapter”) in the Table of Contents. Thumbnails shall be generated for each page or graphic in the PDF file.

The opening view for each PDF document shall be as follows:

Initial View: Bookmarks and Page

Magnification: Fit In Window

The file shall open to the cover page of the manual, with bookmarks to the left, and the first bookmark shall be linked to the Table of Contents.

- Labeling. As a minimum, the following information shall be included on all final O&M manual materials, including CD-ROM disks, jewel cases, and hard copy manuals:

  Manufacturer’s name.

  Equipment name and/or O&M title spelled out in complete words.

  Example: “Operations and Maintenance Manual”

  “Vertical Diffusion Vane Pumps”

  Specification Section Number. Example: “Section 11140”

  Project Name. “Final Expansion of the Groundwater
Replenishment System

File Name and Date. Example: “11140_01.pdf”, “5-05-10”

- Drawings. All drawings shall be in PDF format in PDF Searchable Image format. The Optical Character Recognition of the image shall be at a 95-percent confidence level. The drawings shall be linked as follows:
  o External links from the Drawing Index
  o External links from the references within drawings to other drawings

Drawings available in native format (i.e. AutoCAD) shall be provided in electronic format in a native format supported by available viewers.

12. ELECTRONIC RED-LINE DRAWINGS.

Electronic red-line drawing updates shall be submitted once every three months for the duration of the Contract on a date agreed to by the Owner, Engineer, and Contractor. If electronic red-line drawing updates are not submitted by the due date, progress payments will be withheld until the required information is submitted. Contractor shall refer to the Project Record Documents part of the Closeout Procedures section for requirements on information to be included on red-line drawings. Electronic format and requirements are as follows:

A. Upon Notice to Proceed, a DVD containing Conformed Drawings in electronic PDF format will be provided to the Contractor.

B. Contractor shall use Adobe Acrobat Professional or Revu Bluebeam to red-line PDF drawings to reflect as-built installation of facilities. Line color requirements provided in the Closeout Procedures section shall be used.

C. For each change made to the electronic drawings, the Contractor shall create a link to the document in which the change was approved (RFI, Change Order, etc.).

D. Electronic “RED-LINE” updates shall only include drawings revised during that period, but shall include all changes to date for those drawings submitted.

E. A complete electronic “AS-BUILT” set of drawings shall be provided with the hard copy set of Project Record Documents required in the Closeout Procedures section.
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Complete either (a) or (b) following:

(a) We have verified that the material or equipment contained in this submittal meets all the requirements specified or shown (NO EXCEPTIONS).

(b) We have verified that the material or Equipment contained in this submittal meets all the requirements specified or shown, except for the following deviations (ATTACH LIST OF DEVIATIONS:)

Contractor’s or Supplier’s Authorized Signature:
## EQUIPMENT MAINTENANCE DATA SUMMARY

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### BREAK-IN MAINTENANCE REQUIREMENTS (INITIAL OIL CHANGES, ETC.)

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Orange County Water District 01300 SUBMITTALS
Groundwater Replenishment System -18- August 2018
Final Expansion DS2 Submittal
### LUBRICATION SUMMARY

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Special Instructions or warnings associated with this equipment

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End of Section
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1.1 THE REQUIREMENT

A. It is expressly understood and agreed that the rate of progress and the time of completion of the Work are of the essence for this Contract. The Work shall be executed with such progress as required to prevent any delay to this Contract and to other CONTRACTORS working on other contracts at the site. This includes Contract Milestone dates and constraints, time requirements, and the general completion of the Work as defined in the Contract Documents;

B. The Work specified in this Specification section includes preparation, submittal, and use of a Construction Schedule as a portion of the CONTRACTOR's mobilization. Its subsequent updates and revisions, as reviewed and allowed by the ENGINEER, shall be a required part of each Progress Payment Application submitted by the CONTRACTOR as provided in the Contract Documents.

C. The CONTRACTOR shall prepare and submit all required Construction Schedules in accordance with the requirements of this Specification section. By preparing and submitting the schedules and progress period updates, the CONTRACTOR represents that it can, and intends to, safely execute the contracted Work and all portions thereof including all activities of Subcontractors, equipment vendors, and suppliers including submittals and re-submittals within the specified times and constraints and that its Bid Price includes all costs associated with execution of the Work described in the Contract Documents and as represented in the Construction Schedules.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The requirements of the following sections and divisions apply to the Work of this section. Other sections and divisions of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 01140, Work Restrictions
2. Section 01090, Regulatory Requirements and Permits
B. Comply with the requirements of the General Provisions, Special Provisions, and General Requirements.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. The CONTRACTOR shall comply with the reference specifications of the General Requirements.

B. The following publications are cited as references for the Critical Path Method (CPM) scheduling technique described in this Contract:
   2. Association for the Advancement of Cost Engineering International (AACE), latest editions of Recommended Practices as applicable for Engineering, Procurement and Construction.

1.4 PURPOSE OF THE SCHEDULE

A. This Specification section specifies requirements and procedures for the CONTRACTOR to use in preparation of construction schedules, cost-loaded schedules, resource-loaded schedules, cash flow projections, manpower projections, and cost and schedule reports. The purpose of the schedules and reports shall be to:
   1. Ensure adequate planning and timely execution of the Work by the CONTRACTOR;
   2. Facilitate coordination and interfacing of the CONTRACTOR's work with others as needed;
   3. Establish a baseline Construction Schedule to which subsequent periodic schedule updates will be compared to determine overall progress and performance toward satisfactory completion of the Contract;
   4. Periodically record the “As-Built” condition of the Contract;
   5. Assist the ENGINEER in monitoring progress;
   6. Establish the amount of the progress period payment to be made to the CONTRACTOR;
   7. Establish the amount of daily manpower required to complete the Contract within the Contract Duration;
   8. Evaluate proposed changes to the Contract and resultant impacts to the construction schedule;
1.5 MOBILIZATION AND PROGRESS PAYMENTS

A. OCWD’s administration of the Contract, its construction program, internal resource coordination, and operations planning may be severely impeded if adoption of the schedule is delayed. Consequently, ten percent of the CONTRACTOR’s mobilization payment, as allowed pursuant to the Contract Documents, shall be retained and allocated for payment as follows:

1. The CONTRACTOR may request and be paid twenty percent of the retained mobilization in its payment application that follows submittal and acceptance of the Interim Construction Schedule.

2. The CONTRACTOR may request and be paid the balance of the retained mobilization in its payment application that follows submittal and acceptance of the Baseline Construction Schedule.

B. The CONTRACTOR’s progress payment applications may be deemed improper and may not be accepted and processed for payment by OCWD without periodic Construction Schedule updates submitted in the time and manner required by this Specification section and subsequently accepted by the ENGINEER.

1.6 CONTRACTOR SUBMITTALS

A. Certifications and other submittal documentation in compliance with Article entitled “Contractor Qualifications” of this Specification.

B. The CONTRACTOR shall submit all items as required by Appendix G of this Specification section in the time, quantities, and manner stipulated therein and in accordance with the Contract Documents for submittals unless noted otherwise herein.

1.7 QUALITY ASSURANCE

A. Contractor Qualifications

1. The CONTRACTOR shall provide a full-time, onsite construction scheduler, proficient in the use of Primavera® Project Management software, who shall have a minimum of ten years verifiable experience in construction work sequencing, productivity, preparation and maintenance of detailed construction schedules for individual contracts of $50 Million and larger in constructed value.
a. Within seven days after Notice to Proceed, the CONTRACTOR shall submit the construction scheduler's resume to the ENGINEER, including personal references from at least two owner-representatives familiar with the construction scheduler's work on previous similar contracts. The ENGINEER reserves the right to reject the proposed scheduler based on poor references, lack of qualifications as defined in this Specification section, and/or poor performance history on previous OCWD contracts including late schedule submittals, lack of responsiveness to requested clarifications, corrections, re-submittals and/or time impact analysis.

b. The CONTRACTOR's scheduler shall attend all meetings, including progress and special meetings pertaining to scheduling of the Work. The scheduler, along with the CONTRACTOR's management team shall work closely with the ENGINEER to comply with and deliver the requirements of this Specification section.

c. It is the specific intent of this Specification section that the CONTRACTOR and its scheduler shall be wholly responsible for developing, maintaining, updating, checking and providing an accurate and comprehensive representation of the CONTRACTOR's work plan in the required software, related databases and reports to achieve the purposes set forth in the Contract Documents.

1.8 ENGINEER'S REVIEW

A. The ENGINEER shall review schedule submittals in accordance with this Specification section and the other Contract Documents for the administrative purposes described herein. However the ENGINEER's review, comments or consent to use the CONTRACTOR's schedule shall not be construed as validation or endorsement of the CONTRACTOR's work plan and approach nor shall it relieve the CONTRACTOR of any and all responsibility, liability or risk related to its work plan, its work plan as represented by the schedule, or requirements of the Contract.

1.9 GENERAL SCHEDULE REQUIREMENTS

A. The CONTRACTOR shall have sole responsibility for development, maintenance, update, revision, checking and presentation of its work plan in the form of a Critical Path Method (CPM) Construction Schedule for use by the ENGINEER in meeting the purposes described in the Contract Documents. The CONTRACTOR shall provide all information concerning
methods, means, sequencing, logic, and duration of all activities as well as providing all CPM logic network diagram and tabular report data.

B. The CONTRACTOR shall use Primavera® Project Management, latest version, and a hardware system commensurate with the size of the contract. The system shall be capable of handling, processing, printing, and plotting all data required to satisfy the requirements of this Specification section. Electronic files submitted to OCWD shall be compatible with Primavera® Project Management, latest version.

C. Within fourteen days following Notice to Proceed, the ENGINEER shall schedule and conduct a Pre-Construction Scheduling Conference to commence development of the required construction schedules. At the meeting, the requirements of this and related Specification sections will be reviewed with the CONTRACTOR and the CONTRACTOR shall present its proposed:

1. Methodology for the CPM Construction Schedule, illustrating sequence of operations, cost, resource and quantity loading.

2. Work Breakdown Structure (WBS), Activity Coding Structure and Activity Identification numbering system for labeling all Work Activities, correlated with the Contract Agreement Schedule of Prices. At a minimum the CONTRACTOR shall provide the data detailed in Appendices B and C of this Specification section.

D. The ENGINEER shall review the WBS, the coding structure, and activity identification system presented by the CONTRACTOR within ten days following the Pre-Construction Scheduling Conference. The CONTRACTOR shall make all modifications requested by the ENGINEER and, following concurrence by the ENGINEER, shall employ the agreed to coding, structure, and system in its Construction Schedule. In addition the CONTRACTOR may be required to develop additional activity codes and values to comply with reporting requirements listed in the Contract Documents, and/or as directed by the ENGINEER.

E. The Work activities comprising the Construction Schedule shall be of sufficient detail to assure adequate planning and execution of the Work such that, in the judgment of the ENGINEER, it provides an appropriate basis for predicting, monitoring, evaluating and recording the progress of the Work. Work Activities shall conform to the following requirements:

1. Describe Work Activities using consistent terminology such that the Work is readily identifiable for assessment of progress and completion.
2. Subdivide the Work into activities of duration no longer than fifteen uninterrupted work days each, except as to non-construction activities, such as procurement and delivery of materials and equipment, and any other activities for which the ENGINEER may accept a longer duration in writing.

3. The construction time, as determined by the schedule, from early start to late finish for any sub-phase, phase, or the entire contract shall not exceed the Contract Duration specified or shown in the Contract Documents. One day shall be the smallest time unit shown unless otherwise directed in writing by the ENGINEER.

4. Except as provided for in Appendix B for milestones, activities labeled "start," "continue," or "completion" shall not be allowed. Logic relationships between activities shall be limited to finish-to-start (FS) type relationships and the use of lags or durations between activities shall not be permitted unless accepted in writing by the ENGINEER.

5. The CONTRACTOR shall not constrain the schedule with artificial logic ties and/or constraint dates and/or use any other scheduling techniques that may distort the activity float and total float associated with the critical path activities and the schedule in general. The only allowable constraint shall be for Contract Milestone dates using a “Finish On or Before” constraint, unless accepted in writing by the ENGINEER.

6. Each Work Activity shall contain the following information as elaborated in Appendix B of this Specification section:
   a. WBS coding, activity coding and a unique activity identification number consistent with the structure and system agreed to by the ENGINEER.
   b. Performance responsibility; General Contractor or Subcontractor trade code; GEN, MECH, ELEC, CARP, PLAST, etc.
   c. Work location code and description of the physical plant area involved.
   d. Duration in work days based on the appropriate Activity Calendar.
   e. Cost Data as mandated herein
   f. Resource Data as mandated herein

F. The ENGINEER may require the CONTRACTOR, at any time during the Contract, to develop a more detailed schedule and/or fragment than
depicted in the Construction Schedule to clearly illustrate the effort needed to complete a specific area or task.

G. The Construction Schedule shall contain the following standard milestones; Notice to Proceed; Mobilization; Construction Start; Specified Contract Milestones for each phase of Work as identified in Contract Documents; Beneficial Occupancy; Substantial Completion and Final Completion

H. Activity Cost Loading:
1. The schedule shall incorporate cost-loaded activities equal to the Contract Total Price and Sub-Totals set forth in Contract Agreement ‘Exhibit “A” Schedule of Prices’ and as further detailed in the General Conditions section entitled ‘PAYMENT – ITEMIZED BREAKDOWN OF CONTRACT LUMP SUM PRICES’.
2. The CONTRACTOR shall further divide its prices to determine and substantiate a fair allocation of costs to each activity of Work in the schedule that is physically incorporated into the facility.
3. The CONTRACTOR shall not unbalance the activity cost loading and, except for mobilization costs, shall prorate overhead and profit on all activities for the entire contract term. The CONTRACTOR shall furnish the minimum data required in Appendix G of this Specification section to the ENGINEER for review and agreement prior to integrating cost data into the schedule:
4. Procurement, submittal preparation and submittal review activities shall not be cost-loaded. Payment for material and equipment shall be made in accordance with the Contract Documents.
5. The Payment Application and all periodic payment requests shall be based upon, but may not be limited to, the cost-loaded Construction Schedule update; the Contract Agreement ‘Exhibit “A” Schedule of Prices’; and the General Conditions section entitled ‘PAYMENT – ITEMIZED BREAKDOWN OF CONTRACT LUMP SUM PRICES’.
6. Proposed changes to the authorized Cost-loaded Construction Schedule may only be made with the written acceptance by the ENGINEER.

I. Activity Resource Loading:
1. The activities contained in the Construction Schedule shall be resource-loaded to show the number of work force employees
needed on a work day basis to complete the Work within the Contract Duration.

2. Resource activity loading shall include, at a minimum, the composite crew, the classification (e.g., foreman, journeyman, etc.) of the individuals comprising the crew, materials, and equipment associated with each activity shown on the schedule, plus any other information required by ENGINEER.

3. Labor resources shall be listed in the Resource Library of the Primavera® Software and the CONTRACTOR shall assign labor resource loading by trade for each Work Activity of the schedule.

4. The CONTRACTOR may use the Primavera® Resource Leveling function for its own internal analysis and planning, but shall not use it in the contract record or submittal schedule databases to avoid potential distortions resulting from the retained logic function.

5. Proposed changes to the authorized Resource-loaded Schedule may only be made with the written acceptance by the ENGINEER.

J. The Construction Schedule shall begin with the date of issuance of the Notice to Proceed and not exceed the maximum Contract Duration provided in the Contract. It shall include, but not be limited to, the following items as appropriate to this Contract:

1. All administrative tasks

2. Type of work to be performed, sequences, and labor trades involved, including performance responsibility and trade code.

3. Quantity loading of activities showing, at a minimum, unit price bid items, estimated quantities to be installed or removed as indicated in the Contract Documents or as determined by the CONTRACTOR in preparation of its Bid, and any additional information required by the ENGINEER.

4. All manufacturer factory tests, material and equipment deliveries, field tests, readiness tests, and installation activities that the CONTRACTOR intends to seek payment for, including stored materials.

5. All submittal preparation and reviews including ENGINEER reviews, and acceptance of shop drawings and material samples shall provide a 25 day minimum duration as specified for the ENGINEER’s review of submittals, unless the submittal is of the type requiring a longer period of time as specified in the Contract Documents for Shop Drawing Submittals.

6. Delivery, installation, check-out/testing, and startup of OCWD-furnished equipment and/or materials in accordance with the
schedule dates set forth in the Specifications or as furnished by the ENGINEER.

7. Approvals required by regulatory agencies or other third parties, including CONTRACTOR obtained permits

8. Identification of all subcontract Work and assignments of responsibility for performing specific activities.

9. All temporary utilities and construction required by the CONTRACTOR to perform the Contract Work.

10. Access to and availability of work areas including all anticipated plant shutdowns, pump station shutdowns, flow diversions, or bypass pumping.

11. All interruptions, shut downs and connections to existing plant systems and equipment.

12. All start up, testing, training, and assistance required under the Contract Documents.

13. Timing of the phased or total takeover of the Work by OCWD as may be required by the CONTRACT.

14. Identification of any work force, material, or equipment restrictions, as well as any activity requiring unusual shift work, such as two shifts, six day weeks, overtime, or work at times other than regular days or hours, shall be clearly identified in the Construction Schedule. Normal work hours are eight hours per day, five days a week, unless specified otherwise in the Contract Documents.

15. CONTRACTOR activities that will be coordinated with OCWD and OCSD on-going activities.

16. Material and Equipment Installation including installation, check-out, vendor equipment manuals submittal and acceptance, training lesson plan(s) submittal and acceptance, and OCWD staff training.

17. CONTRACTOR-prepared drawings and diagrams such as shoring diagrams.

18. Clearly identify all non-work days such as holidays, or other non-work periods in the schedule,

19. Specific Work activities, including but not limited to, site work, underground piping and electrical ductbanks, structural excavation, soil testing, backfill, placement of sheeting, pile driving, formwork erection, rebar placement, placing of concrete, stripping forms, concrete curing, installation of process piping, electrical conduits and wiring, instrumentation and controls conduits and wiring, terminations, other materials and plant equipment, and cleanup.
20. The CONTRACTOR shall provide an activity for Inclement Weather with a duration that reflects the number of inclement weather days provided for in the Contract Documents as follows:

a. The Inclement Weather predecessor activity shall be the last construction activity that occurs before Substantial Completion.

b. The Inclement Weather successor activity shall be the Substantial Completion milestone.

c. The CONTRACTOR shall notify the ENGINEER in writing within seven days when a lost work day has occurred due to inclement weather. The CONTRACTOR shall correspondingly reduce the inclement weather activity duration as weather days occur, are recognized and accepted by the ENGINEER.

d. The CONTRACTOR shall notify the ENGINEER in writing to request a non-compensable extension of time if the number of actual inclement weather delay days exceeds the number of inclement weather delay days identified in the Contract Documents. Such delays shall not entitle the CONTRACTOR to additional compensation.


22. Final cleanup.

23. Specific information required by the ENGINEER.

24. Required inspections by the ENGINEER.

25. Progress period updating of Contract Record Drawings and final submittal of As-Built Drawings at contract completion, or as directed by the ENGINEER.

1.10 INTERIM CONSTRUCTION SCHEDULE REQUIREMENTS

A. Within 30 days following Notice to Proceed the CONTRACTOR shall submit its detailed written work plan for the first 150 days of operation and its general approach to the remainder of the Work. The work plan and approach to the remainder of the Work shall also be submitted in the form of an Interim Construction Schedule that incorporates all applicable elements of this Specification section and the other Contract Documents sufficient to meet its purpose.

B. The ENGINEER shall meet with the CONTRACTOR within ten days of the submittal to review and agree on any necessary adjustments and revisions. When revised and accepted by the ENGINEER the Interim Construction Schedule shall illustrate the CONTRACTOR’s methods, means, logic, sequencing and durations of the Work represented by cost-
loaded and resource-loaded activities for the first 150 days of the contract. It shall also include cost loading and resource loading for the balance of all contract Work to a summary level through the Final Completion milestone as forecast by the CONTRACTOR.

C. The Interim Construction Schedule shall be updated as provided in this Specification section and used to monitor job progress during the first 150 days of the contract or until acceptance of the Baseline Construction Schedule by the ENGINEER.

1.11 BASELINE CONSTRUCTION SCHEDULE REQUIREMENTS

A. Within 90 days following Notice to Proceed the CONTRACTOR shall submit its detailed written plan for the Work. The work plan shall also be submitted in the form of a Baseline Construction Schedule that incorporates all applicable elements of this Specification section and the other Contract Documents sufficient to meet its purposes as described therein. It shall demonstrate the final level of detail for each activity, all required relationships completely identified, and the duration of each activity correctly depicted. It shall be developed as follows:

1. The activities shown in the interim schedule shall be integrated into the Baseline Construction Schedule without change to form a comprehensive representation of the CONTRACTOR’s execution of the Work from start to finish.

2. The Baseline Construction Schedule submitted for review and acceptance by the ENGINEER shall be un-statused and the data date shall be the Contract Notice to Proceed date.

3. The Baseline Construction Schedule shall clearly indicate the Longest Critical Path of activities from Notice to Proceed to the Contract Completion date.

4. The Baseline Construction Schedule shall contain all cost information assigned to each discrete activity at the final level of detail. Each activity shall be cost-loaded to permit generation of cash flow curves.

5. The Baseline Construction Schedule shall contain all resource information assigned to each discrete activity at the final level of detail. Each activity shall be resource-loaded to permit generation of resource curves.

6. The CONTRACTOR shall collect data and information from subcontractors, suppliers, and equipment manufacturers for incorporation into the Baseline Construction Schedule. The baseline schedule submittal shall include signed certification letters
from subcontractors, suppliers and vendors that they have reviewed, discussed and agreed to the schedule as it relates to their work.

7. The Baseline Construction Schedule shall contain no Contract changes or delays which may have been incurred during the schedule development period. These changes will be entered at the first update after the Baseline Construction Schedule has been accepted by the ENGINEER and a change to the Contract Duration made as part of an approved Change Order in accordance with the Contract Documents.

8. Once the Baseline Construction Schedule is agreed to and accepted by the ENGINEER it shall become the schedule of record and shall be the basis for future schedule updates.

9. After adoption of the Baseline Construction Schedule, no changes shall be made therein, including changes to logic, sequence and/or duration, without the agreement of the ENGINEER.

B. The ENGINEER will have up to 25 days to evaluate and prepare its comments to the Baseline Construction Schedule submittal before scheduling a meeting with the CONTRACTOR to discuss it.

C. Within ten days of returning its submittal response, the ENGINEER will schedule a meeting with the CONTRACTOR to review and discuss any adjustments and revisions to the Baseline Construction Schedule required to make it acceptable to the ENGINEER.

D. After acceptance by the ENGINEER, the Baseline Construction Schedule shall represent the CONTRACTOR’s methods, means, logic, sequencing and durations of the Work and include the CONTRACTOR’s estimated costs and resources for each discrete activity as required to meet the purposes of this Specification section and the other Contract Documents.

1.12 PROGRESS OF THE WORK

A. Once the Baseline Construction Schedule is adopted the CONTRACTOR shall be responsible for preparing and submitting periodic progress update information in the form of a progress report concurrent with the Progress Payment Application cycle established for the contract. At a minimum the progress report and schedule update shall include:

1. Narrative Progress Report
2. Updated Construction Schedule

3. Reports, tables and diagrams as described in Appendix G of this Specification section.

B. On a date determined by the ENGINEER, the CONTRACTOR shall meet with the ENGINEER to review the CONTRACTOR’s Progress Payment Application and its required supporting documents, including its Narrative Progress Report and its Construction Schedule Update.

1. Appendix E of this Specification section outlines the update preparation and review sequence to be used for preparation, submittal and review of the Narrative Progress Report and Construction Schedule update.

2. The CONTRACTOR and the ENGINEER will review the Draft submittal, discuss its content and the ENGINEER will authorize modifications, as appropriate, to facilitate approval of the Payment Application.

3. Following the review meeting, only those revisions authorization by the ENGINEER shall be incorporated into the electronic file entitled “Update” which shall then be submitted as the record schedule for the progress period update.

4. The ENGINEER shall be allowed seven days after the meeting to review and determine the acceptability of the Narrative Progress Report and Construction Schedule update. This variance from the typical submittal review period is made specifically to facilitate timely processing of the CONTRACTOR’s Progress Payment Application.

5. Narrative Progress Report and Construction Schedule updates returned to the CONTRACTOR marked “Revise & Resubmit” or “Not Acceptable” shall constitute a deficient payment application that will not be processed for payment until the schedule report is acceptable to the ENGINEER.

6. Narrative Progress Report and Construction Schedule updates returned to the CONTRACTOR marked “Revise & Resubmit” or “Not Acceptable” shall be resubmitted to the ENGINEER within seven days, at which time a new seven day review period will begin for the ENGINEER.

C. The Narrative Progress Report shall summarize the schedule status and be organized as follows:

1. The CONTRACTOR’s transmittal letter, containing the submittal number.
2. Contents Sheet

3. Identification of the Update including the Data Date, Update Period and the Schedule File Names as defined in Appendix D to this Specification section.

4. Update Summary including the variance between Contract Milestone dates and their predicted completion dates; Contract Completion variance for the reporting period; the number of days ahead or behind schedule; weather days taken and remaining from the Contract allowance and tables summarizing the status of Contract finances and time. At a minimum the CONTRACTOR shall provide the data required by the example in Appendix G of this Specification section.

5. Analysis of Critical Path and each negative Float Path describing the nature of the Critical Path, its impact and the impact of any negative float path on other activities, milestones and completion dates:

6. All current and anticipated time impacts describing the origin of each event; corrective action and schedule adjustments to correct it; recommendations to recover from it and the effect that it may have on other activities, milestones and completion dates.

7. Pending status of outstanding issues such as permits, if any; Contract modifications, RFC’s and or RFP’s containing requests for time adjustment; long-lead procurement items; safety reports and any code violations or warnings.

8. Narrative discussion of contract status including highlights of work by area, progress, completion, impediments, changes to the Work plan, issues and concerns accompanied by OCWD Activities and Schedule Change Tables. At a minimum the CONTRACTOR shall provide the data required in Appendix G of this Specification section.

D. Progress Period Schedule Updates:

1. The CONTRACTOR shall be responsible for preparing and submitting updated schedules, related reports and diagrams, as part of its periodic update Report.

2. The Construction Schedule update shall measure and record only those facts that have occurred to the Work including physical percent complete type, actual start and finish dates, and duration changes. Modifications to logic, durations of activities not started or to actual dates already recorded in previous updates shall not be allowed unless authorized in writing by the ENGINEER. An
electronic file shall be created and entitled “Pure Progress” and included with the update.

3. With each update the CONTRACTOR shall identify any changes to the schedule, such as Field Change Orders, accepted time adjustment requests, new activities, constraint changes, deleted activities, activity duration changes, activity description changes, and changes in logic relationships between activities in a Schedule Change Table as detailed in Appendix G of this Specification section. Logic changes shall be described with an explanation of the rationale for the change provided in the report. Such revisions may be incorporated into an electronic file entitled “Draft Update” for target comparison with the “Pure Progress” update. The CONTRACTOR shall provide printed diagrams of the target comparisons as part of its presentation to the review meeting.

4. All progress period schedule updates shall be compared to the Baseline Construction Schedule. In addition, each current progress period update shall be compared to the previous period update. Each update shall be labeled with the OCWD project number, data date and title abbreviation identified on the hard copy and electronic file as described in Appendix G of this Specification section.

5. The schedule shall be updated with actual start and finish dates for every in-progress or completed activity, as documented by the CONTRACTOR’s Daily Reports and Three Week Look Ahead schedules. No other basis, including automated software calculations or default mechanisms shall be allowed. Failure of the CONTRACTOR to ensure that documented dates as specified herein are incorporated into the schedule update shall constitute cause for disapproval of the update and the inability of the ENGINEER to accurately evaluate the CONTRACTOR’s progress for payment purposes.

6. Activities that have reported progress without predecessor activities being completed such as Finish to Start (FS) Relationships with out of sequence progress will not be allowed except on a case-by-case basis with the written acceptance by the ENGINEER. A written explanation of each such activity shall be included with each update in the Schedule Change Table as detailed in Appendix G of this Specification section. The ENGINEER may direct that changes in schedule logic be made to correct any or all out-of-sequence Work.

7. Change order work shall be identified in the schedule as a new activity inserted into the affected schedule logic. The schedule activity shall only be added after the Change Order is approved for payment by OCWD.
1.13 CONSTRUCTION SCHEDULE REVISION

A. If the CONTRACTOR decides to make major changes to the sequencing and logic of the accepted work plan it shall prepare a schedule reflecting its proposed changes for submittal to, and review by, the ENGINEER separate and apart from the periodic schedule updates.

B. The CONTRACTOR's submittal shall be made in accordance with the requirements of the Contract Documents and the ENGINEER will have a maximum 25 day period for review before scheduling a meeting with the CONTRACTOR.

C. A Revised Schedule that results in a predicted completion date later than the Contract Completion date shall be rejected unless the delay is deemed to be excusable or caused by OCWD or OCSD and a time extension is authorized in writing by the ENGINEER.

D. The ENGINEER will then arrange a meeting with the CONTRACTOR to review the submittal, discuss its content, and authorize modifications required to allow its integration into the Construction Schedule.

1.14 AS-BUILT CONSTRUCTION SCHEDULE

A. As a condition precedent to release of any retention, the CONTRACTOR shall submit its As-Built Construction Schedule. The As-Built Construction Schedule shall reflect the manner in which the contract was actually constructed including start and completion dates, and all activities, sequences, and logic ties.

B. This schedule submission shall be accompanied by a certification, signed by an officer of the CONTRACTOR’s company, the CONTRACTOR's Project Manager and Construction Scheduler, stating “To the best of our knowledge, the accompanying As-Built Construction Schedule accurately reflects the actual start and completion dates and logical relationships of all activities contained herein and represents an accurate depiction of the way in which the contract was constructed.”

1.15 WEEKLY THREE WEEK LOOK AHEAD

A. The CONTRACTOR shall submit an electronic copy of the Three Week Look Ahead schedule to the ENGINEER no later than 48 hours prior to
the weekly construction progress meeting. The Three Week Look Ahead schedule shall be developed maintained and provided using MS Excel® software, shall be in the form shown in Appendix G and include at a minimum actual performance for the previous week compared to the planned work for the previous week, planned work for the current week and planned work for the two weeks following the current week.

B. Each weekly Three Week Look Ahead schedule shall be based on the current Construction Schedule update Four Week Look Ahead Report and fully correlated to the activities planned in its Primavera® counterpart, including submittal reviews, procurement, fabrication and delivery of contract deliverables.

C. The CONTRACTOR shall use the Three Week Look Ahead schedule actual performance record in preparing its Construction Schedule update.

1.16 FLOAT OWNERSHIP AND EARLY COMPLETION

A. Total float, free float, independent float, near-critical float, critical path float, slack time, or contingency within the overall Construction Schedule is not for the exclusive use of either OCWD or the CONTRACTOR but is jointly owned by both and is an expiring resource available to and shared by both as needed to meet Contract Milestones and the Contract Completion date.

B. Pursuant to the float sharing requirements of the Contract, use of float suppression techniques such as preferential sequencing, special lead/lag logic restraints, extended activity times, or imposed dates shall be cause for rejection of the Construction Schedule and any revisions or updates thereto.

C. Within fifteen days of Contract award, the CONTRACTOR shall formally notify OCWD in writing of its intent to finish the Work earlier than the Contract Completion date. Agreement between the ENGINEER and the CONTRACTOR to adopt an early completion Baseline Construction Schedule shall include agreement by both parties to amend the Contract Milestones, completion dates, and associated liquidated damages, by Change Order, to those completion dates contained in the agreed to schedule.

1.17 TIME ADJUSTMENT REQUESTS
A. Requests for time adjustments shall be submitted in the time and manner specified in the Contract Documents, as described herein and further elaborated in Appendix F of this Specification section.

B. OCWD initiated changes that extend or shorten the Contract Duration shall be the sole basis to adjust the Contract Completion date. Delays in the critical path not associated with proper requests for time extensions in accordance with the Contract Documents shall be deemed to be the responsibility of the CONTRACTOR.

1.18 REMEDIAL MEASURES AND RECOVERY SCHEDULE

A. The CONTRACTOR shall mitigate any potential delay to the Work as efficiently and economically as possible regardless of cause. Where practical the CONTRACTOR shall do so without added cost or adverse time impact. Prior to initiating any action for which it expects OCWD to be liable, the CONTRACTOR shall notify the ENGINEER in writing and receive written authorization to proceed.

B. If the CONTRACTOR believes the delay may result in a predicted completion date later than the Contract Completion date, it shall review all uncompleted activities on the critical and near critical paths to assess mitigation options and, within seven days of discovering the potential delay it shall submit a written statement to the ENGINEER describing its plan to recover, including a statement that it has verified the accuracy of all critical and near critical paths. Following acceptance by the ENGINEER the CONTRACTOR shall incorporate its recovery plan into the next schedule update.

C. Whenever it becomes apparent to the ENGINEER that the current schedule update shows a delay to the critical path, that these delays are through no fault of OCWD and hence, the Contract completion date will not be met, or when so directed by the ENGINEER, the CONTRACTOR shall submit to the ENGINEER for review a written statement of the steps it intends to take to remove or arrest the delay to the schedule and the CONTRACTOR shall promptly provide the requisite level of effort to bring the Work back on schedule. The CONTRACTOR shall then incorporate its recovery plan into the next Construction Schedule update.

D. A Recovery Schedule that results in a predicted completion date later than the Contract Completion date shall be rejected unless the
ENGINEER determines that the delay is the responsibility of OCWD, is excusable or that it cannot be mitigated, and authorizes a time extension in writing.

E. The ENGINEER may require the CONTRACTOR to provide reasonable additional resources to recover from any schedule delay, however under no circumstances will the addition of equipment or construction forces, increasing the working hours or any other method, manner, or procedure to recover from delays to the Schedule be considered justification for contract modification for extra Work.

F. The holidays observed by the Owner are as follows:

New Year’s Day
Presidents’ Day
Lincoln’s Birthday (Observed by OCSD only)
Memorial Day
Independence Day
Labor Day
Veteran’s Day
Thanksgiving Day (Thursday and Friday)
Christmas Eve
Christmas Day

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SUPPLEMENTS

A. The supplements listed below are attached to and form a part of this Specification section:

- Appendix A - Definitions
- Appendix B - Work Breakdown and Activity Coding Structure
- Appendix C - Activity ID System
- Appendix D - Electronic File Naming
- Appendix E - Update Preparation Sequence
- Appendix F - Time Adjustment Request
- Appendix G - Contractor Deliverables

End of Section
APPENDIX A TO SECTION 01310
Definitions

A. Baseline Construction Schedule: the CONTRACTOR’s as bid Work plan for the Contract, prepared using the Critical Path Method, which shows all planned activities, costs, resources and durations, as accepted to by the ENGINEER.

B. Cash Flow: The CONTRACTOR’s estimate of time-phased construction gross billings, before retention, generated from its scheduled cost-loaded activities.

C. Construction Schedule: the CONTRACTOR’s accepted Baseline Construction Schedule, as it evolves through periodic updates that record actual progress of the Work to completion when it shall show the “as-built” record of the CONTRACTOR’s Work plan as executed.

D. Contemporaneous Period Analysis: a methodology, used in conjunction with a CPM schedule, to model the effects of a time impact event in near real time for a ‘forward-looking’ estimate of contract completion. Also referred to as Time Impact Analysis by the AACE.

E. Contract Completion: the final completion milestone date established by adding the duration in calendar days stipulated in the Contract agreement to the Notice to Proceed date, and as amended via change orders.

F. Contract Duration: the performance period provided for in the contract.

G. Contract Milestone: significant performance points in the Work, as provided for in the Contract.

H. Cost-Loaded Schedule: the CONTRACTOR’s allocation of bid estimate costs to each schedule activity which forms the basis for anticipated CONTRACTOR gross billings before retention is withheld.

I. Critical Path: a continuous sequence of schedule network activities with the least amount of total float ending at a Contract Milestone.

J. Critical Path Method (CPM): schedule development that starts with a proper plan sequenced from beginning to end, followed by time driven forward and backward passes to establish the Critical Path and the Float for all other paths.

K. Early Finish: the earliest a schedule activity is expected to finish, based on its relationship (logic) to other activities in the contract.

L. Early Start: the earliest a schedule activity is expected to start, based on its relationship (logic) to other activities in the contract.

M. Float: the flexibility that an activity has against the critical path.

N. Fragnet: a fragment of the schedule network that typically illustrates a particular sequence for thorough analysis.

O. Free Float: the amount of time the start of an activity can be delayed without delaying the start of a successor activity.

P. Independent Float: the amount of time that an activity may be delayed without affecting the early start or early finish of any succeeding activities.

Q. Interim Construction Schedule: the CONTRACTOR’s as bid Work plan for that portion of the Contract that precedes adoption of the Baseline Construction Schedule prepared using the Critical Path Method and showing in detail all planned activities, logic, sequencing, costs, resources and durations planned for the interim period cited in this Specification section. It shall also include cost and resource...
loading to a summary level for the balance of all Contract Work through the Final Completion milestone as forecast by the CONTRACTOR.

R. Late Finish: the latest a schedule activity can finish, based on its relationship (logic) to other activities on the contract, and still permit the contract to be completed on time.

S. Late Start: the latest a schedule activity can start, based on its relationship (logic) to other activities on the contract, and still permit the contract to be completed on time.

T. Longest Critical Path: a continuous sequence of schedule network activities that begins with the notice to proceed milestone and ends at the contract completion milestone.

U. Milestone: a significant schedule event identified in the Contract as a “milestone”.

V. Narrative Progress Report: a written report that summarizes the status of the Contract and narrates in detail progress of the Work during the report period, anticipated for the next reporting period and the outlook for completion of the Contract.

W. Near-Critical Float: is typically defined as float values within a set range just above the critical path float.

X. Original Duration: the amount of time, in calendar days, an activity is expected to take to complete at the beginning of a contract.

Y. Planned Completion: the construction completion milestone date established by the agreed to baseline construction schedule.

Z. Pre-Construction Scheduling Conference: the first meeting between the ENGINEER and the CONTRACTOR to review the requirements of this and related Specification sections, the CONTRACTOR’s proposed methodologies for its work breakdown structure, activity coding, identification, sequencing, cost, resource and quantity loading.

AA. Predicted Completion: a variable date predicted for completion of the Work in each periodic progress update.

BB. Primavera® Project Management, latest version: the latest version of Primavera® scheduling software currently in use by OCWD.

CC. Progress Period: the 28 day progress payment period established by the ENGINEER for the contract.

DD. Project Float: the amount of time between the CONTRACTOR’s planned early completion date and the contract completion date.

EE. Recovery Schedule: the CONTRACTOR’s plan to mitigate its predicted delay to the Contract completion date and conclude the Work as Contracted.

FF. Resource-loaded Schedule: the CONTRACTOR’s allocation of all labor and equipment necessary to complete the Work for each activity as entered into the schedule software database.

GG. Total Float: the amount of time that the actual start and finish of an activity can be delayed along a given network path without delaying the contract completion date.

HH. Work Activity: an activity that requires time and resources to complete and must be performed before the Contract is considered complete.
APPENDIX B TO SECTION 01310

Work Breakdown Structure

The CONTRACTOR shall code the Work Breakdown Structure (WBS) Code Value with the OCWD Contract Number and the WBS Name with the OCWD Project Title at the EPS Root level (Level 1) to facilitate integration into the OCWD database. The Activity Coding Structure shall be used to organize all subordinate levels of the Work.

OCWD Contract No: **GWRS-2017-01**

OCWD Project Title: **Final Expansion of the Groundwater Replenishment System Project**

Activity Coding

At a minimum, the CONTRACTOR shall assign codes to each activity in the Construction Schedule, using the activity code names, values and corresponding descriptions outlined in the Activity Codes Dictionary below to give OCWD the ability to sort and select schedule information based on the following categories:

1. Type of Work: Construction and non-construction
2. Performance Responsibility: General and Subcontractors
3. CSI Division:
4. Milestone:
5. Tie-In
6. Location

**ACTIVITY CODES DICTIONARY**

<table>
<thead>
<tr>
<th>Code Name</th>
<th>Length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>1-6</td>
<td>TYPE OF WORK</td>
</tr>
<tr>
<td>CONT</td>
<td>4</td>
<td>CONSTRUCTOR / SUB-CONSTRUCTOR</td>
</tr>
<tr>
<td>CSI</td>
<td>4</td>
<td>CSI DIVISION</td>
</tr>
<tr>
<td>MS</td>
<td>4</td>
<td>MILESTONE</td>
</tr>
<tr>
<td>TIE</td>
<td>4</td>
<td>SHUTDOWN / TIE-IN</td>
</tr>
<tr>
<td>LOC</td>
<td>4</td>
<td>WORK LOCATION</td>
</tr>
</tbody>
</table>
### Code Name: TYPE
Description: Type of Work
Field Length: 6

At a minimum, the CONTRACTOR shall assign a Code Value to each activity corresponding to one of the following Code Descriptions:

[TO BE PROVIDED]

### Code Name: CONT
Description: CONTRACTOR / Subcontractor
Field Length: 4

At a minimum, the CONTRACTOR shall assign a unique code for each Subcontractor. Following are examples of code values and descriptions to illustrate the expected level of detail.

Examples:

<table>
<thead>
<tr>
<th>Code Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC</td>
<td>Electrical Subcontractor</td>
</tr>
<tr>
<td>GENL</td>
<td>General Contractor</td>
</tr>
<tr>
<td>MECH</td>
<td>Mechanical Subcontractor</td>
</tr>
</tbody>
</table>

### Code Name: CSI
Description: CSI Division
Field Length: 4

At a minimum, the CONTRACTOR shall assign one of the following values that best describe the division for the Work involved to complete the activity.

<table>
<thead>
<tr>
<th>Code Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0100</td>
<td>General Requirements</td>
</tr>
<tr>
<td>0200</td>
<td>Sitework</td>
</tr>
<tr>
<td>0300</td>
<td>Concrete</td>
</tr>
<tr>
<td>0400</td>
<td>Masonry</td>
</tr>
<tr>
<td>0500</td>
<td>Metals</td>
</tr>
<tr>
<td>0600</td>
<td>Wood and Plastics</td>
</tr>
<tr>
<td>0700</td>
<td>Thermal and Moisture Protection</td>
</tr>
<tr>
<td>0800</td>
<td>Doors and Windows</td>
</tr>
<tr>
<td>0900</td>
<td>Finishes</td>
</tr>
<tr>
<td>1000</td>
<td>Specialties</td>
</tr>
</tbody>
</table>
At a minimum, the CONTRACTOR shall assign a unique code for each Milestone required by the Contract Documents.

<table>
<thead>
<tr>
<th>Code Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>_________</td>
<td>Project Award</td>
</tr>
<tr>
<td>_________</td>
<td>Notice to Proceed</td>
</tr>
<tr>
<td>_________</td>
<td>Mobilization</td>
</tr>
<tr>
<td>_________</td>
<td>Construction Trailers Completion</td>
</tr>
<tr>
<td>_________</td>
<td>Process Control System Completion</td>
</tr>
<tr>
<td>_________</td>
<td><strong>42-inch Microfiltration Backwash Completion</strong></td>
</tr>
<tr>
<td>_________</td>
<td>Secondary Effluent Flow Equalization Facilities Completion</td>
</tr>
<tr>
<td>_________</td>
<td>Beneficial Occupancy</td>
</tr>
<tr>
<td>_________</td>
<td>Substantial Completion as Established in Bid Form</td>
</tr>
<tr>
<td>_________</td>
<td>Final Completion as Established in Bid Form</td>
</tr>
<tr>
<td>_________</td>
<td>Permit Constraints</td>
</tr>
<tr>
<td>_________</td>
<td>Facility shutdown or outage milestone requirements</td>
</tr>
</tbody>
</table>

**Code Name**  **TIE**
**Description:** Shutdown / Tie-In
**Field Length:** 4
At a minimum, the CONTRACTOR shall assign a unique code for each Shutdown or Tie-In required to complete the Work.

<table>
<thead>
<tr>
<th>Code Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outages A through S identified individually per Section 01140</td>
</tr>
</tbody>
</table>

**Code Name LOC**

Description: Location

Field Length: 4

At a minimum, the CONTRACTOR shall assign a unique code for each significant area of the Work required by the Contract Documents.

<table>
<thead>
<tr>
<th>Code Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area 100 - Yard Piping</td>
</tr>
<tr>
<td></td>
<td>Area 200 - Microfiltration</td>
</tr>
<tr>
<td></td>
<td>Area 300 – Green Acres Plant</td>
</tr>
<tr>
<td></td>
<td>Area 400 – Bulk Chemical Storage / Cartridge Filter Facility</td>
</tr>
<tr>
<td></td>
<td>Area 500 – RO Building</td>
</tr>
<tr>
<td></td>
<td>Area 600 – UV Facility</td>
</tr>
<tr>
<td></td>
<td>Area 700 – Decarbonation / Post Treatment</td>
</tr>
<tr>
<td></td>
<td>Area 800 – Product and Barrier Pump Station</td>
</tr>
<tr>
<td></td>
<td>Area 900 – Substation and Switchgear Building</td>
</tr>
<tr>
<td></td>
<td>Area 144 – Secondary Effluent Flow Equalization</td>
</tr>
</tbody>
</table>
APPENDIX C TO SECTION 01310
Activity ID System

The CONTRACTOR shall assign a unique identification number to each activity in the schedule to facilitate ease of reference and integration into the OCWD database. The CONTRACTOR shall prepare an Activity Identification Dictionary to provide a common key to the structure it employs following the examples provided below.

EXAMPLE ACTIVITY ID STRUCTURE

The 7th, 8th and 9th digits provide a unique designator
The 5th and 6th digit describes location / type detail
The 3rd and 4th digit refers to work type
The 1st and 2nd digit refers to primary work locations

The combination of symbols creates a unique reference ID that allows the same symbol to be used in more than one application.

EXAMPLE ACTIVITY IDENTIFICATION DICTIONARY
Scheduler shall coordinate with OCWD for more concise dictionary

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS</td>
<td>Product / Barrier Pump Station</td>
<td>HV</td>
<td>HVAC</td>
</tr>
<tr>
<td>DP</td>
<td>Decarbonation / Post Treatment</td>
<td>JB</td>
<td>Junction Box</td>
</tr>
<tr>
<td>AD</td>
<td>Administration</td>
<td>MC</td>
<td>Mechanical</td>
</tr>
<tr>
<td>AR</td>
<td>Architectural</td>
<td>ME</td>
<td>Mechanical Equipment</td>
</tr>
<tr>
<td>GA</td>
<td>Green Acres Plant</td>
<td>MP</td>
<td>Mechanical Piping</td>
</tr>
<tr>
<td>MF</td>
<td>Microfiltration Facility</td>
<td>MS</td>
<td>Milestones</td>
</tr>
<tr>
<td>SU</td>
<td>Substation / Switchgear Building</td>
<td>PE</td>
<td>Primary Effluent</td>
</tr>
<tr>
<td>BW</td>
<td>Baffle Walls / Basement Walls</td>
<td>RC</td>
<td>RAS Chlorination</td>
</tr>
<tr>
<td>CB</td>
<td>Catch Basin</td>
<td>RO</td>
<td>RO Building</td>
</tr>
<tr>
<td>CD</td>
<td>Conduits</td>
<td>RW</td>
<td>Retaining Walls / Raw Water</td>
</tr>
<tr>
<td>CS</td>
<td>Bulk Chemical Storage / Cartridge</td>
<td>SB</td>
<td>CONTRACTOR Submittal</td>
</tr>
<tr>
<td>UV</td>
<td>UV Facility</td>
<td>SP</td>
<td>Site Prep</td>
</tr>
<tr>
<td>CM</td>
<td>Commissioning</td>
<td>ST</td>
<td>Structure</td>
</tr>
<tr>
<td>DB</td>
<td>Duct Bank / Diversion Box</td>
<td>SX</td>
<td>Site Excavation</td>
</tr>
<tr>
<td>DL</td>
<td>Drain Line</td>
<td>TI</td>
<td>Tie-In</td>
</tr>
<tr>
<td>DR</td>
<td>Demo / Removal</td>
<td>TL</td>
<td>Trunk Line</td>
</tr>
<tr>
<td>EL</td>
<td>Electrical</td>
<td>TN</td>
<td>Tunnel</td>
</tr>
<tr>
<td>FN</td>
<td>Foundation</td>
<td>XX</td>
<td>No further description</td>
</tr>
<tr>
<td>FD</td>
<td>Fabricate &amp; Deliver</td>
<td>YP</td>
<td>Yard Piping</td>
</tr>
<tr>
<td>SP</td>
<td>SEFE Pump Station</td>
<td>ST</td>
<td>SEFE Tanks</td>
</tr>
</tbody>
</table>
APPENDIX D TO SECTION 01310
Electronic File Naming

ELECTRONIC FILE NAMING

The CONTRACTOR shall assign a unique identification number to each electronic file submittal that will be compatible with the OCWD database. Each file shall be labeled with the OCWD project number, data date, submittal type abbreviation and file name as described below:

EXAMPLE FILE ID STRUCTURE (Primavera®)

The file name shall be structured to reflect the file content in words as exemplified by the following illustration:

Project ID   Project Name
P1-000 100608 F 00  June 08, 2010 Update - FINAL Rev 00.xer

EXAMPLE FILE NAMING STRUCTURE

Non-Primavera® native files that comprise the balance of the submittal shall be named to reflect the file content in words as exemplified by the following illustrations:

June 08, 2010 Progress Update Narrative Report - FINAL Rev 00.docx

June 08, 2010 Progress Update Tables - FINAL Rev 00.xlsx (all MS Excel® report attachments shall be submitted in one workbook).
APPENDIX E TO SECTION 01310
Construction Schedule Update Preparation and Review

STEP 1 - INFORMAL UPDATE SUBMITTAL:
A. Electronic files:
   1. Unimpeded pure progress update of all work actually occurred during the update period saved in an electronic file entitled “Pure Progress”;  
   2. Continuation of the update to include each proposed revision saved in an electronic file entitled “Draft Update”.
B. Printed Informal Update Submittal Report:
   1. Narrative Report including a Schedule Change Table describing each revision that actually took place during the update period, and each proposed revision for discussion and acceptance of by the ENGINEER. This shall also include the following:
      • Target Analysis Schedules comparing the Pure Progress file to the previous months authorized update file and comparing the Draft Update file to the Pure Progress Update file.

STEP 2 - REVIEW MEETING:
A. Review and comment on CONTRACTOR’s periodic payment application  
B. Review and comment on CONTRACTOR’s update to critical path schedule  
C. Review and comment on CONTRACTOR’s actual and proposed schedule revisions  
D. Identify problems that could impede planned progress, and assign action items along with responsible parties  
E. Develop corrective measures and procedures to regain planned schedule.

STEP 3 - CONTRACTOR REVISION:
A. Revise the Narrative Report and Construction Schedule update as agreed at the meeting including the Schedule Change Table.

STEP 4 - FINAL UPDATE SUBMITTAL:
A. Revised electronic file incorporating only those comments agreed to by the ENGINEER, saved in an electronic file entitled “Update”;  
B. Revised Narrative Report, Tables and Construction Schedule for validation of conformance with the ENGINEER’s meeting comments.
EXAMPLE CALENDAR - UPDATE PREPARATION AND REVIEW SEQUENCE:

The following example calendar illustrates the sequence of tasks required for the CONTRACTOR and ENGINEER to prepare, discuss and complete a review of the Narrative Progress Report and Construction Schedule update and facilitate a timely determination to support the payment application.

![Example Calendar Image]

<table>
<thead>
<tr>
<th>Action</th>
<th>Day Dur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Date (Up to 2 Weeks Prior to Due Date)</td>
<td>0</td>
</tr>
<tr>
<td>Informal Review Submittal</td>
<td>7</td>
</tr>
<tr>
<td>Meeting - OCSD &amp; Contractor</td>
<td>0</td>
</tr>
<tr>
<td>Contractor - Update Preparation</td>
<td>7</td>
</tr>
<tr>
<td>Contractor - Revise &amp; Correct Submittal</td>
<td>4</td>
</tr>
<tr>
<td>OCSD Informal Review - Schedule</td>
<td>2</td>
</tr>
<tr>
<td>OCSD Analysis &amp; Report Preparation - Schedule</td>
<td>7</td>
</tr>
<tr>
<td>OCSD Verify Revisions - Schedule</td>
<td>3</td>
</tr>
<tr>
<td>OCSD Informal Review - Payment Application</td>
<td>2</td>
</tr>
<tr>
<td>OCSD Verify Revisions - Payment Application</td>
<td>3</td>
</tr>
<tr>
<td>OCSD Complete &amp; Forward - Payment Application</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX F TO SECTION 01310
Time Adjustment Request

APPROACH

It shall be the CONTRACTOR’s sole responsibility to make a full, complete and comprehensive case for each time adjustment request. As part of its request the CONTRACTOR shall demonstrate that no concurrent cause would have equally impacted the Work regardless of OCWD action. The following outline provides an overview of requirements which the CONTRACTOR shall confirm with its own review of Contract Documents.

PREPARATION OF INDIVIDUAL TIME ADJUSTMENT REQUEST

Requests for time adjustments shall be submitted in the time and manner specified in the Contract Documents which require the CONTRACTOR to file a written request for time extension within 15 days “from the beginning of the delay” that includes, at a minimum:

1. A written Time Impact Analysis (TIA)

2. A Fragnet (fragmentary network) showing how the CONTRACTOR proposes to incorporate the change or delay into the current construction schedule.

3. The Contract Documents require the CONTRACTOR’s request for time extension to accompany either a:
   A. Request for Change (RFC) if initiated by the CONTRACTOR
   B. Request for Proposal (RFP) if initiated by OCWD

4. The CONTRACTOR is obligated to promptly request each time extension to inform the ENGINEER that the CONTRACTOR believes a discrete time impact affecting a milestone or contract completion date has been encountered, what steps the CONTRACTOR believes must be taken to mitigate it, and engage the ENGINEER in collaborative mitigation efforts as close in “real time” as possible.

5. The schedule in place at the start or occurrence of the impact event is to be used for analysis of all impacts encountered during the period in which the impact event occurs. For example, if an impact is encountered in April 2020, the schedule to be analyzed is the authorized March 2020 periodic update.

6. The CONTRACTOR shall describe its proposed mitigation plan in a written TIA accompanied by a Fragnet that illustrates the sequence of activities required to accomplish the plan in sufficient detail for the ENGINEER to fully understand the scope and magnitude of impact. The Fragnet shall also illustrate how the mitigation activities impact the critical path by including logic tie(s) to its immediate existing predecessor(s) and logic tie(s) to its immediate existing successor(s).

7. The CONTRACTOR is reminded that notice of potential delay shall be deemed insufficient to meet the requirements of the Contract and that reservation of rights to submit a future request may not be made at the sole discretion of the CONTRACTOR and shall be subject to ENGINEER’s written authorization.
FRAGNET EXAMPLE

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Name</th>
<th>Dur</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA.BB.CC.012</td>
<td>Predecessor</td>
<td>4D</td>
</tr>
<tr>
<td>AA.BB.CC.013.A</td>
<td>New Activity # 1</td>
<td>3D</td>
</tr>
<tr>
<td>AA.BB.CC.013.B</td>
<td>New Activity # 2</td>
<td>2D</td>
</tr>
<tr>
<td>AA.BB.CC.013.C</td>
<td>New Activity # 3</td>
<td>3D</td>
</tr>
<tr>
<td>AB.BB.CC.002</td>
<td>Successor # 1</td>
<td>5D</td>
</tr>
<tr>
<td>BA.BB.CD.008</td>
<td>Successor # 2</td>
<td>5D</td>
</tr>
</tbody>
</table>

TIA EVALUATION

OCWD utilizes contemporaneous period analysis for time impact evaluations as the method least susceptible to analyst manipulation, thus the most equitable to all parties. This methodology is reliant on timely submittal to ensure its integrity. The CONTRACTOR’s failure to make its submittal in the time and manner required by the Contract may impede effective and equitable evaluation of its assertion of time impact. Consequently, OCWD may be compelled to perform a forensic reconstruction of the event, including subjective speculation and assumptions, to more definitively assess the request.

The CONTRACTOR may find it expedient to prepare the TIA schedule (a parallel schedule) in conjunction with the Construction Schedule update. However, the CONTRACTOR shall submit it separately following the normal processes described in the Contract Documents. The review and status recommendation of the Construction Schedule update, in accordance with its accelerated seven-day review window, will take precedence over review and discussion of the TIA submittal.

OCWD will use the checklist provided in this section to initiate review of the CONTRACTOR’s request and confirm its compliance with Contract requirements before proceeding with a technical review. Should the CONTRACTOR’s request fail to meet Contract requirements the checklist will be returned to the CONTRACTOR with deficiencies noted and a request that the CONTRACTOR comply with the Contract in preparing its TIA.
**RFC/RFP:** REVIEW CHECKLIST

**IMPACT EVENT:** Description

<table>
<thead>
<tr>
<th>CONTRACT REQUIREMENT</th>
<th>YES</th>
<th>NO</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Request:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• RFC:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• RFP:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Impact Event:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Start:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• End:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Request Provided Within 15 days:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Discovery Date:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Date TIA Submitted:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation Basis:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Actual - use all available actual information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Anticipated - estimate if actuals are unavailable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Written TIA Demonstrating:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The events of the delay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Status of construction at discovery of event</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Event time computation of all activities affected by the change or delay.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fragnet:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Sequence of activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Logic tie(s) to existing predecessor(s)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Logic tie(s) to existing successor(s)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Status of construction at discovery of event</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Event time computation of all activities affected by the change or delay.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schedule Update:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Current at the time the change or delay is encountered DD:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• <strong>Actual</strong> performance of the Work extends:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Beyond current contract completion date</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Beyond current predicted completion date</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

_In accordance with the Contract a written request for extension of time or the granting of an extension of time shall not, in itself, constitute a basis for any claim against OCWD for additional compensation._
APPENDIX G TO SECTION 01310
Contractor Deliverables

1.1 SUBMITTAL REQUIREMENTS

A. The CONTRACTOR shall submit the items required by Specification section 01310 in accordance with this Appendix and the other Contract Documents unless noted otherwise herein.

B. Following Notice to Proceed (NTP) the CONTRACTOR shall submit the following items within the stipulated timeframes:
   1. CONTRACTOR’s Construction Scheduler Qualifications, within seven days following NTP
   2. CPM Construction Schedule methodology, within ten days following NTP
   3. Work Breakdown Structure (WBS) Code, Activity Coding and ID system plans within ten days following NTP
   4. Interim Construction Schedule, within 30 days following NTP
   5. Commence submittal of the first three week look ahead schedule, within 30 days following NTP
   6. Commence submittal of initial Daily Reports, dated from the start of onsite Work, within 30 days following NTP
   7. Narrative Report supported by the Cost-loaded and Resource-loaded Baseline Construction Schedule, including supporting documents, within 90 days following NTP.

C. The CONTRACTOR’s Interim Construction Schedule shall be prepared, maintained and submitted in accordance with this Specification section and the other Contract Documents. It shall be submitted in both electronic and physical forms.

D. The CONTRACTOR’s Baseline Construction Schedule and reports shall be prepared, maintained and submitted in accordance with this Specification section and the other Contract Documents. It shall be submitted in both electronic and physical forms.

E. The CONTRACTOR’s Construction Schedule Update and reports shall be prepared, maintained and submitted in accordance with this Specification section and the other Contract Documents. It shall be submitted in conjunction with the CONTRACTOR’s Progress Period Payment Application and shall be in both electronic and physical forms.

F. The CONTRACTOR’s As-Built Construction Schedule shall be prepared, maintained and submitted in accordance with this Specification section and the other Contract Documents. It shall be submitted in both electronic and physical forms.

G. The CONTRACTOR’s Three Week Look Ahead Schedule shall be prepared, maintained and submitted in accordance with this Specification section and the other
Contract Documents no later than 48 hours before each weekly construction progress meeting. It shall be submitted in electronic form via e-mail or CD at the option of the ENGINEER.

1.2 REQUIRED REPORT SUBMITTAL CYCLES AND COMPONENTS

A. The CONTRACTOR shall include the following reports and report components with its submittals in the time, quantities and manner described in the following table and the other Contract Documents unless noted otherwise herein.

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Format</th>
<th>Initial Interim &amp; Baseline</th>
<th>Progress Reports</th>
<th>3 Week Look Ahead</th>
<th>Daily Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submittal Cycle</td>
<td>--</td>
<td>Per Contract</td>
<td>28 Days</td>
<td>28 Days</td>
<td>Once</td>
</tr>
<tr>
<td>Electronic Files of Submittal Elements</td>
<td>CD</td>
<td>2 CD</td>
<td>2 CD</td>
<td>2 CD</td>
<td>2 CD</td>
</tr>
<tr>
<td>Printed Report Components:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Written Narrative Report</td>
<td>8.5 x 11</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
</tr>
<tr>
<td>• OCWD Activities Report</td>
<td>8.5 x 11</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
</tr>
<tr>
<td>• Schedule Change Table</td>
<td>11 x 17</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
</tr>
<tr>
<td>• Cost Summary</td>
<td>11 x 17</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
</tr>
<tr>
<td>• Critical Path Schedule</td>
<td>11 x 17</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
</tr>
<tr>
<td>• Four Week Look Ahead Schedule</td>
<td>11 x 17</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
</tr>
<tr>
<td>• CPM Schedule</td>
<td>11 x 17</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
<td>4 ea</td>
</tr>
<tr>
<td>Required Supplements:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• [Price Breakdown]</td>
<td>11 x 17</td>
<td>4 ea</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>• Schedule of Submittals</td>
<td>11 x 17</td>
<td>4 ea</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>• CPM Schedule Plot</td>
<td>30 x 42</td>
<td>1 ea</td>
<td>--</td>
<td>--</td>
<td>1 ea</td>
</tr>
<tr>
<td>• CPM Logic Diagram Plot</td>
<td>30 x 42</td>
<td>1 ea</td>
<td>--</td>
<td>--</td>
<td>1 ea</td>
</tr>
</tbody>
</table>

1.3 REPORT COMPONENTS

A. The CONTRACTOR shall provide electronic files for all components of each submittal required by this Specification section. The files shall include all templates used by the CONTRACTOR with screen shots of each for reference. The CONTRACTOR shall name and label its electronic files in accordance with the file naming convention appended to this Specification section.

B. The CONTRACTOR shall provide printed and bound reports in the quantities and format described in this Specification section and the other Contract Documents. The reports shall be prepared using Ariel font no smaller than 10 points, be divided by component section tabs and be bound in new three ring binders. 11” x 17” pages shall be tri-folded to match the 8.5” x 11” pages.

C. At a minimum, report components shall be comprised of and contain the following:
1. Narrative Report with content as described in this Specification section and as illustrated by Plate 1;

2. OCWD Activities Report, shall be generated by the CONTRACTOR from the scheduling software to list each remaining activity on the CPM Schedule which requires OCWD action such as power supplied equipment, plant shutdowns, permits, inspections, approvals, start-ups, training activities, etc., as illustrated by Plate 4;

3. Schedule Change Table, shall be prepared by the CONTRACTOR in an MS Excel® spreadsheet to describe each Schedule activity that has been added or deleted or had a change in planned sequence, duration, logic and/or relationship(s) during the reporting period as illustrated by Plate 2;

4. Cost Summary, shall be generated by the CONTRACTOR from the scheduling software to support each progress payment application to the requisition level of detail. The cost information shall be updated by activity and summarized for each monthly pay application and the sum of all pay applications shall be shown as costs to date, along with the remaining contract balance. The sum of all monthly costs shall be equal to the Contract Price plus approved Change Orders;

5. Cost Curve, shall be generated by the CONTRACTOR from the scheduling software to show cash flow projections by month and include actual partial payment amounts and cumulative total;

6. Critical Path Schedule shall be a Gantt chart generated by the CONTRACTOR from the scheduling software, sorted by start date and show Logic Ties;

7. Four Week Look-Ahead Schedule, shall be a Gantt Chart generated by the CONTRACTOR from the scheduling software, in WBS form sorted by Start Date (SD) and showing all Work planned by the CONTRACTOR for the next progress reporting period;

8. CPM Schedule shall be a Gantt chart generated by the CONTRACTOR from the scheduling software, in WBS form sorted by Start Date (SD). At a minimum the activity table shall include activity ID number, activity description, original durations, start date, finish date, total float and activity constraints.

D. Required Supplemental Submittals:

1. Price Breakdown shall be prepared and submitted by the CONTRACTOR as provided for in the Contract Documents.

2. Schedule of Submittals shall be prepared and submitted by the CONTRACTOR as provided for in the Contract Documents.

3. Three Week Look Ahead shall be prepared and submitted by the CONTRACTOR in an MS Excel® spreadsheet as provided for in this Specification section and the other Contract Documents and shall, at a minimum, provide the data illustrated in Plate 3;

4. CONTRACTOR Daily Reports shall be prepared and submitted by the CONTRACTOR as provided for in the Contract Documents;
5. CPM Schedule Plot shall be a Gantt chart generated by the CONTRACTOR from the scheduling software, in WBS form sorted by Start Date (SD). At a minimum the activity table shall include activity ID number, activity description, original durations, start date, finish date, total float and activity constraints. The CONTRACTOR shall submit a plot of the schedule on 30” x 42” sheets of the Baseline, at 25%, 50%, 75% completion and of the As-Built submittal, and as directed by the ENGINEER for any major re-sequencing, logic revision, re-baseline and/or integration of the commissioning plan.

6. CPM Logic Diagram Plot shall be a Precedence Diagram generated by the CONTRACTOR from the scheduling software, using the Activity Network icon. At a minimum the activity table shall include the Activity ID, Activity Name, Start Date and Finish Date. The CONTRACTOR shall submit a plot of the diagram on 30” x 42” sheets of the Baseline, at 25%, 50%, 75% completion and of the As-Built submittal, and as directed by the ENGINEER for any major re-sequencing, logic revision, re-baseline and/or integration of the commissioning plan.

1.4 EXAMPLE PLATES

A. At its option, the CONTRACTOR shall use its own forms or the templates available from OCWD to report, at a minimum, the required data illustrated in the following example plates:

Plate 1 - Example Narrative Report
Plate 2 - Schedule Change Table
Plate 3 - Three Week Look-Ahead
Plate 4 - OCWD Activities Report
1. **GENERAL.**

1.01. **Units of Measurement.** When both inch-pound (English) and SI (metric) units of measurement are specified herein, the values expressed in inch-pound units shall govern.

2. **SCHEDULE OF VALUES.** After review of the preliminary schedule at the preconstruction conference, and before submission of the first Application for Payment, Contractor shall prepare and submit to Engineer a Schedule of Values covering each lump sum item. The Schedule of Values, showing the value of each kind of work, shall be acceptable to Engineer before any Application for Payment is prepared.

The sum of the items listed in the Schedule of Values shall equal the Contract Price. Such items as Bond premium, temporary construction facilities, and plant may be listed separately in the Schedule of Values, provided the amounts can be substantiated. Overhead and profit shall not be listed as separate items.

The Schedule of Values shall have sufficient detail such that partial completion of separable items of work can easily be calculated. The Schedule of Values shall have separate lines for manufacturer's field services, O&M manuals, and performance testing for each item of equipment requiring such services. Payment for submittals (other than O&M Manuals) will not be approved.

An unbalanced Schedule of Values providing for overpayment of Contractor on items of Work which would be performed first will not be accepted. The Schedule of Values shall be revised and resubmitted until acceptable to Engineer. Final acceptance by Engineer shall indicate only consent to the Schedule of Values as a basis for preparation of applications for progress payments, and shall not constitute an agreement as to the value of each indicated item.

3. **SCHEDULE OF PAYMENTS.** Within 30 days after award of contract, Contractor shall furnish to Engineer a schedule of estimated monthly payments. The schedule shall be revised and resubmitted each time an Application for Payment varies more than 10 percent from the estimated payment schedule.
4. **SURVEY DATA.** All field books, notes, and other data developed by Contractor in performing surveys required as part of the Work shall be available to Engineer for examination throughout the construction period. All such data shall be submitted to Engineer with the other documentation required for final acceptance of the Work.

5. **LAYOUT DATA.** Contractor shall keep neat and legible notes of measurements and calculations made in connection with the layout of the Work. Copies of such data shall be furnished to the Resident Project Representative for use in checking Contractor's layout as provided in the project requirements section. All such data considered of value to Owner will be transmitted to Owner by Engineer with other records upon completion of the Work.

End of Section
1. GENERAL. Should the Contractor discover conflicts, omissions, or errors in the contract documents, or have any questions concerning interpretation or clarification of the contract documents, or if it appears to the Contractor that work to be done or any matter relative thereto are not sufficiently detailed or explained in the contract documents, then, before proceeding with the work affected, the Contractor shall immediately notify the Engineer in writing and request interpretation, clarification, or additional detailed instructions concerning the work. In addition to the requirements set forth in the General and Special Provisions, this section details additional procedural requirements for Requests for Information (RFI) and Clarifications.

The Contractor shall be responsible for its costs to implement and administer RFI’s throughout the Contract duration. Regardless of the number of RFI’s submitted, Contractor will not be entitled to additional compensation.

A RFI is not to be used for request for materials/equipment substitutions or value engineering/cost reduction incentive proposals.

2. RFI PROCEDURES.

2-1. Contractor Review and Submittal.

A. Contractor’s review

Before submitting each RFI, the Contractor shall carefully review the following for relevant information:

1. All field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto

2. All materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work

3. All information relative to means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto
4. The coordination of each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents

5. The Contract Documents

6. The Project correspondence and documentation

B. Submittal requests

The Contractor shall submit all requests for clarification and/or additional information in writing through the Engineer. Contractor shall provide a detailed written statement that indicates the specific Drawings or Specifications in need of clarification and the nature of the clarification requested.

Contractor shall upload RFI electronically on project website and inform Engineer. Each RFI shall be dated and bear a signed certification that Contractor has performed the review defined above. No consideration for review by Engineer of any RFI will be made for any item which has not been certified by the Contractor. All non-certified RFI’s will be returned to Contractor without action taken by Engineer, and any delays caused thereby shall be the total responsibility of Contractor.

Each RFI shall be limited to one subject.

2-2 RFI Numbering System.

The Engineer will assign blocks of numbers for the Contractor, Engineer, Owner's Representative, and for substitutions. The Contractor will use the block of numbers consecutively with the date of issue, except for re-issuance of a respective RFI in which the subscript A, B, C, etc., will be added until the RFI is resolved. If Contractor believes the RFI reviewer’s response is incomplete, Contractor shall issue another RFI (with the same RFI number with the letter "A" indicating if it is a follow-up RFI) to Engineer clarifying original RFI. Additionally, Engineer may return RFI requesting additional information should original RFI be inadequate in describing condition.

End of Section
PART 1 – GENERAL

1-1. SCOPE. This section covers the environmental controls required during execution of the work. Further environmental controls are available in the Project’s Environmental Impact Report (EIR), available for review at the District.

1-2. SITE MAINTENANCE.

The Contractor shall keep the work site, staging areas, and Contractor’s facilities clean and free from rubbish and debris and shall comply in accordance with the General and Special Provisions. In addition, the contractor shall be responsible for the following activities:

A. Clean-up

1. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, the Contractor and subcontractors shall comply with all applicable Federal, State and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and elsewhere in the Specifications.

2. The Contractor shall keep all buildings occupied by the Contractor clear of all refuse, rubbish and debris that may accumulate from any source and shall keep them in a neat condition to the satisfaction of the Engineer.

3. In the event that waste material, refuse, debris and/or rubbish are not so removed from the work by the Contractor, the Owner reserves the right to have the waste material, refuse, debris and/or rubbish removed and the expense of the removal and disposal charged to the Contractor.

4. Paints, solvents, and other construction materials shall be handled with care to prevent entry of contaminants into storm drains, surface waters, or soils.

5. Contractor shall maintain all interiors of buildings and structures in broom sweep clean condition at all times during construction of buildings and structures. Upon enclosing the
buildings or structures and installation of process equipment, interior finishes, or fixtures, the Contractor shall maintain the building or structure in mop or vacuum-clean condition.

B. Street cleaning

1. The Contractor shall be responsible for preventing dirt and dust from escaping from trucks departing the project site, by covering dusty loads, washing truck tires before leaving the site, or other reasonable methods.

2. When working dump trucks and/or other equipment on paved streets and roadways, the Contractor will be required to clean said streets as required by the Engineer to remove dirt caused by the Contractor's activities. The use of water in amounts, which result in mud on public streets, is not acceptable as a substitute for sweeping or other methods. Equipment for this operation shall be on the job site or available at all times.

3. In the event that the above requirements are violated and no action is taken by the Contractor after notification of infraction by the Engineer, the Owner reserves the right to have the streets in question cleaned by others and the expense of the operation charged to the Contractor.

4. Contractor shall broom clean all offsite adjacent roadways, on a daily basis during any demolition and disposal, mass excavation and haul off, grading, trenching or any other sitework operations. Contractor shall broom clean all onsite pavement roadway and parking areas within Owner property, and all work areas within Orange County Water District property associated with this contract on a daily basis for the duration of this Contract.

C. Disposal

1. The Contractor is advised that the disposal of excess excavated material in wetlands, stream corridors and plains is strictly prohibited even if the permission of the property Owner is obtained. Any violation of this restriction by the Contractor or any person or firm employed by Contractor will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. Therefore, the
Contractor will be required to remove the fill at Contractors own expense and restore the area impacted.

1-3. **DUST AND AIR POLLUTION CONTROL.**

The Contractor shall be required to reduce particulate emissions by complying with the local Air Pollution Control District. The Contractor shall provide the following measures as a minimum:

A. Enclose, cover, or water all soil stockpiles as needed to maintain dampness and prevent visible dust emissions. The amount of watering may depend upon temperature, humidity, and wind speed for any given day. Alternatively, a higher degree of emission reduction can be achieved through installation of sprinklers on all soil stockpiles. Contractor is advised that high wind conditions are prevalent at the site.

B. Water all exposed soil as needed to maintain dampness and prevent visible dust emissions. The amount of watering may vary depending upon temperature, humidity, and wind speed for a given day.

C. Water all haul roads as necessary to maintain dampness and prevent visible dust emissions. The amount of watering may vary depending upon temperature, humidity, and wind speed for a given day.

D. Maintain adequate freeboard or secure covering of all haul/dump trucks sufficient to prevent visible dust emissions and to prevent soil spillage on to surrounding roadways.

E. The Contractor shall not discharge smoke, dust, and other contaminants into the atmosphere that violate the regulations of the local Air Pollution Control District combustion engines shall not be allowed to idle for prolonged periods of time. The Contractor shall maintain construction vehicles and equipment in good repair. Exhaust emissions that are determined to be excessive by the Engineer shall be repaired or replaced.

F. The Contractor shall implement approved odor control plan to prevent offensive odors resulting from the Contractor’s work on existing systems from leaving the site.

G. Furnish one new street sweeper Johnston Sweeper VT650, or equal, for dedicated use at the plant sites and off-site as directed by the Engineer in accordance with this section. The Work area and
off-site haul routes shall be kept clean. Street sweeper shall be operated continuously at all times during the Work and at the direction of the Engineer. Street sweeper shall remain the property of the Contractor upon completion and final acceptance of the Work. The contractor shall utilize gravel beds, rumble plates (ribbed/corrugated steel plates), tire wash devices and other methods of dirt control measures to eliminate the tracking of on-site and off-site dirt. No Dirt hauling shall occur during a period of rain and one day after rain.

In addition to all dirt-excavation-haul-placement operations requiring the use of a sweeper vehicle, the Contractor shall, on each Friday toward the end of the work period, clean all roadways throughout the project area as well as areas impacted by Contractor’s construction operation including the perimeter of the construction area.

H. Additional Dirt Control:

Following final shaping of approved excavated material storage areas, Contractor shall apply a soil binder to limit the amount and degree of free blowing dirt from the job site to adjacent land. The binder shall be applied per manufacturer's instructions/recommendations. The binder may need to be reapplied following inclement weather periods. The binder shall be Select SoilTite, as manufactured by Select Products, 1131 W. Baker Street, Costa Mesa, CA 92626, or equal.

I. See Regulatory Requirements and Permits section for additional requirements.

1-4. NOISE CONTROL.

A. The Contractor shall comply with applicable laws, regulations, and ordinances which apply to any work performed pursuant to the Contract. If the requirements of this Section are more restrictive than those of the local regulations, the requirements of this Section shall govern. See Regulatory Requirements and Permits section for additional requirements.

B. Each internal combustion engine, used for any purpose on the job or related to the job, shall be enclosed and 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 and enclosure. Use "quiet package" or "hush" equipment which is readily available for such equipment as trailer-mounted
compressors, generators, welders, etc. All equipment shall be operated in the quietest manner practicable.

C. Contractor shall be required to locate all fixed construction equipment such as compressors and generators as far as feasibly possible from sensitive receptors. Contractor shall shroud or shield all impact tools.

D. Where possible, the Contractor shall use electric rather than diesel or gas-powered equipment.

E. There shall be no start-up of machines or equipment, no delivery of materials or equipment, no cleaning of machines or equipment and no servicing of equipment except during the permitted hours of construction involving noisy operations as defined in the General Provisions.

F. Amplified sound and other forms of loud communication constituting a nuisance, at the sole discretion of the Engineer, shall not be permitted.

G. Material stockpiles and/or vehicle staging areas shall be located as far as practicable from dwellings.

H. The Contractor shall designate a disturbance coordinator responsible for responding to noise complaints. The name and telephone number of the coordinator shall be clearly posted at the construction site. The disturbance coordinator shall determine causes and implement measures to mitigate the noise impact, including the enforcement of the allowable hours of construction, the identification of poorly muffled equipment and requiring its repair or replacement; and recommending temporary construction noise barriers.

I. Additional Noise Requirements:

1. The CONTRACTOR shall comply with all Noise Ordinance provisions of the City of Fountain Valley for work at the AWTF.
   a. Exterior Noise Standards
      1) The following noise standards, unless otherwise specifically indicated in the City of Fountain Valley Municipal Code, shall apply to all residential property:
         a) Maximum Allowable Noise Standards Noise Level:
            i. 55 dB(A) between 7:00 a.m. and 10:00 p.m.
ii. 50 dB(A) between 10:00 p.m. and 7:00 a.m.

b) In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by 5 dB(A).

c) It is unlawful under the City of Fountain Valley Municipal Code for any person at any location within the City to create any noise, or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, when the foregoing causes the noise level, when measured on any other residential property, either incorporated or unincorporated, to exceed:

   i. The noise standard for a cumulative period of more than thirty minutes in any hour; or

   ii. The noise standard plus five dB(A) for a cumulative period of more than fifteen minutes in any hour; or

   iii. The noise standard plus ten dB(A) for a cumulative period of more than five minutes in any hour; or

   iv. The noise standard plus fifteen dB(A) for a cumulative period of more than one minute in any hour; or

   v. The noise standard plus twenty dB(A) for any period of time.

d) In the event the ambient noise level exceeds any of the first four noise limit categories set forth in subsection (c) of this section, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

b. Special Provisions

   1) The following activities shall be exempted from the provisions of this section:

      a) Noise sources associated with the construction, repair, remodeling or grading of any real property, provided said activities take place between the hours
of 7:00 a.m. and 8:00 p.m. Monday through Friday, 9:00 a.m. through 8:00 p.m. on Saturday, and at no
time on Sunday or any legal holiday. For purposes of
this exception the use of saws, buffers, sanders, drills
and sprayers shall be included, as shall similar
activity.

2. The CONTRACTOR shall comply with all Noise Ordinance
provisions of the City of Huntington Beach for work at Plant 2.
   a. Exterior Noise Standards
      1) The following noise standards, unless otherwise
         specifically indicated in the City of Huntington Beach
         Municipal Code, shall apply to all residential property:
         a. Maximum Allowable Noise Standards Noise
            Level:
            i. XX dB(A) between XX:00 a.m. and
               XX:00 p.m.
            ii. XX dB(A) between XX:00 p.m. and
                XX:00 a.m.
         b. In the event the alleged offensive noise consists
            entirely of impact noise, simple tone noise,
            speech, music, or any combination thereof, each
            of the above noise levels shall be reduced by XX
            dB(A).
         c. It is unlawful under the City of Huntington Beach
            Municipal Code for any person at any location
            within the City to create any noise, or to allow the
            creation of any noise on property owned, leased,
            occupied or otherwise controlled by such person,
            when the foregoing causes the noise level, when
            measured on any other residential property, either
            incorporated or unincorporated, to exceed:
            i. The noise standard for a cumulative
               period of more than thirty minutes in any
               hour; or
            ii. The noise standard plus five dB(A) for a
                cumulative period of more than fifteen
                minutes in any hour; or
            iii. The noise standard plus ten dB(A) for a
                cumulative period of more than five
                minutes in any hour; or
iv. The noise standard plus fifteen dB(A) for a cumulative period of more than one minute in any hour; or

v. The noise standard plus twenty dB(A) for any period of time.

d. In the event the ambient noise level exceeds any of the first four noise limit categories set forth in subsection (c) of this section, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

b. Special Provisions

1) The following activities shall be exempted from the provisions of this section:

a. Noise sources associated with the construction, repair, remodeling or grading of any real property, provided said activities take place between the hours of 7:00 a.m. and 8:00 p.m. Monday through Friday, 9:00 a.m. through 8:00 p.m. on Saturday, and at no time on Sunday or any legal holiday. For purposes of this exception the use of saws, buffers, Sanders, drills and sprayers shall be included, as shall similar activity.

3. All equipment shall meet the OSHA noise standard of 85 db(A) at workstation positions in proximity to the various equipment items except as otherwise specified in equipment technical specifications.

4. Noise barriers, temporary walls, portable panels, acoustical blankets, mufflers on equipment, and other measures shall be utilized by the CONTRACTOR as required. Barriers shall be installed around the noise sources or directly between the construction area and the nearest homes to shield these residents from direct noise exposure from the construction activities.

5. Construction techniques designed to reduce noise shall be implemented where feasible. Loud equipment shall be separated and not grouped in one location. Areas reserved for testing and fixing equipment shall be placed away from sensitive receptors.

1-5. WATER CONTROL.
A. Temporary pumping and drainage

1. The Contractor shall conform to the regulations and requirements of legally authorized surface water management agencies.

2. The Contractor shall be responsible for keeping trenches and other areas free from water as required to permit continuous progress of, or to prevent damage to, its own work or the work of others. The Contractor’s operations shall be conducted in such a manner as to prevent sediment from reaching existing sewers, storm drains, and creeks.

3. The Contractor shall cover exposed excavated areas and spoils piles when runoff from rain is or would be likely to cause turbidity to enter local waterways. The Contractor shall suspend work in the rain if such work cannot be performed without causing turbid runoff.

4. To avoid solids or turbid runoff from entering local waterways, the Contractor shall cover, secure, and/or berm excavated area and spoils piles and employ other methods as necessary such as hay bale around storm drains or around construction sites; use of cut and cover construction method; or use of sedimentation basins.

5. At no time will any water from any source be allowed to enter the Santa Ana River.

B. Water quality measures

1. Erosion control measures, such as silt fences, filter fabric, sedimentation ponds, placement of hay bales along the peripheries of construction sites, temporary detention ponds, and terraced slopes, shall be employed as appropriate in conformance with the approved Storm Water Pollution Prevention Plan (SWPPP) and shall be in place prior to any clearing or grading activity. SWPPP shall show means and methods to prevent water from entering the Santa Ana River.

1-6. OIL SPILL PREVENTION AND CONTROL.

The Contractor shall be responsible for prevention, containment, and cleanup of spilling of oil, fuel, and other petroleum products used in the Contractor’s operations. All such prevention, containment, and cleanup costs shall be borne
by the Contractor. The Contractor shall not discharge oil, fuel, or other petroleum products from equipment or facilities into surrounding waters or onto adjacent land.

The Contractor shall, at a minimum, take the following measures regarding oil spill prevention, containment, and cleanup:

A. Fuel hoses, lubrication equipment, hydraulically operated equipment, oil drums, and other equipment and facilities shall be inspected regularly for drips, leaks, or signs of damage, and shall be maintained and stored properly to prevent spills. Proper security shall be maintained to discourage vandalism.

B. All land-based oil and products storage tanks shall be diked or located so as to prevent spills from escaping to the water. Diking and subsoils shall be lined with impervious material to prevent oil from seeping through the ground and dikes.

C. All visible oils on land shall be immediately contained using dikes, straw bales, or other appropriate means and removed using sand, ground clay, sawdust, or other absorbent material, which shall then be properly disposed of by the Contractor. Waste materials shall be temporarily stored in drums or other leakproof containers after cleanup and during transport to disposal. Waste material shall be disposed of off property at an approved site.

1-7. DISCOVERY OF CULTURAL RESOURCES

The Contractor’s attention is directed to the National Historic Preservation Act of 1966 (16 US C490) and 36 CFR 800 which provides for the preservation of potential architectural, archaeological, or cultural resources. The Contractor shall conform to the applicable requirements of the National Historic Preservation Act of 1966 as it is related to the preservation of cultural resources.

All cultural materials or human remains discoveries that would be disturbed as a result of the Work must be reported immediately to the Owner and all work must immediately halt within two-hundred (200) feet of the discovery to allow inspection by the Owner’s representative and until the area is cleared by the Owner’s representative. Cultural materials include, but are not limited to, bones and bone pieces (both human and animal), rock walls, dump sites (including privies and wells), hearths or ovens, fist size rock concentrations with or without charcoal stains, slabs or grinding rock and obsidian pieces or chips. The Contractor’s attention is directed to general conditions section regarding changes that may be required as a result of the discovery of cultural materials that would be disturbed as a result of the Work.
If discovery is made of items of historical archaeological or paleontological interest, the Contractor is to immediately cease all Work in the area of discovery and promptly notify the Engineer. Archaeological indicators may include, but are not limited to, dwelling sites, locally darkened soils, stone implements or other artifacts, fragments of glass or ceramics, animal bones, human bones and fossils. Do not resume Work in the area of discovery until authorization is received from the Engineer. If the discovery of cultural resources causes a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the Work the Owner shall cause to be issued a change order under the procedures provided in the General and Special Provisions.

1-8. MINIMIZE AND REPAIR DAMAGE TO ROADWAYS.

The Contractor shall minimize damage to roadways including haul routes. The Contractor shall be responsible for repairing damage to the roadways caused by construction activities or, as determined by the agency having jurisdiction over the roadway, for reimbursing the agency having jurisdiction on the roadways for damage caused by construction operations. The Contractor shall be responsible for damage directly attributable to its own and its subcontractor's and material suppliers' activities and shall be responsible for repairs to return the roadways to the pre-project condition. The Owner will periodically monitor the roadway condition, and will notify the Contractor of damages and repairs that need to be implemented. The Contractor’s attention is directed to the Temporary Facilities section.

1-9. CONSTRUCTION RELATED TRAFFIC.

Construction of the facilities will cause increased traffic from transporting construction materials to crews to the work areas and traffic delays caused by construction at or adjacent to a roadway. The Contractor shall plan the transportation of materials and crews to limit the project-related impacts on traffic during peak hours. The Owner or Engineer will, to the extent it determines to be needed, direct the Contractor to re-arrange transportation to and from the job site to minimize increased traffic. If transportation does need to be re-arranged, such re-arrangement will be at the Contractor’s expense. The Contractor shall perform construction activities at roadways and at access road entrances and exits to the public roadways in such a manner to eliminate substantial traffic delays and traffic delays or detours that would last more than one week at any location. The Owner will notify the Contractor in the event that traffic delays have or are anticipated to exceed an acceptable level or duration. In such cases, the Contractor shall, at the Contractor’s expense, re-arrange the work activities to reduce the delays caused by the performance of the Work. Allowed access routes are discussed further in the Temporary Facilities section.

1-10 HAZARDOUS ENVIRONMENTAL CONDITIONS AT SITE. NOT USED
1-11 SAFETY AND HEALTH.

A. General

1. Portions of the existing facilities are exposed to wastewaters of varying degrees of treatment. The Contractor certifies that he is experienced and qualified to anticipate and meet the safety and health requirements of this project.

2. Workmen involved in the removal, renovation, or installation of equipment within the facility may be exposed to disease-producing organisms in wastewater. The Contractor shall require his personnel to observe proper hygienic precautions.

3. Solvents, gasoline, and other hazardous materials enter the facility with incoming sewage, and therefore, certain areas are hazardous to open flame, sparks, or unventilated/poorly ventilated occupancy. The Contractor shall take measures to assure his personnel observe proper safety precautions when working in these areas.

4. Additional safety and health requirements are specified in the Contract Documents, including, but not limited to, the Contract Agreement, GENERAL CONDITIONS, SPECIAL PROVISIONS, and GENERAL REQUIREMENTS.

B. Safety and Health Regulations

1. The Contractor shall comply with Safety and Health Regulations for Construction, promulgated by the Secretary of Labor under Section 107 of the Contract Work Hours and Safety Standards Act, as set forth in Title 29, C.F.R. Copies of these regulations may be obtained from Labor Building, 14th and Constitution Avenue N.W., Washington, DC 20013.

2. The Contractor also shall comply with the provisions of the Federal Occupational Safety and Health Act, as amended; and the General Industry Safety Orders of the State of California as implemented by Cal OSHA.

3. The Contractor shall comply with all OCSD Safety and Emergency Procedures.

End of Section
Section 01380

CONSTRUCTION PHOTOGRAPHS

1. CONSTRUCTION PHOTOGRAPHS BY CONTRACTOR.
Contractor shall be responsible for the production of construction photographs as provided herein. Engineer shall designate the subject of each photograph. Photographs before, during and after construction are an important record of site conditions, construction progress, as-built features and significant planned/unplanned events. The Contractor is to employ a competent photographer to record this important factual information. Contractor shall be responsible for the production of construction photographs as provided herein. Engineer shall designate the subject of each photograph. All construction photographs shall be provided in both print and digital format per the requirements in this section.

1-1. Pre-Construction Photographs.
The Contractor shall provide one hundred (100) pre-construction photographs prior to commencement of Work on the site. Preconstruction photographs shall be taken at locations to be designated by the Engineer. These photographs shall be submitted prior to beginning construction.

1-2. During Construction Photographs.
The Contractor shall provide construction color photographs showing the progress of the Work. Contractor shall take photos of all Work prior to being buried or covered, including piping, fittings, transitions, tie-ins and valves. Contractor shall take photos of any significant planned or unplanned events. Contractor shall also take photos from the same five locations at monthly intervals to record progress of work from same vantage points. These vantage points will be determined by the Engineer. A minimum of sixty (60) photographs shall be provided every month during construction. Photographs shall be submitted with each month’s Application for Payment.

1-3. Post-Construction Photographs
Upon acceptance of the Work, the Contractor shall provide one hundred (100) photographs of the Work where directed by the Engineer. Post-construction photographs shall be taken at locations to be designated by the Construction Manager. These photographs shall be submitted as part of Contract Closeout.
2. DELIVERABLE PRODUCTS.

2-1. Prints.

A. Color:
   1. Paper: Single weight, first quality, fine grain, minimum resolution 100 lines per inch.
   2. Finish: Smooth surface, glossy.
   3. Size: 4-inch x 6-inch minimum.

B. Identify Each Print on Adhesive Label Placed on Front:
   1. Name of project.
   2. Orientation of view.
   3. Date and time of exposure.
   4. Photo number
   5. Negative identification.

C. Prints shall be indexed chronologically and provided in a three-ring binder with transparent protective sleeves intended for storage of photographs.

D. Provide 8-1/2" x 11" color printed page with thumbnail views and file name identification for each photo. All printed pages shall be indexed chronologically and provided in a three-ring binder.

2-2. Digital.

Digital images shall be compiled on CD and provided with a descriptive index of the images. All CD’s shall be labeled and protected in an individual plastic case.

End of Section
1. CONTRACTOR’S QUALITY CONTROL.

1-1. General.

The Contractor is to ensure that products, services, workmanship and Site conditions comply with the requirements of the Contract Documents by coordinating, supervising, testing and inspecting its Work. The Contractor shall utilize only suitably qualified, skilled and trained personnel experienced in the tasks required to complete the Work in accordance with the quality requirements of the Contract Documents. Should there be no quality basis specifically prescribed for any portion of the Work, the quality and testing procedures shall be in accordance with the best-accepted practices of the construction industry in the State of California, for projects of this type, or standards set by engineering or technical societies (e.g. ASTM or ASHRAE), whichever is more stringent.

1-2. Quality of Work.

The Contractor’s quality of Work shall include, but not be limited to, the following requirements:

A. Quality of Products: Unless otherwise indicated or specified, all products shall be new, free of defects, and fit for the intended use.

B. Quality of installation: All Work shall be produced plumb, level, square and true, or true to indicated angle, and with proper alignment and relationship between the various elements, as shown on or required by Contract Documents.

C. Protection of Completed Work: Take all measures necessary to preserve completed Work free from damage, deterioration, soiling, and staining, until acceptance by Owner.

D. Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Unless more stringent requirements are indicated or specified, comply with manufacturer's instructions and recommendations, reference standards and building code research report requirements in preparing, fabricating, erecting, installing, applying, connecting, and finishing Work.

E. Deviations from Standards and Code Compliance and Manufacturer's instructions and Recommendations: Secure Owner's advanced written consent. Document and explain all
deviations from reference standards and building code research report requirements and manufacturer's product installation instructions and recommendations, including acknowledgement by the manufacturer that such deviations are acceptable and appropriate for the Project.

F. Verification of Quality: Work shall be subject to verification of quality by Owner in accordance with provisions of the Contract Documents.

1-3. Defective Work.

Defective Work shall be modified, replaced, repaired or redone by the Contractor as described in the General and Special Provisions.

2. INSPECTION AND TESTING.

Additional requirements for tests are described in the Testing, Startup and Training Requirements section and other Technical Specifications of these Contract Documents.

2-1. General.

Where the Contract Documents require work to be field tested or approved, it shall be tested in the presence of the Engineer or its authorized representative. The Engineer shall have the right to witness all on-site tests performed by the Contractor and any shop tests. The results of any tests performed by the Contractor shall be made available for the information of the Engineer. Inspections, tests or favorable reviews by the Engineer or others shall not relieve the Contractor from its obligation to perform the work in accordance with the requirements of the Contract Documents or for its sole responsibility for the quality of workmanship and materials.

Except as specifically required under the technical specifications for testing and inspection, all tests for materials furnished by the Contractor will be done in accordance with commonly recognized standards of national organizations. Where tests are to be performed by the Engineer or by an independent laboratory or agency, the Contractor shall furnish such samples of all materials as required by the Engineer without charge.

The sample or samples of materials to be tested shall be selected by such laboratory or agency, or the Engineer, and not by the Contractor. No material for which the Contract Documents require the submittal and approval of tests, certificates of compliance or other documentation shall be incorporated in the Work until such submittal has been made and approved. The Contractor shall provide safe access, including plants where materials or equipment are
manufactured or fabricated, for the Engineer and inspectors to adequately inspect the quality of work and the conformance with the Contract Documents. The Contractor shall furnish the Engineer the necessary labor and facilities for such things as excavation in the compacted fill to the depths required to take samples. The Contractor shall provide adequate lighting, ventilation, ladders and other protective facilities as may be necessary for the safe performance of inspections.

Upon completion of the Work the Engineer will conduct a final inspection. Records shall be available at all reasonable hours for inspection by other local or State agencies to ascertain compliance with laws and regulations.

Neither the employment of independent testing and inspection agency nor observations or tests by Owner and Owner's consultants shall in any manner relieve the Contractor of obligation to perform Work in full conformance to all requirements of the Contract Documents. The Owner reserves the right to reject all Work not in conformance to the requirements of the Contract Documents, or otherwise Defective.

2-2. Notice.

The Contractor shall notify the Engineer in writing at least forty-eight (48) hours before any field testing or special inspections are required to be performed by the Engineer or independent laboratory furnished by the Owner. The Contractor shall notify the Engineer at least two hours before any inspection is required to be performed or to witness the Contractor's on-site field testing.

Whenever the Contractor varies the period during which work is carried on each day, the Contractor shall give due notice to the Engineer so that proper inspection may be provided. Any work done in the absence of the Engineer shall be considered to be rejected. It will be the responsibility of the Contractor to demonstrate to the satisfaction the Engineer that the work meets all conditions of the specification and if such conditions are not met to remove the work.

The Contractor shall give the Engineer written notification at least thirty (30) days prior to the shipment of materials and equipment to be tested and/or inspected at the point of origin. Satisfactory tests and inspections at the point of origin shall not be construed as a final acceptance of the materials and equipment nor shall such tests and inspections preclude retesting or re-inspection at the site of the Work.

2-3. Work Covered Prior to Inspection and/or Testing.

Work requiring inspection and/or testing shall not be concealed or buried prior to the acceptance of such inspection or testing. Work covered without the favorable review or consent of the Engineer shall, if required by the Engineer, be uncovered for inspection and/or testing at the Contractor's expense.
2-4. **Work Covered With Prior Inspection and/or Testing.**

If the Engineer considers it necessary or advisable that covered work which was favorably inspected and tested be uncovered for re-inspection and/or retesting, the Contractor, at the Engineer's request, will uncover, expose or otherwise make available for observation, inspection or testing as the Engineer may require, that portion of the work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such work is defective, the Contractor will bear all expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such work is not found to be defective the Contractor will be allowed an increase in the Contract price or an extension of the Contract time, or both, directly attributable to such uncovering, exposure, observation, testing and reconstruction, and a Change Order shall be issued for such additional work.

2-5. **Special Tests and Inspections.**

As provided for in the Contract Documents, laws and regulations, specialized tests and inspections shall be performed by special inspectors certified by the International Conference of Building Officials (ICBO). Unless otherwise stated in the Contract Documents, each of these tests will be performed on site and paid for by the Owner.

2-6. **Inspections and Tests by Serving Utilities.**

Unless otherwise indicated in the Contract Documents, the Contractor shall cause, schedule and conduct inspections and tests by serving Utilities required for the Work under this Contract.

2-7. **Inspections and Tests by Serving Manufacturers.**

Unless otherwise indicated in the Contract Documents, the Contractor shall cause all required tests and inspections to be conducted by materials, equipment or systems manufacturers. Additionally, all tests and inspections required by materials, equipment or systems manufacturers as conditions of warranty or certification of Work shall be made, the cost of which shall be included in the Contractor's bid.

Each manufacturer's representative shall furnish to Owner, through Contractor, a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

All costs for these services shall be included in the Contract Price.
2-8. **Offsite Inspection.** When the Contract Documents require inspection of material or equipment during the production, manufacturing, or fabricating process, or before shipment, such services will be performed by Owner or an independent testing firm or inspection organization acceptable to Owner. The Contractor shall note that offsite inspection is not considered factory witness testing, which is described in the Testing, Startup and Training Requirements section and select equipment specifications.

Contractor shall require the producer, manufacturer, or fabricator to arrange for and pay an independent organization to perform the inspection services specified herein the Contract Documents.

Owner shall send a representative to the factory or shop to review the assembly and witness the factory testing and performance for the equipment specified.

Contractor shall give appropriate written notice to Owner not less than 10 days before offsite inspection services are required, and shall provide for the producer, manufacturer, or fabricator to furnish safe access and proper facilities and to cooperate with inspecting personnel in the performance of their duties.

The inspection organization will submit a written report to Owner, with a copy to Contractor, at least once each week.

2-9. **Transmittal of Test Reports.** Written reports of tests and engineering data furnished by Contractor for Owner’s review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings.

The laboratory retained by Owner will furnish four copies of a written report of each test. Three copies of each test report will be transmitted to the Owner and one copy to Contractor, within 3 days after each test is completed.

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TEMPORARY FACILITIES AND CONTROLS

1. OFFICE AT SITE OF WORK. During the performance of this Contract, Contractor shall maintain a suitable office at or near the Site which shall be the headquarters of its representative authorized to receive drawings, instructions, or other communication or articles. Any communication given to the said representative or delivered at Contractor's office at the Site in the representative's absence shall be deemed to have been delivered to Contractor.

Copies of the Drawings, Specifications, and other Contract Documents shall be kept at Contractor's office at the Site and available for use at all times.

In addition, the Contractor shall provide a modular field office meeting the requirements of Exhibit A and Exhibit A Figures adjacent to the Contractor's office at the Site, for use by the Engineer. The partitioning off of the Contractor's own office space for use by the Engineer will not be permitted. Each office shall be provided with an outside entrance door with a substantial lock; glazed windows suitable for light and ventilation; stairs with handrail; a concrete stoop with boot scraper; and adequate heating, air conditioning, and lighting facilities. Gravel shall be placed and maintained throughout the life of the project in a 10-foot-wide area around the office perimeter. Skirting shall be installed around the entire perimeter of each office, and each office shall be provided with the necessary tie downs. A pole mounted light shall be provided to adequately illuminate the area outside each office.

Windows for light and ventilation shall be provided in the Engineer's office. All windows shall be equipped with blinds. Adequate indoor lighting and thermostatically controlled heating and air conditioning shall be provided.

Contractor shall pay all electricity, water, sewer, cleaning services, cable, and heating bills and shall provide telephone and internet service to the Contractor's field office(s) and Engineer's field offices and shall provide connections to all required field office utilities. Each office shall, at least, be furnished with all items as specified in Exhibit A. The general arrangement of the offices and facilities provided shall be acceptable to Engineer.

Maintenance of the Engineer's office shall be by Contractor throughout the duration of the project. Maintenance requests not resolved in 48 hours may be resolved by the Engineer and the cost of such maintenance backcharged to Contractor.
3. CONSTRUCTION WATER. Owner will furnish, with charge to the Contractor, water required for and in connection with the Work to be performed at a connection on the northwest side of the Switchgear Building (Building 910).

OCSD will furnish, with charge to the Contractor, water required for and in connection with the Work to be performed at Plant 2 on the [INSERT LOCATION FOR WATER FROM OCSD].

The maximum volume of water available at these locations will be up to half (0.5) million gallons per day at a cost of $150 per acre-foot.

The Contractor shall install an approved Backflow Prevention System on the connection point along with a flow meter with totalizer to track all water usage and shall be responsible for transporting water from the designated location to the location of use. The Backflow Prevention System shall be approved by the Engineer, Owner, and OCSD.

Contractor shall furnish necessary pipe, hose, nozzles, meter, and tools and shall perform all necessary labor. Contractor shall make arrangements with the Owner as to the amount of water required and the time when the water will be needed. Unnecessary waste of water will not be tolerated.

4. CONSTRUCTION POWER. Power required for and in connection with the Work to be performed shall be provided by the Contractor.

Power for operation of the expanded facilities during startup and testing shall be provided by the Owner in accordance with the requirements set forth in the Testing, Startup and Training Requirements section, and shall be subject to the following conditions:

a. Contractor shall meet local power provider requirements for temporary construction power.

b. The existing transformer must have the capacity and voltage needed by the Contractor for construction power.

c. Contractor at its own expense shall make authorized connections to the existing power sources and shall extend temporary service lines to the required areas. Temporary wiring shall conform to Article 305 of the NEC.

e. Contractor shall at all times provide adequately against waste and needless use of power. Electrical power shall be used only in such quantities as will not interfere with Owner’s requirements, and care shall be taken not to overload the existing facilities. Contractor
shall provide any additional or temporary electrical power or power of other voltages it may require for prosecution of the Work.

These provisions shall not be construed as a guarantee by Owner of the uninterrupted supply of power, and interruptions beyond the control of the Owner shall not be reason for claims for additional costs nor for extensions of time. Contractor shall provide, at no additional cost to Owner, any necessary power required for prosecution of the Work during such interruptions. Contractor shall provide sufficient standby power and automatic power transfer to provide continuous operation of all dewatering systems in the event of an outage.

Contractor shall provide all power for heating, lighting, operation of Contractor's plant or equipment, or for any other use by Contractor. Temporary heat and lighting shall be maintained until the Work is accepted.

5. VOICE AND DATA SERVICES. Contractor shall make all necessary arrangements and pay all installation charges and monthly or periodic service for voice and data lines in its offices at the Site and for separate voice and data lines in the office of the Resident Project Representative, and shall provide all telephone instruments.

Data communications in the form of a standard T-1 data line shall be provided to each Engineer's office. Data service shall be capable of full T-1 bandwidth and shall be independent of any data services provided to the Contractor's office facilities. Data communications shall be terminated in a CSU/DSU in each Engineer's office. At least two static IP addresses shall be provided by the data communications provider for the exclusive use of the Engineer's staff. Contractor shall install up to 12 Standard RJ-45 Ethernet wall jacks at locations in each of the Engineer's two offices to be determined after the office is set up on the site and one TIA/EIA-568-A-5 Category 5e patch panel with at least 24 ports within 10 feet of the CSU/DSU in each of the Engineer's two offices. Contractor shall provide concealed Category 5e wiring between each wall jack and the patch panel. Additional data communications devices necessary to complete the installation will be provided by others.

Contractor shall verify the availability and costs of telecommunications service at and near the site with the local telecommunications provider. The Contractor is responsible for all costs associated with installing and maintaining telephone and data communications.

It shall be the Contractor's responsibility, and at its own cost, to route and install cable and new telephone poles if service is required further inside within the plant.
6. **SANITARY FACILITIES.** Contractor shall furnish temporary sanitary facilities at the Site, as provided herein, for the needs of all construction workers and others performing work or furnishing services on the Project.

Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each 20 persons. Contractor shall enforce the use of such sanitary facilities by all personnel at the Site.

7. **CONSTRUCTION AIDS.** Contractor shall furnish, install, maintain, and operate all construction aids required by it and its Subcontractors in the performance of the Work, except as otherwise provided herein.

Contractor shall provide construction aids necessary for the performance of work by other contractors on the Project. Such construction aids shall be suitable for conditions encountered and shall include:

A. Provide railings, kick plates, enclosures, safety devices, and controls required by Laws and Regulations and as required for adequate protection of life and property.

B. Use construction hoists, elevators, scaffolds, stages, shoring, and similar temporary facilities of ample size and capacity to adequately support and move loads.

C. Design temporary supports with adequate safety factor to assure adequate load bearing capability.
   1. When requested, submit design calculations by professional registered engineer prior to application of loads. Submitted design calculations are for information and record purposes only.

D. Accident Prevention:
   1. Exercise precautions throughout construction for protection of persons and property in accordance with this Section and the Contract Documents.
   2. Guard machinery and equipment, and eliminate other hazards.
   3. Make reports required by authorities having jurisdiction, and permit safety inspections of the Work.
   4. Before commencing construction Work, take necessary action to comply with provisions for safety and accident prevention.
E. Warning Devices and Barricades:
   1. Place barriers at ends of excavations and along excavations to warn pedestrian and vehicular traffic of excavations.
   2. Provide barriers with flashing lights after dark.
   3. Barricade excavations to prevent persons from entering excavated areas in streets, roadways, parking lots, treatment plants, or other public or private areas.
   4. Adequately identify and guard hazardous areas and conditions by visual warning devices and, where necessary, physical barriers.
   5. Warning devices shall conform to OSHA and State agency requirements, which administers OSHA regulations where the Project is located.

F. Hazards in Public Right-of-Way:
   1. Mark at reasonable intervals trenches and other continuous excavations in public right-of-way, running parallel to general flow of traffic, with traffic cones, barricades, or other suitable visual markers during daylight hours.
      a. During hours of darkness, provide markers with flashers, or other adequate lights.
   2. At intersections or for pits and similar excavations, where traffic may reasonably be expected to approach head on, protect excavations by continuous barricades.
      a. During hours of darkness, provide warning lights at close intervals.

G. Hazards in Protected Areas: Mark or guard excavations in areas from which public is excluded, in manner appropriate for hazard.

H. Above Grade Protection: On multi-level structures, provide safety protection that meets requirements of OSHA and State agency which administers OSHA regulations where the Project is located.

I. Protect existing structures, trees, shrubs, and other items to be preserved on Project site from damage or destruction by vehicles, equipment, worker or other agents with substantial barricades or other devices commensurate with hazards.

Construction aids shall be furnished without charge to the other contractors, and all necessary erection, maintenance, and operating personnel shall be included. In the event of conflict, the contractor furnishing the equipment shall determine priorities in the best interest of the Project.
The use of any plant equipment, whether furnished and installed under this Contract or not, including elevators, shop cranes, heating, ventilating, air conditioning, and plumbing fixtures, shall be only with Owner's written permission.

8. MAINTENANCE OF TRAFFIC. Contractor shall conduct its work to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel, and shall give reasonable notice to owners of private drives before interfering with them. Such maintenance of traffic will not be required when Contractor has obtained permission from the owner and tenant of private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated location.

In making open-cut street crossings, Contractor shall not block more than one-half of the street at a time. Whenever possible, Contractor shall widen the shoulder on the opposite side to facilitate traffic flow. Temporary surfacing shall be provided as necessary on shoulders.

All construction traffic, including, but not limited to, Contractor's employees, subcontractors, and deliveries of equipment and materials shall use the second access road from Garfield Avenue through the south entrance on Orange County Sanitation District's property to the plant site. The Contractor may need to coordinate access through this entrance with the Contractor at Orange County Sanitation District if construction is continuing at the adjacent site. No construction traffic will be allowed on Ward Street or Ellis Street.

[INSERT PLANT 2 TRAFFIC/ACCESS REQUIREMENTS]

Contractor shall under no circumstances use residential tract streets adjacent to the Project site for stockpiling construction materials or equipment or for access to the Work site or for parking.

8.01. Detours. Where required by the authority having jurisdiction that traffic be maintained over any construction work in a public street, road, bike trail, or highway, and the traffic cannot be maintained on the alignment of the original roadbed or pavement, Contractor shall, at its own expense, construct and maintain a detour around the construction work. Each detour shall include a bridge across the pipe trench and all necessary barricades, guardrails, approaches, lights, signals, signs, and other devices and precautions necessary for protection of the Work and safety of the public.
9. BARRICADES AND LIGHTS. All streets, roads, highways, bike paths, and other public thoroughfares which are closed to traffic shall be protected by effective barricades on which shall be placed acceptable warning signs. Barricades shall be located at the nearest intersecting public highway or street on each side of the blocked section.

All open trenches and other excavations shall have suitable barricades, signs, and lights to provide adequate protection to the public. Obstructions, such as material piles and equipment, shall be provided with similar warning signs and lights.

All barricades and obstructions shall be illuminated with warning lights from sunset to sunrise. Material storage and conduct of the Work on or alongside public streets and highways shall cause the minimum obstruction and inconvenience to the traveling public.

All barricades, signs, lights, and other protective devices shall be installed and maintained in conformity with applicable statutory requirements and, where within railroad and highway rights-of-way, as required by the authority having jurisdiction.

Warning devices, at a minimum, shall conform to the requirements of Cal/OSHA.

10. FENCES. All existing fences affected by the Work shall be maintained by Contractor until completion of the Work. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the owner of the fence, and the period the fence may be left relocated or dismantled has been agreed upon. Where fences must be maintained across the construction easement, adequate gates shall be installed. Gates shall be kept closed and locked at all times when not in use. Gates shall be kept closed and locked at all times when not in use.

On completion of the Work across any tract of land, Contractor shall restore all fences to their original or to a better condition and to their original locations.

11. PROTECTION OF PUBLIC AND PRIVATE PROPERTY. Contractor shall protect, shore, brace, support, and maintain all underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by its construction operations. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with all sod and shrubs in yards, parkways, and medians, shall be restored to their original condition, whether within or outside the easement. All replacements shall be made with new materials.
No trees shall be removed outside the permanent easement, except where authorized by Engineer. Whenever practicable, Contractor shall tunnel beneath trees in yards and parking lots when on or near the line of trench. Hand excavation shall be employed as necessary to prevent injury to trees. Trees left standing shall be adequately protected against damage from construction operations.

Contractor shall be responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, bridges, and other public or private property, regardless of location or character, which may be caused by transporting equipment, materials, or workers to or from the Work or any part or site thereof, whether by Contractor of its Subcontractors. Contractor shall make satisfactory and acceptable arrangements with the owner of, or the agency or authority having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage.

All fire hydrants and water control valves shall be kept free from obstruction and available for use at all times.

12. **DAMAGE TO EXISTING PROPERTY.** Contractor will be held responsible for any damage to existing structures, Work, materials, or equipment because of his operations and shall repair or replace any damaged structures, Work, materials, or equipment to the satisfaction of, and at no additional cost to, Owner.

Contractor shall protect all existing structures and property from damage and shall provide bracing, shoring, or other work necessary for such protection.

13. **TREE AND PLANT PROTECTION.** All trees and other vegetation which must be removed to perform the Work shall be removed and disposed of by Contractor; however, no trees or cultured plants shall be unnecessarily removed unless their removal is indicated on the Drawings. All trees and plants not removed shall be protected against injury from construction operations.

Trees considered by Engineer to have any significant effect on construction operations are indicated on the Drawings and those which are to be preserved are so indicated.

Contractor shall take extra measures to protect trees designated to be preserved, such as erecting barricades, trimming to prevent damage from construction equipment, and installing pipe and other Work by means of hand excavation or tunneling methods. Such trees shall not be endangered by stockpiling excavated material or storing equipment against their trunks.
When injuring or removal of trees designated to be preserved cannot be avoided, or when removal and replacement is indicated on the Drawings, each tree injured beyond repair or removed shall be replaced with a similar tree of the nearest size possible.

All trimming, repair, and replacement of trees and plants shall be performed by qualified nurserymen or horticulturists.

14. **ACCESS ROADS.** Contractor shall establish and maintain temporary access roads to various parts of the Site as required to complete the Project. Such roads shall be available for the use of all others performing work or furnishing services in connection with the Project.

A. General:

1. The Contractor shall maintain access roads in accordance with this Section, the Contract Drawings, and the GENERAL REQUIREMENTS section.
2. Build and maintain dust free roads, which are suitable for travel at 20 miles per hour.

B. On-site Access Roads:

1. Maintain access roads to storage areas and other areas to which frequent access is required.
2. Maintain similar roads to existing facilities on site of the Work to provide access for maintenance and operation.
3. Protect buried vulnerable utilities under temporary roads with steel plates, wood planking, or bridges.
4. Maintain on-site access roads free of dirt and mud. Under no circumstances shall vehicles leaving the site track dirt or mud off the site onto the public right-of-way.
5. The Contractor shall provide flagmen to control traffic where construction traffic and OCSD or public traffic share the same roadway.

15. **PARKING.** Contractor shall provide and maintain suitable parking areas for the use of all workers and others performing work or furnishing services in connection with the Project, as required to avoid any need for parking personal vehicles where they may interfere with public traffic, Owner's operations, or construction activities.
Contractor may be required to, at its own cost, make its own arrangements for off-site parking and storage provided the locations shown on the Drawings are not sufficient for the Contractor.

16. **NOISE CONTROL.** See Regulatory Permits and Requirements section.

17. **DUST CONTROL.** Contractor shall take reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water or by application of a chemical dust suppressant. When practicable, dusty materials in piles or in transit shall be covered to prevent blowing dust.

Buildings or operating facilities which may be affected adversely by dust shall be adequately protected from dust. Existing or new machinery, motors, instrument panels, or similar equipment shall be protected by suitable dust screens. Proper ventilation shall be included with dust screens.

18. **TEMPORARY DRAINAGE PROVISIONS.** Contractor shall provide for the drainage of storm water and such water as may be applied or discharged on the Site in performance of the Work. Drainage facilities shall be adequate to prevent damage to the Work, the Site, and adjacent property.

Existing drainage channels and conduits shall be cleaned, enlarged, or supplemented as necessary to carry all increased runoff attributable to Contractor's operations. Dikes shall be constructed as necessary to divert increased runoff from entering adjacent property (except in natural channels), to protect Owner's facilities and the Work, and to direct water to drainage channels or conduits. Ponding shall be provided as necessary to prevent downstream flooding.

Water for flushing and disinfection work, and water used for hydrostatic testing of structures, shall be treated as specified and properly discharged by Contractor. Contractor shall be responsible for obtaining a discharge permit.

19. **EROSION CONTROL.** Contractor shall prevent erosion of soil on the Site and adjacent property resulting from its construction activities. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation, or other operation that will disturb the natural protection.

Work shall be scheduled to expose areas subject to erosion for the shortest possible time, and natural vegetation shall be preserved to the greatest extent practicable. Temporary storage and construction buildings shall be located, and construction traffic routed, to minimize erosion. Temporary fast-growing
vegetation or other suitable ground cover shall be provided as necessary to control runoff.

20. **POLLUTION CONTROL.** Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances resulting from construction activities. No sanitary wastes shall be permitted to enter any drain or watercourse other than sanitary sewers. No sediment, debris, or other substance shall be permitted to enter sanitary sewers, and reasonable measures shall be taken to prevent such materials from entering any drain or watercourse.

21. **TEMPORARY LIGHTING.** Contractor shall provide temporary lighting in all work areas sufficient to maintain a lighting level during working hours not less than the lighting level required by Cal/OSHA standards. As permanent lighting facilities are completed, they may be used in lieu of temporary facilities, provided however, that bulbs, lamps, or tubes of such facilities used by the Contractor shall be replaced prior to final acceptance of the Work.

22. **HEATING AND VENTILATION.** Contractor shall provide means for heating and ventilating all work areas as may be required to protect the Work from damage by high temperatures, weather, or to provide a safe environment for workers. Un-vented direct fired heaters shall not be used in areas where freshly placed concrete will be exposed to the combustion gases until at least two (2) hours after the concrete has attained its initial set.

23. **CHEMICALS AND ENERGY.** Owner will provide chemicals, water, and energy required for testing and regular operation of the expanded Plant and Flow Equalization facilities as described in the Testing, Startup and Training Requirements section. Contractor shall notify the Engineer forty-five (45) days prior to any startup activities to allow the Owner time to order chemicals and have them delivered to the site for startup procedures.

Contractor shall furnish all additional chemicals required for other uses (i.e., disinfection activities following construction) and not specifically for regular operation of the plant.

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Exhibit A

PART 1 – GENERAL

1-1 SCOPE OF WORK. The Contractor shall provide a modular field office meeting the following requirements in addition to the requirements of Paragraph 1-1, adjacent to the Contractor’s office at the Site, for use by the Engineer. This Exhibit includes materials and installation requirements for Type V, non-rated, B-occupancy, mobile office construction. Contractor shall supply and install mobile office with overall dimensions, and layout, as shown on Figure 1, which is attached at the end of this specification section. Contractor shall provide materials and complete installation needed for all wet and dry utilities for District Modular Field Office, including but not limited to, wiring and plumbing not shown on drawings, but needed for connections to outlets and fixtures.

1-2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS. In addition to the requirements of the Project Requirements section, the mobile office shall also conform to the latest revision of the American Disabilities Act.

1-3 SUBMITTALS. Submittals shall be in accordance with the submittals section. At a minimum the following information shall be submitted for review.
- Seismic restraint design and layout for mobile office, and exterior decking, stairs and ramps, to be signed and sealed by a California State Registered Engineer.
- Building structural design conforming to referenced standards shall be signed and sealed by a California State Registered Engineer.
- A communications wiring plan for office trailer. Diagram shall show locations of communications receptacles. A minimum of one phone port and three data ports shall be provided for each work station.
- An electrical wiring diagram for office trailer. Diagram shall show location of all lights, receptacles and power boards.
- An HVAC plan showing location of all air supply and return vents and HVAC unit. Plan shall be accompanied by calculations showing HVAC provides air balance for office trailer.
- Contractor shall provide for fire detection and alarm in accordance with Uniform Fire Code, Latest Revision.
- Catalog cuts, color and fabric samples for following items to be approved by District:
  - Flooring.
  - Trim.
  - Counters.
  - Fixtures.
  - Siding.
- Furniture
- A lighting level plan showing all areas maintain minimum 50 foot-candles.
- Construction details for all steps and stairs.
- Final plans and calculations signed by an architect or engineer licensed to practice in California.
- Provide complete door and hardware schedule on the plans, specifying all door sizes and hardware types. Three exit doors shall be required.
- Provide calculations and details for the guardrail handrail attachment capable of withstanding a load applied to top rail in any direction of 50 pounds per foot or 200 pounds whichever is greater.
- Plans that show location and layout of the restrooms to show ADA compliance with requirements for persons with disabilities.

1-4 MOBILE OFFICE CONSTRUCTION. All materials used in the construction shall be new as specified herein.

PART 2 - PRODUCTS

2-1 TRAILER MANUFACTURER. Mobile office trailer shall be supplied by Preferred Modular Structures, Inc.

Matthew F. Casserly PO Box 1293 Corona, CA 92878-1293
(909) 735-2332 office

2-2 TRAILER FRAME. Perimeter frame shall be constructed from steel satisfying ASTM-A-36. Hitch shall be demountable type with demountable elevating screw jack capable of handling load of trailer with safety factor of 1.5. Axles shall be equalized multiple axles with electric brakes, minimum 3 axles. Axles shall not be under-slung type. Spring ratings shall be designed to accommodate differential loading due to un-uniform trailer load. Sidewall tire rating shall not be exceeded at full load. A safety factor of 1.5 shall be used. Tire axle and tire combination shall be rated for 150% of the finished but unfurnished trailer load.

2-3 TRAILER FLOORING. Trailer bottom board shall be minimum 6 mil reinforced plastic or equal. Floor shall be insulated with R20 unfaced fiberglass minimum. Framing shall be minimum 8-inch by 11.5 pound C-channel, with steel floor joists at 24-inch O.C. (16-inch O.C. beneath file areas, ref. Figure 1). Decking shall be ¾-inch Sturdi floor plywood, minimum. Tile cover shall be minimum 1/8” thick vinyl composition. Linoleum sheeting shall be 50% offset checkerboard pattern. Color shall be neutral, gray or brown. Linoleum sheeting shall be placed using clear latex based adhesive. Linoleum sheeting shall be placed in bathroom, janitor closet and kitchen.

Carpet shall be provided in all rooms except bathrooms, janitor closet and kitchen. Carpet shall have the following characteristics:
• Color to be selected by the District.
• Gage 1/2”
• Commercial Grade
• Direct glue down
• Face yarn weight: 26 oz
• Backing: Primary — woven polypropylene
• Solution dyed.
• Static parameter: less than 3.5 kV built in, permanent.
• Flame spread: per NFPA Class II rating.
• Provide clear latex carpet adhesive and sealant adhesive as recommended by carpet manufacturer.
• At carpet/tile junctions, provide carpet reducer to cover seam.

2-4 ROOF AND CEILING. Roof joists shall be designed for ridge drainage. Roofing shall be 45 mil minimum, non-reinforced EPDM adhered per manufacturer’s recommendations. J rail shall be included as required by code. Sheathing shall be minimum 7/16” plywood, OSB or greater as required by EDPM manufacturer. R30 rated insulation shall be provided between ceiling joists. Ceiling shall be finished with T-grid (Armstrong ceiling tiles 755B, or equal, 2 X 4 foot.) Roof vents shall be installed at the factory as required by code. Overall roof height including wheels shall not exceed 13’ 6” or legal height, whichever is less. Roof system shall be clear span.

Contractor shall provide eight tubular skylights, consisting of skylight dome, reflective tube, and diffuser assembly, designed for suspended ceilings. The skylights shall be transparent roof-mounted skylight dome and self-flashing curb, reflective tube, all necessary extensions and accessories, and ceiling level diffuser assembly, transferring sunlight to interior spaces; complying with ICBO/ICC AC-16. All components made and assembled by one manufacturer. Reflective tube shall be 21” in diameter, transparent, UV and impact resistant dome with flashing base supporting dome and top of tube. Diffuser face shall be 24” x 24” and connected to the reflective tube by a 24” x 24” transitional box. Engineer shall select color and diffuser lens.

• Tubular skylights shall be installed in the men's restroom (1), women's restroom (1), and open area above conference table (6). Contractor to coordinate exact placement of skylights with Engineer.
• Contractor to install per manufacturer's recommendation.
• Tubular skylights shall be Solatube SolaMaster Series 21” as manufactured by Solatube International, Inc. 2210 Oak Ridge Way, Vista, CA 92083. (760) 597-4425, or equal.

Contractor shall provide gutters above all exterior doorway openings, and downspouts to convey runoff from roof and gutters to ground at locations that will avoid ponding and tie into drainage for adjacent paved areas.
2-5 **WALLS.** Non-load bearing walls shall be constructed using 2”x 4” stud-grade timber at 16” O.C. minimum. Triple studs shall be used on all exterior doors. Walls shall be equipped with double top and single bottom plates. The ceiling height shall be 8'-O" nominal interior A.F.F. Exterior walls shall be insulated with minimum R19. Sheathing shall be APA Exposure 1 plywood or OSB.

**Interior Finishes:**
- Interior paneling shall be 1/2” vinyl wrapped gypsum board with underlayment. Panel color shall be selected by the District. Restroom paneling shall be 1/8” Bestile (full height) over 3/8” backer. Color to be selected by District.
- Molding color shall match paneling. Molding base trim shall be 4” vinyl base cove. Nominal 1” wood batten shall be used at ceiling and inside corners. 1-3/8” wood shall be used for door and window casings. Nominal 1” shall be used for outside corners.
- Molding shall be secured using latex-based cove base adhesive.

**Exterior Finishes:**
- Exterior siding shall be 7/16” Louisiana Pacific Smart Panel or 7/16” Innerseal @ 8” channel groove, or equal, finished with two coats of Glidden, Dunn Edwards (or equal) paint, color to be selected by the District. Cut edges shall be primed and painted.
- Exterior trim shall be Louisiana Smart Start Trim or Innerseal 8” OC, or equal, finished with two coats of Glidden, Dunn Edwards (or equal) paint, color to be selected by the District. Cut edges shall be primed and painted.
- Contractor shall provide complete skirting around building from bottom of trailer to ground, with two access panels. Texture and color of skirting shall match exterior siding.

Wall shall attach to floor and roof per manufacturer’s recommendations and design requirements. Doors and windows shall be sealed using clear acrylic urethane or translucent silicone sealant. Provide 8’ high sound stop board system with a minimum STC rating of 48 in all interior full height walls. As an alternative Contractor may insulate all interior walls to R-19.

2-6 **EXTERIOR DOORS.** Doors shall be 36” x 80” heavy duty aluminum metal frame active RLC-3. Exterior shall be painted to match exterior siding. Doors shall be supplied with eye-level window (10 inch by 18 inch) for safety. Doors shall be supplied with heavy duty storm chain, weather stripping and drip cap. Hardware shall be Schlage “D” series heavy-duty commercial or equal. Hardware shall be finished brush chrome. All hardware shall be Grade I. All locks shall be keyed same. Keys shall be cut to District Standard. Exterior doors shall be keyed alike per District standards. Interior doors keyed separately. Four keys provided per lock set. Doors shall have commercial grade adjustable closure devices, Norton 1601 or approved equal. Closing speed shall be adjusted per District requests.
2-7 INTERIOR DOORS. Doors shall be 36" x 80" solid core prefinished woodgrain with metal jams. Hardware shall be Schlage “D” series heavy-duty commercial or equal. All hardware shall comply with current ADA requirements. Door knob bumpers shall be wall mounted.

2-8 WINDOWS. Windows shall be 48 X 48 inch (horizontal slider) nominal mill finished aluminum dual glazed clear glass with insect screens. Windows shall be supplied for each room having an exterior wall as shown on Figure 1. Windows shall be installed with windowsill 42" off of floor. One-inch horizontal mini-blinds shall be supplied and installed for all windows. Miniblinds shall be submitted to District for color selection.

2-9 FURNITURE AND PANELING. Contractor shall provide office furniture and paneling for the common areas, office and cubicle workstations. Furniture and paneling shall be as shown on Figure 2 and specified in the table below. Contractor shall submit catalog cuts to District for approval.

- Paneling systems shall be manufactured by AIS, or equal.
- Metal furniture shall be manufactured by McDowell-Craig, or equal.
- Chairs shall be manufactured by ECD, or equal.
- Panels shall be steel framed, covered with Guilford of Maine Terratex panel fabric, or equal, made from 100% recycled materials. Work surfaces shall be steel framed with the laminated surface. All other parts/components shall be steel framed with powder-coated paint. The color of the fabric and paint will be selected by the District to match existing.
- All Steelcase remanufactured products shall be warranted to be free of defects in design, material, and workmanship, given normal use, for a period of 10 years from the date of original purchase. The manufacturer shall provide support and responsiveness to the District as required.

Suppliers for furniture and paneling equipment shall be:
1. Harbor Business Interiors  Mr. Ruben Rivera  3600 West Carriage Drive  Santa Ana, CA 92706  (714) 668-0615
2. McMahan Business Interiors  Mr. Jeffrey Schiom  8645 Research Drive  Irvine, CA 92618  (949)727-1234
3. Swedlow Distributors  Mr. Mark S. Swedlow  1061 South Prospero Drive  Glendora, CA 91740  (626) 488-0522
4. or equal

Partition heights shall be a minimum height of 60" and a maximum height of 66". Contractor shall include office partitions as part of the seismic restraint design and layout for mobile office clusters. Any additional furniture required by the District shall be coordinated by the Contractor with the District, with additional compensation to be negotiated.
<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furnish and install AIM M-Wall 65&quot; And 41&quot; High Fabric Non-Powered</td>
<td>7 Cubicles</td>
</tr>
<tr>
<td>Cubicle Panel System for each cubicle as shown on the Contract</td>
<td></td>
</tr>
<tr>
<td>Drawings. Furnish all necessary hardware, trim and accessory items</td>
<td></td>
</tr>
<tr>
<td>required to complete each cubicle installation.</td>
<td></td>
</tr>
<tr>
<td>McDowell DL-7224-112, single pedestal desk 72&quot;w x 24&quot;d with box/box/</td>
<td>13 Each</td>
</tr>
<tr>
<td>file pedestal, locking</td>
<td></td>
</tr>
<tr>
<td>McDowell DL 7230-112, single pedestal desk 72&quot;w x 30&quot;d with box/box/</td>
<td>6 Each</td>
</tr>
<tr>
<td>file pedestal, locking</td>
<td></td>
</tr>
<tr>
<td>McDowell BT-4220 bridge unit 42&quot;w x 20&quot;D with flat brackets</td>
<td>12 Each</td>
</tr>
<tr>
<td>McDowell BT-4820 bridge unit 48&quot;w x 20&quot;D with flat brackets</td>
<td>1 Each</td>
</tr>
<tr>
<td>McDowell CL-7230, plan table 72&quot;w x 30&quot;d with C-legs, no pedestal</td>
<td>7 Each</td>
</tr>
<tr>
<td>McDowell MFP-112-14, mobile pedestal units box/box/file, locking</td>
<td>6 Each</td>
</tr>
<tr>
<td>Carter BC6536-12, bookcase unit 65&quot;h x 36&quot;w x 12&quot;d with adjustable</td>
<td>13 Each</td>
</tr>
<tr>
<td>shelves</td>
<td></td>
</tr>
<tr>
<td>McDowell P36-401DHF, P-series lateral file cabinet, 36&quot;w w/4 drawers,</td>
<td>7 Each</td>
</tr>
<tr>
<td>locking, keyed to desk, paint: black</td>
<td></td>
</tr>
<tr>
<td>McDowell P42-401DHF, P-series file cabinet 42&quot;w w/4 drawers, locking</td>
<td>23 Each</td>
</tr>
<tr>
<td>letter or legal filing, paint: black</td>
<td></td>
</tr>
<tr>
<td>McDowell over-desk cabinet 42&quot;w x 16&quot;h x 12&quot;d w/under-cabinet work</td>
<td>5 Each</td>
</tr>
<tr>
<td>light</td>
<td></td>
</tr>
<tr>
<td>McDowell over-desk cabinet 24&quot;w x 16&quot;h x 12&quot;d w/under-cabinet work</td>
<td>2 Each</td>
</tr>
<tr>
<td>light</td>
<td></td>
</tr>
<tr>
<td>McDowell under desk pencil drawer 20&quot;w x 20&quot;d or equal</td>
<td>6 Each</td>
</tr>
<tr>
<td>Carter OFO-4230-15, overfile organizer 42&quot;w.x 30&quot;h x 15&quot;d with 2</td>
<td>6 Each</td>
</tr>
<tr>
<td>upright supports equally spaced, with 4 adjustable shelves in each</td>
<td></td>
</tr>
<tr>
<td>section, paint: black</td>
<td></td>
</tr>
<tr>
<td>Sisneros CT7230-BT, conference table 72&quot;w x 30&quot;d with T-leg support</td>
<td>4 Each</td>
</tr>
<tr>
<td>, banded edge, laminate. Top, color to be selected by District</td>
<td></td>
</tr>
</tbody>
</table>
Plan Hold mobile plan rack 32”w x 16” d x 42” h 5 Each

ECD 1409JS-D, 1400 series ergonomic task chair, high back, fully adjustable, fabric: grade D, color: District selected, or equal 13 Each

ECD 102-D, 100 series guest side chair, fully adjustable, grade D, color: District selected, or equal 22 Each

La-Z-Boy L9105-042-B, Sequel series conference room chair, standard tilt, black frame, Grade B, Color: District selected, or equal 12 Each

42” Diameter round table with X-base, laminated plastic top, commercial grade 1 Each

Graybeal MB4836 marker board 4’w x 3’h w/black frame, porcelain steel 5 Each

Quartet QRT 3641 TE total erase mobile easel, 4’h x 6’w graphite finish 1 Each

Kitchen cork bulletin board 4’w x 3’d w/black frame 1 Each

Precision SAF 3953 72”w x 37 ½”w drafting table with SAF 3962GR stand 1 Each

Safeco SAF 1850GR 30”h x 28”w x 20”d wood mobile machine stand 1 Each

Rubbermaid RUB3540-00 gray 23-gallon slim waste receptacle 3 Each

Rubbermaid RUB29561 black 7-gallon office waste receptacle 14 Each

2-10 HVAC. HVAC system shall meet true requirements of NFPA 90A and 906 and comply with the requirements of Underwriters Laboratories Standard for Safety UL 181 for Class 1 Air Duct. Two 4-ton and one 5-ton roof mounted units shall be supplied. Contractor shall supply certified air balance calculations. Units shall have Heresite coating on all coils. No end-mounted units will be allowed. Tape used to seal joints shall meet UL 181. Joining surfaces shall be clean and free of contaminates to hinder adhesion. Fabrication and installation shall conform to North American Insulation Manufacturer’s Association’s Fibrous Glass Duct Construction Standard.

Supply:
- Ducting shall be provided.
- Duct shall be 1” minimum fiberglass duct board for main duct.
- Flex branch lines from mainline may be used.
- Adjustable supply registers shall be color coordinated with grills for return air. Color shall match interior colors.

Return grills shall be color coordinated with supply registers. Thermostats shall be wall mounted and shall be 5-day, 7-day programmable. Heating and cooling shall be supplied by same ducting system. All interior and exterior grills shall be 2 X 2 foot, metal.

2-11 PLUMBING FIXTURES FOR BATHROOMS, KITCHEN, AND JANITOR’S ROOM. Walls shall be finished with 4’-0” minimum wainscot RFP panel. Panel shall be off-white. Water supply shall be type “K” copper with lead free joint. Bathrooms will have hot and cold faucets. Waste lines shall be Schedule 40 ABS. One water heater shall be 52-gallon set at 120°F for restrooms, kitchen, and janitor’s sink. Each restroom shall be supplied with one water closet. Water closet shall be white vitreous china tank type, handicapped accessible. Men’s restroom shall be supplied with two urinals. Lavatories shall be white vitreous china tank type, handicapped accessible with single lever counter-set metallic faucet. Men’s restroom shall be supplied with two lavatories. Women’s restroom shall be supplied with one lavatory. A light/fan shall be mounted in ceiling per code. Fan shall be vented through roof and supplied with weatherproof vent cap.

Handicap accessories per bathroom:
- One set grab bars mounted per ADA.
- One roll type toilet paper holder mounted per ADA.
- One 18-inch x 36-inch minimum mirror mounted per ADA.
- Restrooms shall meet all ADA requirements.

All bathroom accessories shall be Bobrick brand, or equal. Provide isolation/shutoff valves at all fixtures. Water lines and sewer lines shall be installed to facilitate draining. Water lines shall not be run in exterior walls. Utilities shall be extended to meet stub-outs provided at the site. Installer of trailers at site shall make utility connections. Toilet partitions shall be floor based with sizes according to ADA compliance. Compartments for paper products shall be integral to the partition. Provide kitchen sink, faucet and necessary plumbing hook-ups. Kitchen shall have hot and cold faucets. Provide one stainless steel utility sink (Zurn, or equal) in janitor’s closet.

2-12 KITCHEN CABINETS AND COUNTERTOPS. Contractor shall supply and install cabinets (upper and lower) and countertop along North and East walls of kitchen (ref. Figure 1). Contractor shall submit cabinet layout (plan and elevation) views for approval by Engineer. Cabinet manufacturer shall be American Classics by RSI, or equal. Countertop manufacturer shall be Wilsonart Laminate, or equal. Engineer shall select color for cabinets and countertop.
2-13 KITCHEN APPLIANCES. Contractor shall supply the following kitchen appliances:

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water coolers to house 5 gallon bottles of water. Water cooler shall provide both hot and cold taps. Contractor shall pay for delivery service for 5-gallon bottles of water to Engineer’s trailer. Number of bottles shall be adequate to meet the needs of Engineer’s fully occupied trailer.</td>
<td>2 Each</td>
</tr>
<tr>
<td>GE Profile™ Energy Star® 21.7 Cu. Ft. Top-Freezer Refrigerator (Model No. PTS22LCSCC), or equal.</td>
<td>1 Each</td>
</tr>
<tr>
<td>Amana commercial grade countertop microwave (model no. RCS10MPS), or equal.</td>
<td>1 Each</td>
</tr>
<tr>
<td>One horsepower stainless Waste King (model no. 9980), or equal, disposer.</td>
<td>1 Each</td>
</tr>
<tr>
<td>Bunnomatic (model no. VP17-2) commercial type coffeemaker, or equal.</td>
<td>1 Each</td>
</tr>
<tr>
<td>Faberware (model no. FST200) toaster, or equal.</td>
<td>1 Each</td>
</tr>
<tr>
<td>Hamilton Beach (model no. 31169) toaster oven with convection cooking, or equal.</td>
<td>1 Each</td>
</tr>
</tbody>
</table>

2-14 IDENTIFICATION. Trailer shall be identified with a data plate having the following information:
- 1. Name and address of manufacturer
- 2. Manufacturer identification number
- 3. Certification label number
- 4. Construction classification
- 5. Occupancy classification
- 6. Seismic design
- 7. Wind load design
- 8. Roof load
- 9. Floor live load
- 10. Fire rating
- 11. Thermal transmittance valves
- 12. Date of manufacture

2-15 DECKING, STAIRS AND RAILINGS. Contractor shall provide exterior decking, stairs and ramps in locations shown on civil drawings. Decking shall not be supported by building. Minimum stair tread width is 11 inches and maximum
rise is 7 inches. Handrails are required on both sides of the stairs. Handrails are to extend a minimum of 12 inches beyond the top nosing and 12-inches, plus the tread width, beyond the bottom nosing, with end returned to or terminated in new posts. Handrails are to be 34 to 38-inches above the nosing of the treads. Handrail grip shall be not less than 1-1/4 inches or more than 1-1/2-inches in diameter. Guardrail/handrail shall be installed so that a 4-inch diameter sphere cannot pass through intermediate rails and a 6-inch diameter sphere cannot pass between the area formed by the riser and tread. Guardrail/handrail shall be capable of withstanding a load applied to the top rail in any direction of 50 pounds per foot or 200 pounds whichever is greater. The upper and lower treads of each stairway run shall be marked by a strip of contrasting color of at least 2-inches in width. Stairway treads and deck shall be slip resistant. Coat all new deck, stair and ramp surfaces with Elasto-deck 5001, or equal. Pressure wash and apply Elasto-deck 5001 to all surfaces on the existing P2-66 Trailer decking, stairs and ramps. Provide and install one fixed ladder from ground to roof for maintenance of HVAC equipment. Location to be determined by Engineer in the field.

2-16 Office Equipment. Contractor shall provide the following items:

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>72-inch combination Television with DVD player wall mounted in</td>
<td>1 Each</td>
</tr>
<tr>
<td>Conference Room</td>
<td></td>
</tr>
<tr>
<td>Two-line telephones with speaker, memory, intercom, and</td>
<td>12 Each</td>
</tr>
<tr>
<td>conference call features</td>
<td></td>
</tr>
<tr>
<td>Two-line administrative telephone</td>
<td>1 Each</td>
</tr>
<tr>
<td>Hands free speaker phone for conference room, with two (2)</td>
<td>1 Each</td>
</tr>
<tr>
<td>extension microphones</td>
<td></td>
</tr>
<tr>
<td>Printer / Fax Machine / Scanner / Copier / Email. XEROX Work</td>
<td>2 Each</td>
</tr>
<tr>
<td>Centre 7132 all-in-one series with the following minimum features:</td>
<td></td>
</tr>
<tr>
<td>- One-touch speed dial buttons – 75</td>
<td></td>
</tr>
<tr>
<td>- Memory capacity – 40 GB</td>
<td></td>
</tr>
<tr>
<td>- Automatic document feeder – 50 pages</td>
<td></td>
</tr>
<tr>
<td>- Monthly volume – 100,000 pages</td>
<td></td>
</tr>
<tr>
<td>- Color printing and copying</td>
<td></td>
</tr>
<tr>
<td>- Copy speed (normal):</td>
<td></td>
</tr>
<tr>
<td>\quad Black – Up to 32 ppm</td>
<td></td>
</tr>
<tr>
<td>\quad Color – Up to 8 ppm</td>
<td></td>
</tr>
<tr>
<td>- Contract for immediate site service</td>
<td></td>
</tr>
<tr>
<td>Ethernet switches, hubs, and drop cables for a Local Area</td>
<td>As Required</td>
</tr>
</tbody>
</table>
Network.

<table>
<thead>
<tr>
<th>Workplace First Aid Cabinet for General Business (25-person)</th>
<th>1 Each</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide fire extinguishers</td>
<td>4 Each</td>
</tr>
</tbody>
</table>

Cisco 2960-24 port 10/100 Switch

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS-C2960-24TT-L; Catalyst 2960 24 10/100 + 2 1000BT LAN Base Image</td>
<td>1 Each</td>
</tr>
<tr>
<td>CAB-AC; Power Cord, 110V</td>
<td>1 Each</td>
</tr>
<tr>
<td>CON-OS-C29602TT, ONSITE 8X5XNBD Catalyst 2960 24 10/100 + 2 1000BT LAN</td>
<td>3 Each</td>
</tr>
</tbody>
</table>

Cisco 1941 Router

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISCO1941-SEC/K9; Cisco 1941 Security Bundle w/SEC license PAK</td>
<td>1 Each</td>
</tr>
<tr>
<td>S19UK9-15001M; Cisco 1941 IOS UNIVERSAL</td>
<td>1 Each</td>
</tr>
<tr>
<td>SL-19-DATA-K9; Data License for Cisco 1900</td>
<td>1 Each</td>
</tr>
<tr>
<td>MEM-CF-256U512MB; 256MB to 512MB CF Upgrade for Cisco 1900,2900,3900 ISR</td>
<td>1 Each</td>
</tr>
<tr>
<td>AC Power Cord (North America), C13, NEMA 5-15P, CAB-AC; 2.1m</td>
<td>1 Each</td>
</tr>
<tr>
<td>PWR-1941-AC; Cisco 1941 AC Power Supply</td>
<td>1 Each</td>
</tr>
<tr>
<td>ISR-CCP-EXP; Cisco Config Pro Express on Router Flash</td>
<td>1 Each</td>
</tr>
<tr>
<td>MEM-1900-512MB-DEF; 512MB Default DRAM for Cisco 1941 ISR</td>
<td>1 Each</td>
</tr>
<tr>
<td>SL-19-IPB-K9; IP Base License for Cisco 1900</td>
<td>1 Each</td>
</tr>
<tr>
<td>SL-19-SEC-K9; Security License for Cisco 1900</td>
<td>1 Each</td>
</tr>
<tr>
<td>CON-SNT-1941SEC; SMARTNET 8X5XNBD Cisco 1941 Security Bundle w/SEC license</td>
<td>3 Each</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>AIR-AP1142N-A-K9</td>
<td>802.11a, .11g AP, Int Radios, Ants, FCC Cnfgr</td>
</tr>
<tr>
<td>AIR-AP1131AG-A-K9</td>
<td>AIR Line Cord North America</td>
</tr>
<tr>
<td>S114W7K9-12421JA</td>
<td>Cisco 1140 Series IOS WIRELESS LAN</td>
</tr>
<tr>
<td>AIR-PWRINJ4=</td>
<td>Power Injector - 1140 / 1250 Series; Spare</td>
</tr>
<tr>
<td>CON-SNT-1142NAK</td>
<td>SMARTNET 8X5XNBD 802.11a/g/n Fixed Unified AP; Int Ant</td>
</tr>
</tbody>
</table>

**Riverbed for WAN optimization**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHA-00550-H</td>
<td>Steelhead 550 with 2 onboard GbE bypass ports (600 conn/2Mbps)</td>
<td>1 Each</td>
</tr>
<tr>
<td>MNT-GLD-SHA-00550</td>
<td>Gold level annual support for Steelhead Appliance 550 Series</td>
<td>1 Each</td>
</tr>
<tr>
<td>MEM-002</td>
<td>2 GB Memory</td>
<td>1 Each</td>
</tr>
<tr>
<td>RMK-001</td>
<td>Rack Mount Kit for Steelhead SH250/550</td>
<td>1 Each</td>
</tr>
<tr>
<td>RSP-PCK-02</td>
<td>RSP Multi-Package License</td>
<td>1 Each</td>
</tr>
<tr>
<td>MNT-RSP-PCK-02</td>
<td>RSP Multi-Package License Support</td>
<td>1 Each</td>
</tr>
</tbody>
</table>

**UPS**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUA750</td>
<td>APC Smart-UPS 750VA USB &amp; Serial 120V</td>
<td>1 Each</td>
</tr>
<tr>
<td>AP9617</td>
<td>NETWORK MANAGEMENT CARD EX</td>
<td>1 Each</td>
</tr>
</tbody>
</table>

Network printer HP Model 5550DN or greater capable of 11X17 printing and network accessible.  
- Contract for immediate site service
Multi-Function Device (MFD), Konica BizHub C220 or greater 1 Each capable of color printing, 11X17 printing, scan to email and fax capabilities.

- Contract for immediate site service

The contractor shall provide an Internet, T1 line or greater. The internet circuit shall be provided for the duration of the project to the CM with an Ethernet handoff. Provide a public routable IP address scheme with a subnet mask of /29 for routable addresses. The Contractor shall provide LAN Line telephone service and voicemail and will perform maintenance including move, add, and changes for the duration of the project. Each network component and UPS device will carry the stated maintenance types until thirty (30) days after Final Acceptance.

Contractor shall provide all consumable supplies necessary for complete operation of the equipment specified under this section shall be furnished by Contractor until thirty (30) days after Final Acceptance. These supplies include, but are not limited to, ink and toner cartridges, plain paper, first-aid supplies, and fire extinguisher certification.

2-17 INSPECTION. Manufacturer must have all trailers inspected by a third party or agency approved by Department of Housing. Seals shall be affixed to each trailer section prior to shipping. Engineer may inspect trailers at place of manufacture, prior to shipment to project site. Contractor shall provide Engineer with minimum two weeks’ notice prior to shipment.

PART 3 - NOT USED
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[REVISED PER ADDENDUM NO. 3]
PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. This Section describes procedures for site access and pedestrian traffic during construction on-site and off-site in public streets and highways. The Contract Drawings show access requirements for the Work.

B. All work shall be performed in accordance with approved traffic control plans and specifications, Caltrans - Manual of Traffic Control Devices for Construction and Maintenance Work Zones, Standard Plans, Standard Specifications; and the WATCH Manual.

C. All work shall be coordinated so as to minimize the closing of streets or public right-of-way. The Contractor shall at all times keep the City of Fountain Valley, City of Huntington Beach, Police Department, Fire Department, and the California Department of Transportation informed of streets or lanes that are closed and when they are re-opened. A permit for any street or lane closure on City streets must be obtained from the appropriate agency. The Contractor shall comply with all conditions of said permits.

D. The Contractor shall furnish, install, construct, maintain, and remove detours, road closures, lights, temporary signals, signs, striping, markings, barricades, fences, K-rail, flares, flagmen, drainage facilities, paving, and such other items and services as are necessary to adequately safeguard the public from hazard and inconvenience. All such work shall comply with Laws and Regulations of authorities with jurisdiction over the public roads in which the construction takes place and over which detoured traffic is routed by the Contractor.

E. The Contractor shall maintain and keep all temporary traffic control devices in good repair and working order until no longer required. The maintenance shall be at the Contractor's expense. The Contractor shall also pay the cost of replacing such devices that are lost or damaged, to such an extent as to require replacement, regardless of the cause of such loss or damage.

F. Prior to the start of construction operation, the Contractor shall notify the police and fire department, giving the expected starting date and completion date. Notifications on job progress to the emergency service agencies shall be in accordance with procedures and channels to be
established at the pre-construction meeting. In addition, the Contractor shall provide the police and fire departments with the name and telephone number of at least two responsible persons who may be contacted at any hours in the event of a condition requiring immediate correction.

G. The Contractor shall provide reflectorized cones, delineators, or barricades used in the diversion of traffic with flashers, arrow boards, or other approved illumination if in place during hours of darkness. All signs shall be illuminated or reflectorized unless otherwise approved by the appropriate jurisdictional agency.

H. The Contractor shall provide a minimum of 48-hours notice to the appropriate agency for any work that may affect signal loops, equipment, or devices. In the event that any underground utilities, traffic devices, pipes, or conduits are damaged and require emergency repair by the appropriate agency, all costs incurred by the appropriate agency in making such repairs, plus 25 percent for administration costs, shall be paid by the Contractor.

I. The Contractor shall post temporary "No Parking – Tow Away" signs 48 hours prior to work in areas where parking is normally permitted. Police Departments of the Cities within the project areas shall be notified 48 hours prior to the posting of any temporary parking restrictions in the respective City.

J. The Contractor shall coordinate the relocation of bus routes and bus stops with the Orange County Transit Authority staff three weeks in advance of construction activity affecting bus stops.

K. The Contractor shall maintain a 24-hour emergency service to remove, install, relocate, and maintain warning devices and furnish to the authority having jurisdiction the names and telephone number of the person(s) responsible for this emergency service. The emergency response service shall be through cellular phones in order to minimize response time to a construction related emergency. In the event these persons do not promptly respond or the authority having jurisdiction deems it necessary to call out other forces to accomplish emergency service, the Contractor shall pay the cost of such emergency service.

L. The Contractor shall utilize the designated Laydown Areas as shown in the Contract Documents for the exclusive use of delivery, handling and storage of tools, materials and equipment only and no employee parking within the Laydown Area will be allowed.

M. The Contractor shall locate and develop a designated Off-Site Workforce Parking location for utilization of all daily workers at the Contractor's expense. Only employees housed in the Contractor's temporary offices shall be permitted to park on-site. Contractor's Superintendents, Foremen and Inspectors and Subcontractor's Superintendents & Foremen
shall be allowed access on-site provided they are driving authorized company vehicles.

N. All school district and private schools affected by construction activities shall be notified on construction schedules to lessen potential impacts to instructional and transportation services. Ample time shall be provided so affected schools can prepare and plan for possible disruptions caused by project construction.

1.2 SUBMITTALS

A. A traffic control plan shall be prepared by the Contractor for the AWTF work, and approved by the City of Fountain Valley and applicable agencies.

A traffic control plan shall be prepared by the Contractor for the work at OCSD’s Plant 2 and approved by the City of Huntington Beach and applicable agencies.

B. The On-Site Traffic Control Plan shall be submitted to and approved by the Engineer in compliance with all applicable requirements of this specification and all applicable contract documents.

D. The Contractor shall include in the On-Site Traffic Control Plan, the proposed areas for staging and the route(s) for ingress and egress of demolition haul-off trucks, mass excavation and haul-off trucks, import materials trucks, concrete delivery trucks, pipe and equipment materials delivery trucks and vehicles.

E. The Contractor shall meet with the Owner’s and OCSD’s Plant Operations Manager and Engineer for coordination of the traffic plan development with existing operations. The plan shall show the route(s) of Existing Plant Operational deliveries and shall designate areas on the plan for emergency response staging for coordination with local fire & life safety agencies.

F. The Contractor shall coordinate its proposed traffic route(s) that travel on or through the property of the Owner’s and OCSD’s Plant Operation and other construction contractors working on the Owner’s and OCSD’s property.

1.3 DETOURS

A. Whenever streets or alleys are closed as provided herein, it will be the sole responsibility of the Contractor to adequately mark and light the detours.

B. A minimum of forty-eight (48) hours prior to closing any streets to traffic, the Contractor shall notify the appropriate City and/or County Fire and Police
Departments and the California Department of Transportation (if appropriate) of the time of closure, and of the streets closed and the approved detour routing.

1.4 TRAFFIC MAINTAINED OVER CONSTRUCTION

A. Where traffic is maintained along the street or alley under construction, particular care shall be used to shape and maintain the roadbed so that a safe and convenient roadway is available to the traveling public. Temporary cold mix asphalt shall be used to cover backfilled trenches at the end of each day's work. Ramps from undisturbed streets onto disturbed areas shall be maintained for traffic on gradual grades and in no case shall a ramp be steeper than a 6 horizontal to 1 vertical slope. The Contractor shall make full provision for dust control.

1.5 BARRICADES AND WATCHMEN

A. At the end of each workday, it shall be the responsibility of the Contractor to check each job site to insure proper barricading. Barricades will not be removed from each job site until the hazard has been removed.

B. The Contractor shall erect and maintain barricades and sufficient safeguards around all excavation, embankments, and obstructions; shall provide suitable warning lights on or near the work and keep them lighted at night or other times when visibility is limited and shall employ such watchmen as may be necessary for the protection of the public. Barricading shall occur in conformance with California Department of Transportation Manual of Traffic Controls for Construction and Maintenance Work Zones and the WATCH Manual and shall be approved by the inspector prior to any work.

1.6 PROTECTION OF STREET SIGNS, TRAFFIC SIGNS, AND SIGNALS

A. Street signs, traffic signs, signals, and other traffic control devices erected by the City, County, or State for information and to safeguard traffic must be protected by the Contractor. Where it is necessary to disturb or remove any of these items, the Contractor shall secure approval of the Engineer prior to any such work, this approval to be based on concurrence and requirements from the agency having jurisdiction.

B. All traffic control devices shall be restored to their original condition at the end of the Work to the satisfaction of the Owner, OCSD or applicable agency's traffic engineer.

C. Prior to the commencement of construction and ongoing during construction, property owners/residents/businesses within and adjacent to
construction activity shall be notified of the specific construction activity and associated schedule. Additionally, signs shall be posted at strategic locations within the Project area, specifically within the City limits of Fountain Valley and Huntington Beach; easily visible at all times during construction. The notifications and signs shall identify the address, “hotline” number, and name of designated person to contact for the purpose of responding to questions or complaints during the construction period. The notifications and signs shall also identify the hours of permissible construction work and estimated duration.

1.7 MAINTAINING TRAFFIC

A. Construction warning signs and sign placement shall conform to the latest revision of the California Department of Transportation Manual for Traffic Controls and for Construction and Maintenance Work Zones.

B. As noted in Paragraph 1.2, a traffic control plan will be prepared and will be implemented as part of this Contract. This plan is expected to be used in permit applications to regulatory agencies. Any changes to the traffic control plans must be approved by the applicable permit agencies.

C. The Contractor shall furnish and maintain construction traffic control signing that shall include advance warning signs required by the Engineer during construction that interfaces with any moving traffic lane.

D. All materials delivered to the job shall be unloaded and placed in a manner which will not interfere with the flow of necessary traffic.

E. The Contractor shall cleanup all roadways at the end of each work day.

F. The Contractor shall maintain two lanes of traffic on all streets unless otherwise noted.

I. Contractor shall, as necessary, wash truck tires leaving the site to reduce the amount of particulate matter transferred to paved streets as required by SCAQMD Rule 403.

J. Contractor shall sweep on and off-site streets if silt is carried over to adjacent public thoroughfares, as determined by the City Engineers in the affected jurisdictions to reduce the amount of particulate matter on public streets.
1.8 PEDESTRIAN TRAFFIC CONTROL

A. Unless otherwise shown on the plan, the Contractor shall maintain and delineate a minimum of one 4-foot-wide pedestrian walkway along each public street at all times during construction. Maintain existing pedestrian accesses at intersections at all times. When existing crosswalks are blocked by construction activity, install signs directing pedestrian traffic to the nearest alternative crosswalk.

B. Erect a fence or provide other means to preclude unauthorized entry to any open excavation during all nonworking hours on a 24-hour basis including weekends and holidays. Said fence shall be a minimum of 7 feet high around the entire excavation, consisting of a minimum 9-gage chain link type fence fabric and shall be sturdy enough to prohibit toppling by children or adults. There shall be no openings under the wire large enough for any child to crawl through. Lock any gates if no adult is in attendance. Place warning signs spaced on 50-foot centers on the outside of the fence with the statement "DEEP HOLE DANGER".

1.9 ACCESS TO ADJACENT PROPERTIES

A. General: Maintain reasonable access from the public streets to all adjacent properties at all times during the construction. Prior to restricting normal access from public streets to adjacent properties, notify each resident, informing him or her of the nature of the access restriction, the approximate duration of the restriction, and the best alternate access route for that particular property.

B. During the progress of the work, the Contractor shall provide free access to fire hydrants, water and gas valves; gutters and waterways must be kept open or other suitable provisions made for the removal of stormwater. Access to residential and commercial property must be maintained at all times. The Contractor shall build and maintain temporary driveways, bridges, and crossings such as in the opinion of the Engineer are necessary to reasonably accommodate the public. In the event of the Contractor's failure to comply with the same, the Owner may cause such work to be done by others and deduct the cost of such work from any money due or to become due the Contractor under this Contract. Performance of such work by the Owner shall serve in no way to release the Contractor from his general or particular liability for the safety of the Public or the work.

C. Access to police and fire station facilities shall be maintained at all times. Only one driveway of a safety facility shall be closed at any one time.
1.10 SITE SECURITY AND ACCESS CONTROLS

A. The Contractor shall provide security guard(s) at the entrance to the project sites at all times during normal working hours.

B. The Contractor shall develop a badge identification system with picture identification for all workers that will be assigned to the project for more than ten working days or who will be required to provide repeated deliveries on an ongoing/return basis. All truck delivery drivers shall be required to sign in at the guard station to receive a temporary day badge for that day. No workers will be allowed onsite without their identification and Contractor shall remove any worker from the workforce that is in repeated non-compliance.

C. The use of the East Perimeter Road and other plant roads beyond the project areas shown on the Contract Drawings is subject to approval by the Engineer.

The use of the North Perimeter Road (Administration Area) and Front Security Station and guard are prohibited.

[INSERT REQUIREMENTS FOR PLANT 2]

The Contractor shall provide a manned Security Station at all points of ingress and egress from the project area. The Contractor shall coordinate the security procedure with the Owner’s and OCSD’s Security Department. The security procedure shall be approved by the Engineer. Copies of all security logs and records shall be submitted to the District each month.

All regular staff shall be issued parking passes which are approved by the Engineer. All other construction traffic should sign IN/OUT at the security station. All the Contractor’s field offices storage facilities and parking shall be contained within the Contractor’s designated staging area. The Contractor shall make plans for offsite overflow parking. Provide a copy of the Offsite Parking Plan to the Engineer.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section
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PART 1 – GENERAL

1-1. SCOPE. Furnish, install and maintain project identification signs. Install the sign within 30 days of the Notice to Proceed.

Remove sign on completion of construction.

Allow no other signs to be displayed.

1-2. SUBMITTALS. Prior to fabrication of the sign, submit a “mock-up” sample of the proposed sign and graphics for review and approval by the Engineer.

1-3. PROJECT IDENTIFICATION SIGN. Three (3) painted sign of not less than 32 square feet (3 square meters) area, with painted content to include:

1) Final Expansion of the Groundwater Replenishment System
2) Orange County Water District
3) Names and Titles of Authorities
4) Project and completion dates
   a) Consulting Engineer: Black & Veatch
   b) Construction Manager: TBD
5) Prime Contractor
6) Major Subcontractors

1-4. INFORMATIONAL SIGNS. Painted signs with painted lettering, or standard products:

1) Size of signs and lettering: as required by regulatory agencies, or as appropriate to usage.
2) Colors: as required by regulatory agencies, otherwise uniform colors throughout Project.

PART 2 - PRODUCTS
2-1. **SIGN MATERIALS.**

Structure and Framing: may be new or used, wood or metal, in sound condition structurally adequate to work and suitable for specified finish.

Sign Surfaces: Exterior softwood plywood with medium density overlay, standard large sizes to minimize joints.

Thickness: As required by standards to span framing member, to provide even, smooth surface without waves or buckles.

Rough Hardware: Galvanized

Paint: Exterior Quality:

   Use Bulletin colors for graphics.

   Colors for structure, framing, sign surfaces and graphics: As selected by Engineer.

   Adequate to resist weathering and fading for scheduled construction period.

**PART 3 – EXECUTION**

3-1. **PROJECT IDENTIFICATION SIGN.** Paint exposed surfaces of supports, framing and surface material; one coat of primer and one coat of exterior paint.

Paint graphics in styles, sizes, and colors selected by Owner and Engineer

3-2. **MAINTENANCE.** Maintain signs and supports in a neat, clean condition; repair damages to structure, framing or sign.

3-3. **REMOVAL.** Remove signs, framing, supports and foundations at completion of project.

End of Section
Final Expansion of the Groundwater Replenishment System:

We are enhancing the plant to provide water for future generations

Contractor: To Be Determined (TBD)
Start: TBD
Expected Completion: TBD

Design Engineer: Black & Veatch
Construction Manager: TBD

For more information, go to www.gwrsystem.com or call (714) 378-3200
1. **SCOPE.** When an equipment specification section in this Contract references this section, the equipment shall conform to the general stipulations set forth in this section, except as otherwise specified in other sections.

2. **COORDINATION.** Contractor shall coordinate all details of the equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. Contractor shall be responsible for all structural and other alterations in the Work required to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or Specifications.

3. **MANUFACTURER’S EXPERIENCE.** Unless specifically named in the Specifications, a manufacturer shall have furnished equipment of the type and size specified which has been in successful operation for not less than the past 5 years.

4. **WORKMANSHIP AND MATERIALS.** Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

   All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.

   Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment shall conform to AISC standards. All structural members shall be designed for shock or vibratory loads. Unless otherwise specified, all steel which will be submerged, all or in part, during normal operation of the equipment shall be at least 1/4 inch thick. When dissimilar metal components are used, consideration shall be given to prevention of galvanic corrosion.

5. **STRUCTURAL DESIGN REQUIREMENTS.** All equipment, including non-structural components and non-building structures as defined in ASCE 7, and their anchorage, shall be designed and detailed in accordance with the Meteorological and Seismic Design Criteria section. Submittals for equipment and other non-structural components and non-building structures shall include a seal by a professional engineer registered in the state of the project, to confirm that the anchorage design meets the code requirements. Conformance to the
building code of the Contractor designed pipe support systems, shall be certified by a professional engineer registered in the state of the project.

6. **LUBRICATION.** Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during startup or shutdown and shall not waste lubricants.

Lubricants of the types recommended by the equipment manufacturer shall be provided in sufficient quantities to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation prior to acceptance of equipment by Owner. Lubricants for equipment where the lubricants may come in contact with water before or during a potable water treatment process or with potable water, shall be food grade lubricants. This includes lubricants for equipment not normally in contact with water, but where accidental leakage of the lubricants may contaminate the water.

Lubrication facilities shall be convenient and accessible. Oil drains and fill openings shall be easily accessible from the normal operating area or platform. Drains shall allow for convenient collection of waste oil in containers from the normal operating area or platform without removing the unit from its normal installed position.

7. **ELEVATION.** The elevation of the site shall be as indicated in the Meteorological and Seismic Design Criteria section. All equipment furnished shall be designed to meet stipulated conditions and to operate satisfactorily in the specified elevation.

8. **ELECTRIC MOTORS.** Unless otherwise specified, motors furnished with equipment shall meet the requirements specified in the General Purpose Induction Motors section or specified in specific equipment sections.

9. **DRIVE UNITS.** The nominal input horsepower rating of each gear or speed reducer shall be at least equal to the nameplate horsepower of the drive motor. Drive units shall be designed for 24-hour continuous service.

9.01. **Gearmotors.** The use of gearmotors sharing an integral housing or cutgears into the motor output shaft, or that require removal of lubricant from the gear reducer to change out the motor will not be acceptable.

9.02. **Gear Reducers.** Each gear reducer shall be a totally enclosed unit with oil or grease lubricated, rolling element, antifriction bearings throughout.

Unless superseded by individual specification requirements each helical, spiral bevel, combination bevel-helical, and worm gear reducers shall have a service factor of at least 1.50 based on the nameplate horsepower of the drive motor.
Cycloidal gear reducers shall have a service factor of at least 2.0 based on the nameplate horsepower of the drive motor. Shaft-mounted and flange-mounted gear reducers shall be rated AGMA Class III. Helical gear reducers shall have a gear strength rating to catalog rating of 1.5. Each gear reducer shall be designed and manufactured in compliance with applicable most current AGMA standards, except the $L_{10}$ bearing life shall be 200,000 hours.

The thermal horsepower rating of each unit shall equal or exceed the nameplate horsepower of the drive motor. During continuous operation, the maximum sump oil temperature shall not rise more than 100°F above the ambient air temperature in the vicinity of the unit and shall not exceed 200°F.

Each grease lubricated bearing shall be installed in a bearing housing designed to facilitate periodic regreasing of the bearing by means of a manually operated grease gun. Each bearing housing shall be designed to evenly distribute new grease, to properly dispose of old grease, and to prevent overgreasing of the bearing. The use of permanently sealed, grease lubricated bearings will not be acceptable in large sized reducers. In small reducers, similar to basin equipment, permanently sealed grease lubricated bearings rated $L_{10}$ 200,000 hour life may be provided at the manufacturer’s option. An internal or external oil pump and appurtenances shall be provided if required to properly lubricate oil lubricated bearings. A dipstick or a sight glass arranged to permit visual inspection of lubricant level shall be provided on each unit.

Gear reducers which require the removal of parts or the periodic disassembly of the unit for cleaning and manual regreasing of bearings will not be acceptable.

Certification shall be furnished by the gear reducer manufacturer indicating that the intended application of each unit has been reviewed in detail by the manufacturer and that the unit provided is fully compatible with the conditions of installation and service.

9.03. **Adjustable Speed Drives.** Each mechanical adjustable speed drive shall have a service factor of at least 1.75 at maximum speed based on the nameplate horsepower [kilowatts] of the drive motor. A spare belt shall be provided with each adjustable speed drive unit employing a belt for speed change. Unless specifically permitted by the detailed equipment specifications, bracket type mounting will not be acceptable for variable speed drives.

9.04. **V-Belt Drives.** Each V-belt drive shall include a sliding base or other suitable tension adjustment. V-belt drives shall have a service factor of at least 1.75 at maximum speed based on the nameplate horsepower of the drive motor.

10. **SAFETY GUARDS.** All belt or chain drives, fan blades, couplings, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety
guards shall be fabricated from 16 USS gage [1.52 mm] thick or thicker galvanized, aluminum-clad sheet steel, or stainless sheet steel or from 1/2 inch [12.7 mm] mesh galvanized expanded metal, or pultrusion molded UV resistant materials. Each safety guard shall be reinforced or shaped to provide suitable strength to prevent vibration and deflection and shall comply with OSHA. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

11. **ANCHOR BOLTS.** Equipment suppliers shall furnish suitable anchor bolts for each item of equipment. Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete is placed. Anchor bolt materials shall comply with the Anchorage in Concrete and Masonry section, and sleeves shall be provided as indicated on the drawings. Unless otherwise specified, anchor bolts shall be at least 3/4 inch in diameter.

Unless otherwise indicated or specified, anchor bolts for items of equipment mounted on baseplates shall be long enough to permit 1-1/2 inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete.

12. **EQUIPMENT BASES.** Unless otherwise indicated or specified, all equipment shall be installed on concrete bases at least 6 inches high. Cast iron or welded steel baseplates shall be provided for pumps, compressors, and other equipment. Each unit and its drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components, and adequate grout holes. Baseplates for pumps shall have a means for collecting leakage and a threaded drain connection. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with grout as specified in the Grouting section.

13. **SPECIAL TOOLS AND ACCESSORIES.** Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

14. **SHOP PAINTING.** All iron and steel surfaces of the equipment shall be protected with suitable protective coatings applied in the shop. Surfaces of the equipment that will be inaccessible after assembly shall be protected for the life of the equipment. Coatings shall be suitable for the environment where the equipment is installed. Exposed surfaces shall be finished, thoroughly cleaned, and filled as necessary to provide a smooth, uniform base for painting. Electric motors, speed reducers, starters, and other self-contained or enclosed
components shall be shop primed or finished with an epoxy or polyurethane enamel or universal type primer suitable for top coating in the field with a universal primer and aliphatic polyurethane system.

Surfaces to be coated after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of a universal primer.

Machined, polished, and nonferrous surfaces which are not to be painted shall be coated with rust-preventive compound as recommended by the equipment manufacturer.

15. PREPARATION FOR SHIPMENT. Equipment shall be prepared for shipment as specified in the Shipping section.

16. STORAGE. Handling and storage of equipment shall be as specified in the Handling and Storage and Requirements section.

17. INSTALLATION AND OPERATION. Installation and operation shall be as specified in respective equipment sections and the Startup Requirements section.

18. OBSERVATION OF PERFORMANCE TESTS. Where the Specifications require the presence of Engineer, initial tests shall be observed or witnessed by Engineer. Owner shall be reimbursed by Contractor for all costs of subsequent visits by Engineer to witness or observe incomplete tests, retesting, or subsequent tests.

19. PROGRAMMING SOFTWARE. Programming software shall be provided for any equipment which includes a programmable logic controller (PLC) or other digital controller that is user-programmable. The software shall be suitable for loading and running on a laptop personal computer operating with a Windows-based operating system. A copy of the manufacturer's original operating logic program shall be provided for use in maintaining and troubleshooting the equipment. Where multiple pieces of equipment, from the same or different vendors, use the same programming software, only one copy of the software need be provided. Programming software shall be provided to Engineer, Owner, and OCSD.

End of Section
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Section 01611

METEOROLOGICAL AND SEISMIC DESIGN CRITERIA

1. SCOPE. Buildings, non-structural components and non-building structures shall be designed in accordance with this section. In the event of conflict with requirements in other sections, the more stringent criteria shall be followed.

2. DESIGN CRITERIA. Buildings, non-structural components, non-building structures including anchorage of such items, shall be designed in accordance with the following criteria.

General Design Data - AWTF:

Building code and references CBC 2016 edition, ASCE

7-10 "Minimum Design Loads for Buildings and Other Structures", AISC

360 “Specification for Structural Steel Buildings”, AISC 341

“Seismic Provisions for Structural Steel Buildings”

Site elevation, above mean sea level (ft)

21.5’ (Plant 1)

13.0’ (Plant 2)

Design flood elevation, DFE (ft) NA

Design groundwater elevation (ft)

16.5’ (Plant 1)

1.50’(Plant 2)

Wind Design Data:

Basic wind speed, V (mph) 115

Exposure category C

Risk Category (wind loads), III
**Seismic Design Data for Building Structures**

<table>
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<tr>
<th>Description</th>
<th>Value</th>
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<tr>
<td>Mapped MCE short period spectral response acceleration, $S_s$</td>
<td>$1.557g$ (Plant 1), $1.67g$ (Plant 2)</td>
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<td>Mapped MCE one second period spectral response acceleration, $S_1$</td>
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Non-Structural Components Importance factors, $I_P$                        | As indicated in the Non-Structural Component Schedule |
Non-Structural Components Seismic Design Category                           | D                                                      |
Non-Building Structures Importance factors, $I$                            | As indicated in the Non-Building Structure Schedule or in the applicable reference documents, whichever is greater. |
3. **WIND ANCHORAGE.** Equipment that is to be located outdoors shall have anchor bolts designed for the effects of wind forces, as determined in accordance with ASCE 7, Chapter 6. Design of anchorage into concrete shall be in accordance with ACI 318 Chapter 17, shall consider concrete to be cracked, and shall not include the strengthening effects of supplementary reinforcement or anchor reinforcement unless approved by Engineer. Design of anchorage into masonry shall be in accordance with ACI 530. Post-installed anchors into concrete or masonry may be used only when approved by Engineer, and shall be designed in accordance with the anchor manufacturer’s research report. Shop drawings shall include full anchor bolt details, and shall be sealed by a professional engineer licensed in the state of the project. Calculations shall be furnished when requested by Engineer.

4. **SEISMIC DESIGN.**

4-1. **General.** Structural systems shall provide continuous load paths, with adequate strength and stiffness to transfer all seismic forces from the point of application to the point of final resistance.

4-2. **Pre-Engineered Buildings.** Pre-engineered buildings shall have sufficient strength and ductility to resist the specified seismic effects defined for buildings and shall meet all of the design, proportioning, detailing, inspection, and quality assurance provisions of the specified building code.

"W" for buildings shall include the total dead load, the total operating weight of permanent equipment and the effective contents of vessels, and applicable portions of other loads, as required by the specified building code.

4-3. **Non-Structural Components.** Non-structural components are architectural, mechanical, and electrical items that are permanently attached to and supported by a structure but are not part of the structural system, as indicated in Chapter 13 of ASCE 7. The Non-Structural Components Schedule identifies the components that require seismic design. The requirements of this paragraph are applicable only to the items listed in the Non-Structural Components Schedule.
4-3.01. **General.** Design of non-structural components shall be in accordance with all applicable provisions of ASCE 7, Chapter 13. \( W_p \) shall include the total operating weight of the component or system, including, but not limited to, any insulation, fluids, and concentrated loads such as valves, condensate traps, and similar components.

4-3.02. **Anchorage Design.** Every component in the Non-Structural Components Schedule shall have its anchorage to the supporting structure designed in accordance with ASCE 7, Chapter 13. Design of anchorage into concrete shall be in accordance with ACI 318 Chapter 17, shall consider concrete to be cracked, and shall not include the strengthening effects of supplementary reinforcement or anchor reinforcement unless approved by Engineer. Design of anchorage into masonry shall be in accordance with ACI 530. Post-installed anchors into concrete or masonry may be used only when approved by Engineer, and shall be designed in accordance with the anchor manufacturer’s research report.

Components shall be attached so that seismic forces are transferred to the structural system. Curbs that support roof-mounted equipment shall be designed to transfer forces from the equipment into the main structural roof members. All structural attachments shall be bolted, welded, or otherwise positively fastened. Frictional resistance due to gravity shall not be considered in evaluating the required resistance to seismic forces.

4-3.03. **Component Design.** Components indicated in the Non-Structural Components Schedule to require design of the component itself, as opposed to an anchorage design alone, shall be designed in accordance with ASCE 7, Chapter 13.

Components shall have sufficient strength and ductility to resist the specified seismic effects, and shall meet all of the design, proportioning, detailing, inspection, and quality assurance provisions of the specified building code and other referenced codes. Components shall be designed to be operable during and following a design level seismic event without collapsing, breaking away from supports, creating an ignition hazard, or releasing any contents.

Seismic effects that shall be analyzed in the design of piping systems include the dynamic effects of the piping system, contents, and supports. The interaction between piping systems and the supporting structures, including other mechanical and electrical equipment, shall also be considered. Where pipe supports are to be designed by Contractor, as required by the Pipe Supports section, both the piping and support systems shall be designed to meet the applicable requirements of ASCE 7, Chapter 13.

4-3.04. **Submerged Components.** Components that are to be submerged in water shall be designed to withstand loads from the effects of water sloshing.
during the seismic event. The calculation of the sloshing effects shall be in accordance with the latest edition of ACI 350.3.

4-3.05. Seismic Certification. Design of components and their anchorage shall be certified by one of the following methods.

1. Analysis and design by a design professional registered in the state of the project.

2. Shake table testing based upon a nationally recognized testing standard procedure, such as ICC-ES AC 156, acceptable to the authority having jurisdiction.

3. Experience data, based upon nationally recognized procedures acceptable to the authority having jurisdiction.

Components indicated in the Non-Structural Components Schedule to require special seismic certification shall be certified only by methods 2 or 3 above, except that certification for containment of hazardous materials may be by any of the three methods.

4-3.06. Construction Documents. Construction documents (fabrication or shop drawings) of non-structural components shall be sealed by a design professional that is registered in the state of the project. Documents shall be sealed whether the basis for certification is analysis and design, shake table testing, or experience data. The sealing method shall clearly indicate that the anchorage system, and the component itself when applicable, have been designed for the code required seismic forces.

4-3.07. Submittals. The construction documents, structural design calculations, shake table certification, and experience data certification, as applicable, shall be submitted in accordance with the Submittal Procedures section.

4-4. Non-Building Structures. Non-building structures are the items described as such in Chapter 15 of ASCE 7. The Non-Building Structures Schedule identifies the items that require seismic design. The requirements of this paragraph are applicable only to the items listed in the Non-Building Structures Schedule.

4-4.01. General. Design of non-building structures shall be in accordance with all applicable provisions of ASCE 7, Chapter 15. Design of anchorage into concrete shall be in accordance with ACI 318 Chapter 17, shall consider concrete to be cracked, and shall not include the strengthening effects of supplementary reinforcement or anchor reinforcement unless approved by Engineer. Post-installed anchors into concrete may be used only when approved...
by Engineer, and shall be designed in accordance with the anchor manufacturer's research report.

"W" shall include the total dead load and shall also include all normal operating contents of tanks, vessels, bins, and piping.

Non-building structures shall provide sufficient strength and ductility to resist the specified seismic effects, and shall meet all of the design, proportioning, detailing, inspection, and quality assurance provisions of the specified building code and other referenced codes.

The seismic design of non-building structures shall provide sufficient stiffness, strength and ductility to resist the effects of seismic ground motions during the design level earthquake.

Non-building structures shall be designed to be operable during and following a design level seismic event, without collapsing, breaking away from supports, creating an ignition hazard, or releasing any contents.

4-4.02. Construction Documents. Construction documents (fabrication or shop drawings) depicting all seismic force resisting elements of non-building structures shall be sealed by a design professional that is registered in the state of the project.

4-4.03. Submittals. The construction documents shall be submitted in accordance with the Submittal Procedures section.

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Note: Some specification sections listed in the Non-Structural Components Schedule cover multiple items. Within those sections, some components may be exempt from seismic design based on their weight and/or their height above the floor. Reference ASCE 7, Paragraph 13.1.4 for specific conditions of the exemptions. Some ductwork and piping systems may also be exempt from seismic design based on criteria in their respective paragraphs in ASCE 7, Chapter 13.

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1. **SCOPE.** This section covers packaging and shipping of materials and equipment.

2. **PREPARATION FOR SHIPMENT.** All equipment shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept dry at all times.

Painted and coated surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted and coated surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.

Grease and lubricating oil shall be applied to all bearings and similar items. Contractor shall refer to Figure 1 – 01612 for export shipping packing instructions.

3. **SHIPPING.** Before shipping each item of equipment shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment. Figure 2 – 01612 shall be referenced for marking instructions.

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STYLE 2
(BANDED)

STYLE X

STYLE 2
(PALLETIZED)

OPEN CRATE

STRAPPING 1 3/8" (35 mm) SPACED ON 24" (600 mm) CTRS. WITH CORNER PLATES.

EXPORT SHIPMENT PACKING INSTRUCTIONS
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1. **SCOPE.** This section covers delivery, storage, and handling of materials and equipment.

2. **DELIVERY.** Contractor shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the site and shall comply with the requirements specified herein and shall provide required information concerning the shipment and delivery of the materials specified in this Contract. These requirements also apply to any subsuppliers making direct shipments to the Site.

Contractor shall, either directly or through contractual arrangements with others, accept responsibility for the safe handling and protection of the equipment and materials furnished under this Contract before and after receipt at the port of entry. Acceptance of the equipment shall be made after it is installed, tested, placed in operation and found to comply with all the specified requirements.

All items shall be checked against packing lists immediately on delivery to the site for damage and for shortages. Damage and shortages shall be remedied with the minimum of delay.

Delivery of portions of the equipment in several individual shipments shall be subject to review of Engineer before shipment. When permitted, all such partial shipments shall be plainly marked to identify, to permit easy accumulation, and to facilitate eventual installation.

3. **STORAGE.** Upon delivery, all equipment and materials shall immediately be stored and protected until installed in the Work.

Stacked items shall be suitably protected from damage by spacers or load distributing supports that are safely arranged. No metalwork (miscellaneous steel shapes and reinforcing steel) shall be stored directly on the ground. Masonry products shall be handled and stored in a manner to hold breakage, chipping, cracking, and spalling to a minimum. Cement, lime, and similar products shall be stored off the ground on pallets and shall be covered and kept completely dry at all times. Pipe, fittings, and valves may be stored out of doors, but must be placed on wooden blocking. PVC pipe, geomembranes, plastic liner, and other plastic materials shall be stored off the ground on pallets and protected from direct sunlight.

Pumps, motors, electrical equipment, and all equipment with antifriction or sleeve bearings shall be stored in weathertight structures maintained at a temperature.
above 60°F [16°C]. Electrical equipment, controls, and insulation shall be protected against moisture and water damage. All space heaters furnished in equipment shall be connected and operated continuously.

Equipment having moving parts, such as gears, bearings, and seals, shall be stored fully lubricated with oil, grease, etc., unless otherwise instructed by the manufacturer. Manufacturer's storage instructions shall be carefully followed by Contractor.

When required by the equipment manufacturer, moving parts shall be rotated a minimum of twice a month to ensure proper lubrication and to avoid metal to metal "welding". Upon installation of the equipment, Contractor shall, at the discretion of Engineer, start the equipment at one-half load for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.

When required by the equipment manufacturer, lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment by Contractor at the time of acceptance.

Equipment and materials shall not show any pitting, rust, decay, or other deleterious effects of storage when installed in the Work.

In addition to the protection specified for prolonged storage, the packaging of spare units and spare parts shall be for export packing and shall be suitable for long-term storage in a damp location. Each spare item shall be packed separately and shall be completely identified on the outside of the container.

4. HANDLING. Stored items shall be laid out to facilitate their retrieval for use in the Work. Care shall be taken when removing the equipment for use to ensure the precise piece of equipment is removed and that it is handled in a manner that does not damage the equipment.

During handling, carbon steel constructed material including chains, straps, and forks on lifting equipment shall not directly contact any equipment or material constructed of stainless steel. It shall be the Contractor’s responsibility to correct any carbon steel contamination of stainless steel.

End of Section
1. **SCOPE.** This section consists of an equipment schedule for items for which a basic level of manufacturer's field services or operation and maintenance manuals are required, but not covered in other sections. When other sections indicate that manufacturer's field services and operation and maintenance manuals are required, the requirements shall be as specified in the other sections.

Specific requirements for manufacturer's field services are covered in the Quality Control section and the equipment specifications.

Specific requirements for operation and maintenance manuals are covered in the Submittals Procedures section and the equipment specifications.

2. **SCHEDULE.** Manufacturer's field services, including equipment installation checks and training, and operation and maintenance manuals shall be provided for the items of equipment indicated in the following schedule:

<table>
<thead>
<tr>
<th>Spec Section</th>
<th>Type of Equipment</th>
<th>Factory Test Required</th>
<th>Witness Required</th>
<th>Mfr's. Field Services, Minimum (trips/days)</th>
<th>Mfr's Training, Minimum (trips/days)</th>
<th>O&amp;M Manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>11115</td>
<td>Horizontal End Suction Centrifugal Pumps</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>11140</td>
<td>Vertical Diffusion Vane Pumps (AWTF, MF, OCSD)</td>
<td>Yes</td>
<td>Yes</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>11185</td>
<td>Submersible Sump and Sewage Pumps</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>1/1</td>
<td>Yes</td>
</tr>
<tr>
<td>11213</td>
<td>RO Feed Pumps</td>
<td>Yes</td>
<td>Yes</td>
<td>2/2 each</td>
<td>1/1</td>
<td>Yes</td>
</tr>
<tr>
<td>11217</td>
<td>Vacuum Pumps</td>
<td>Yes</td>
<td>Yes</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>11293</td>
<td>Sluice and Slide Gates</td>
<td>No</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>11401</td>
<td>Forced Draft Decarbonator</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>11403</td>
<td>Cartridge Filters</td>
<td>Yes</td>
<td>No</td>
<td>1/1</td>
<td>1/1</td>
<td>Yes</td>
</tr>
<tr>
<td>11406</td>
<td>Interstage Booster Pumps</td>
<td>Yes</td>
<td>Yes</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>11610</td>
<td>Multistage Centrifugal Blowers</td>
<td>Yes</td>
<td>Yes</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>11720</td>
<td>Polymer Feed Systems</td>
<td>Yes</td>
<td>No</td>
<td>Not Required</td>
<td>Not Required</td>
<td>Yes</td>
</tr>
<tr>
<td>Spec Section</td>
<td>Type of Equipment</td>
<td>Factory Test Required</td>
<td>Witness Required</td>
<td>Mfr's. Field Services, Minimum (trips/days)</td>
<td>Mfr’s Training, Minimum (trips/days)</td>
<td>O&amp;M Manual</td>
</tr>
<tr>
<td>--------------</td>
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<td>------------------</td>
<td>-------------------------------------------</td>
<td>---------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>11727</td>
<td>Liquid Chemical Feed System</td>
<td>No</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>13030</td>
<td>Membrane Filtration System</td>
<td></td>
<td></td>
<td>Refer to MF System Specifications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13190</td>
<td>Fiberglass Reinforced Plastic Chemical Storage Tanks</td>
<td>Yes</td>
<td>Yes</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>13500</td>
<td>Process Control System</td>
<td>Yes</td>
<td>Yes</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>13530</td>
<td>Distributed Controller System</td>
<td>Yes</td>
<td>Yes</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>13561</td>
<td>Panel Mounted Instruments</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>13562</td>
<td>Flow Instruments</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>13563</td>
<td>Pressure and Level Instruments</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>13564</td>
<td>Analytical Instruments</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>13565</td>
<td>Miscellaneous Instruments</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>13570</td>
<td>Panels, Consoles and Appurtenances</td>
<td>Yes</td>
<td>Yes</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>Various</td>
<td>Valves and Gates</td>
<td>Yes</td>
<td>No</td>
<td>1/1 (per type)</td>
<td>Not Required</td>
<td>Yes</td>
</tr>
<tr>
<td>15094</td>
<td>Backflow Preventers</td>
<td>Yes</td>
<td>No</td>
<td>Not Required</td>
<td>Not Required</td>
<td>Yes</td>
</tr>
<tr>
<td>15106</td>
<td>Valves and Gate Actuators</td>
<td>Yes</td>
<td>No</td>
<td>1/1 (per type)</td>
<td>Not Required</td>
<td>Yes</td>
</tr>
<tr>
<td>15500</td>
<td>Heating, Ventilating, and Air Conditioning Systems</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>15650</td>
<td>Refrigeration Systems</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>16101</td>
<td>Prefabricated Electrical Equipment Buildings</td>
<td>Yes</td>
<td>Yes</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>16150</td>
<td>Variable Frequency Drives</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>16155</td>
<td>Medium Voltage Variable Frequency Drives and Isolation Transformers</td>
<td>Yes</td>
<td>Yes</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>16220</td>
<td>General Purpose Induction Motors</td>
<td>Yes</td>
<td>No</td>
<td>Not Required</td>
<td>Not Required</td>
<td>Yes</td>
</tr>
<tr>
<td>Spec Section</td>
<td>Type of Equipment</td>
<td>Factory Test Required</td>
<td>Witness Required</td>
<td>Mfr's. Field Services, Minimum (trips/days)</td>
<td>Mfr's Training, Minimum (trips/days)</td>
<td>O&amp;M Manual</td>
</tr>
<tr>
<td>--------------</td>
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<td>------------------</td>
<td>--------------------------------------------</td>
<td>--------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>16221</td>
<td>Medium Voltage Induction Motors</td>
<td>Yes</td>
<td>Yes</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>16345</td>
<td>Medium-Voltage Metal-Clad Switchgear</td>
<td>Yes</td>
<td>Yes</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>16442</td>
<td>OCSD Control Panels</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>16480</td>
<td>600 Volt Motor Control Centers</td>
<td>Yes</td>
<td>Yes</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>16610</td>
<td>Uninterruptible Power Supply</td>
<td>Yes</td>
<td>No</td>
<td>Not Required</td>
<td>Not Required</td>
<td>Yes</td>
</tr>
<tr>
<td>16721</td>
<td>Fire Detection and Alarm System</td>
<td>Yes</td>
<td>No</td>
<td>Not Required</td>
<td>Not Required</td>
<td>Yes</td>
</tr>
<tr>
<td>16725</td>
<td>Electronic Security System</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
<tr>
<td>17156</td>
<td>OCSD Magnetic Flowmeters</td>
<td>Yes</td>
<td>No</td>
<td>See Spec</td>
<td>See Spec</td>
<td>Yes</td>
</tr>
</tbody>
</table>
1-1. **SCOPE.**
This section consists of a schedule of 4 inch and larger pipelines indicating the type of pipe to be used. Pipe materials, installation, testing, and disinfection, when specified, are covered in other sections.

Water piping 4 inches and larger shown on the plumbing drawings shall be ductile iron pipe with flanged fittings for above ground pipe.

It is noted that some of the MF System piping is to be furnished by the MF Supplier. Refer to mechanical drawings and MF Bill of Materials specification for delineation of scope of supply.

1-2. **ALTERNATIVE PIPE TYPES.** Where more than one type of pipe is indicated in the schedule, the type of pipe material to be installed may be selected by Contractor. The details on the drawings cover only one type of pipe for each line. If a different material is selected by Contractor, all details of connections, jointing, wall fittings, support, anchorage, and harnesses shall be modified as necessary to produce an equivalent design acceptable to Engineer.

1-3. **WALL FITTINGS.** A wall pipe or sleeve will be required for all pipe passing through concrete or masonry block walls unless otherwise noted. Wall fittings and sleeves shall be as indicated on the drawings and as specified in the applicable piping section.

2. **SCHEDULE INDEX.** Pipe material abbreviations and their applicable specification section number are as indicated:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Pipe Material</th>
<th>Section No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BR</td>
<td>Brass</td>
<td>15060</td>
</tr>
<tr>
<td>CI</td>
<td>Cast iron soil pipe</td>
<td>15069</td>
</tr>
<tr>
<td>CMP</td>
<td>Corrugated metal pipe</td>
<td>02622</td>
</tr>
<tr>
<td>CPVC</td>
<td>CPVC pipe</td>
<td>15067</td>
</tr>
<tr>
<td>CS</td>
<td>Miscellaneous steel pipe</td>
<td>15065</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Pipe Material</td>
<td>Section No.</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>CSG</td>
<td>Galvanized steel pipe</td>
<td>15065</td>
</tr>
<tr>
<td>CU</td>
<td>Copper tubing</td>
<td>15070</td>
</tr>
<tr>
<td>DCP</td>
<td>Double-contained pipe (CPVC in CPVC)</td>
<td>02630, 15067</td>
</tr>
<tr>
<td>DIP</td>
<td>Ductile iron pipe</td>
<td>15061</td>
</tr>
<tr>
<td>FRP</td>
<td>FRP pipe</td>
<td>15067</td>
</tr>
<tr>
<td>GRS/CSG</td>
<td>Galvanized steel pipe</td>
<td>15065</td>
</tr>
<tr>
<td>HDPE</td>
<td>HDPE pressure pipe</td>
<td>02634</td>
</tr>
<tr>
<td>PCCP</td>
<td>Prestressed concrete cylinder pipe</td>
<td>02612</td>
</tr>
<tr>
<td>PE</td>
<td>Polyethylene pipe</td>
<td>15067</td>
</tr>
<tr>
<td>PP</td>
<td>Polypropylene pipe</td>
<td>15067</td>
</tr>
<tr>
<td>PVC</td>
<td>PVC pipe</td>
<td>15067</td>
</tr>
<tr>
<td>RBH</td>
<td>Rubber Braided Hose</td>
<td>15067</td>
</tr>
<tr>
<td>RCP</td>
<td>Concrete sewer pipe</td>
<td>02618</td>
</tr>
<tr>
<td>SP (CML&amp;T)</td>
<td>Steel pipe (Cement Mortar Lined and Tape Coated)</td>
<td>15062</td>
</tr>
<tr>
<td>SP (CML&amp;C CMLCSP)</td>
<td>Steel pipe (Cement Mortar Lined and Epoxy Coated)</td>
<td>15062</td>
</tr>
<tr>
<td>STL/L</td>
<td>Steel pipe (Epoxy Lined and Coated; All Areas except Area 144)</td>
<td>15062</td>
</tr>
<tr>
<td>STL/L</td>
<td>Steel pipe (polyurethane Lined and Coated; Area 144 only)</td>
<td>15062</td>
</tr>
<tr>
<td>SS</td>
<td>Stainless steel pipe</td>
<td>15064</td>
</tr>
<tr>
<td>WRFH</td>
<td>Wire reinforced flexible hose</td>
<td>15060</td>
</tr>
</tbody>
</table>
3. **SCHEDULE.** Pipe materials shall conform to those specified in Schedule 01630-S01. All pipelines indicated on the drawings and all pipelines required for proper operation of the equipment furnished shall be provided whether listed in the schedule or not.

End of Section
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## Pipeline Schedule

<table>
<thead>
<tr>
<th>Size</th>
<th>Process Code</th>
<th>Description</th>
<th>Type of Installation</th>
<th>Material</th>
<th>Specification Section</th>
<th>Minimum Wall Thickness or Pressure Class</th>
<th>Test Pressure Specification Section</th>
<th>Test Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>In.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>in. / psi</td>
<td></td>
<td>psi</td>
</tr>
</tbody>
</table>

**TO BE PROVIDED IN DS3**
PART 1 – GENERAL

1.1. SCOPE. This Section of the Specifications forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2. DESCRIPTION. The valves and gates listed in Appendix A (01640A) of this section are a summary list of process valves and gates for supply by the Contractor and others.

All valves and gates indicated on the Drawings or specified in other sections shall be provided whether listed in the schedule or not. The schedule does not relieve the Contractor of the responsibility for providing all valves and gates required by the Drawings and the specifications.

Isolation Ball Valves for instrumentation, chemical feed, or water lines less than 4 inches are not listed herein. For details on those valves, refer to the P&IDs and respective Sections.

PART 2 – PRODUCTS

Not applicable

PART 3 – EXECUTION

Not applicable

End of Section

[NOTE THAT SPECIFICATION 01640A WILL BE PROVIDED IN DS3]
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1-1. **SCOPE.** This section covers testing, startup, and training requirements for all items of equipment and systems individual mechanical equipment. Startup and testing of new facilities shall include Factory Testing, Pre-startup Activities and Checks Preoperational Testing, Individual System Startup, Individual System Acceptance Testing Overall Startup and Acceptance Testing, Performance Testing, and Training activities. The Owner will be responsible for the activities defined under Performance Testing. Additional requirements may be specified in specific equipment specifications. The requirements of this section shall be satisfactorily completed upon completion of any field tests specified herein or in the specific equipment sections. This section shall be used in conjunction with all technical specification sections.

1-2 **GENERAL.** Startup shall include all checkouts of installed equipment and systems as required to verify proper installation and operation, and shall include all Factory Testing, Pre-startup Activities and Checks, Preoperational Testing, Individual System Startup, Individual System Acceptance Testing, Overall Startup and Acceptance Testing, Performance Testing, and Training activities; the requirements of which are defined in this section. Documentation of these activities and test results is considered part of Startup.

The Contractor shall provide personnel, both supervisory and from applicable trades, that are experienced in startup testing. Among these personnel, the Contractor shall provide a designated Startup Manager whose assigned duties are those specifically related to planning, supervising, and executing startup activities. The Startup Manager shall have the necessary experience to fully understand all startup requirements, to organize and coordinate the Contractor’s resources providing the startup services, and to prepare all startup documentation, as specified. Given the complexity of the Work, the Contractor is required to use a third party professional startup services firm to perform the functions of the Startup Manager and startup team.

The Contractor shall furnish all materials, instruments, incidentals, and expendable equipment required. Temporary facilities required to carry out the specified testing, including temporary pipe, pumps, and other appurtenances, shall be furnished and installed, and removed at the Contractor’s expenses. Water power and chemicals required for Pre-startup Activities and Checks and Preoperational testing shall be provided by the Owner, unless specifically stated herein. Water, power, and chemicals required for Individual System Startup, Individual System Acceptance Testing, Overall Startup and Acceptance Testing, and Performance Testing, shall be provided by the Owner from the source.
supplying the system, unless specifically stated herein and/or in the Temporary Facilities section. Wastewater, including treated or test water that cannot be delivered to the system for any reason, shall be disposed of at the expense of the Contractor, in a manner acceptable to the Engineer, and in accordance with all local laws, regulations, and permits.

Startup and testing shall be conducted during the workweek of Monday through Friday, unless otherwise approved by the Owner. Where continuous long-term testing is required, testing may continue over the weekends and holidays with prior approval from the Owner.

1-3. **STARTUP MANAGER, STARTUP TEAM.** Given the complexity of the Work, the Contractor shall provide the services of a Startup Manager to plan, document, manage, and certify all work included in, or directly related to, startup and testing. The Startup Manager shall have a minimum of ten (10) years' experience, in operations and startup of facilities, equipment, electrical, and plant controls of similar type, size, capacity, and of a complexity similar to those included in the Work.

The Startup Manager shall be independent of the Contractor or any of the suppliers, and engaged by the Contractor. The Contractor shall submit information to demonstrate that their Startup Manager is qualified. The qualifications for the Startup Manager shall be submitted at the Preconstruction Conference and will be reviewed by Owner and Engineer. Once accepted, the Contractor shall not change the Startup Manager throughout the full period of performance of the Work without the express written permission of the Owner or Engineer. The Startup Manager shall be part of the Contractor’s team from the beginning of the Project.

The services to be managed and/or executed by the Startup Manager shall include the following tasks:

- **a.** Formation of an onsite Startup Team of supervisory staff qualified as a team in all elements of the startup process required as part of the Work. Startup Manager shall utilize representatives of the Contractor's mechanical, electrical and instrumentation Subcontractor's and others as appropriate for startup activities and testing.

- **b.** Prepare startup and testing documentation, direct the startup activities and the Startup Team.
c. Complete planning, development, and preparation of Startup/Testing Plans, testing procedures, test reports, and related submittals/documentation for startup activities required by the Contract Documents.

d. Provide coordination and scheduling of startup and testing activities, including the development of detailed startup and testing schedules integrated with the Contractor’s CPM Schedule. Update the test schedule and incorporate testing activities in the progress schedule.

e. Coordinating manufacturers’ services and their certification of proper installation and/or function of operation of equipment as required by the Contract Documents.

f. Provide coordination, direction, and management of day-to-day startup activities.

g. Conduct weekly coordination meetings during startup and testing activities.

h. Schedule and conduct a one (1) day submittal review workshop with the Owner and Engineer to receive and resolve submittal review comments to the Contractor’s detailed startup and testing plan submittal.

i. Coordination of all disinfection requirements

j. Ensure that the Startup Team is equipped and ready to provide for emergency repairs and adjustments and corrections to the equipment and systems installed and modified as a part of the Contract.

k. Notify Owner and all respective equipment manufacturers at least 21 days prior to the date when each equipment system is scheduled for Pre-startup Activities and Checks.

l. Provide for required maintenance and servicing of equipment, including electrical gear and instrumentation, during startup and testing.

m. Organize International Electrical Testing Association (NETA) acceptance testing during the Pre-commissioning phase in accordance with the Electrical Equipment Installation section. Tests on newly-installed power systems and apparatus will be conducted before energizing, to ensure that the installation and equipment comply with specifications and intended use as well as with regulatory and safety requirements.

n. Facilitate and submit operator and maintenance training.
1-4. **MANUFACTURER’S FIELD SERVICES ENGINEERS.** The Manufacturers shall provide technically qualified field-service engineer for the installation, startup and testing of equipment furnished as defined in the procurement documents and the specifications.

A technically qualified field service engineer shall be a person employed full-time by the manufacturer and who has conducted startup activities similar to those required herein on at least two other projects of a similar complexity. The field service personnel’s qualifications shall be submitted, in resume format, 21 days prior to commencement of services for approval by Owner. Owner shall have the right to reject the field service engineer for immediate replacement once the field service engineer is on-site, if submitted qualifications were not representative of the field service engineer’s actual experience or abilities, at the sole discretion of the Owner. The Contractor shall be responsible for planning, supervising, and executing the installation of the work, and shall plan for using the field-service engineers’ time.

Additional services and travel expenses necessary to correct defective materials or equipment furnished by the manufacturer shall be provided at no additional cost to the Owner.

Field-service engineers shall observe, instruct, guide, and direct Contractor’s erection and installation procedures, and perform installation checks as required herein or as requested by the Engineer.

The Microfiltration (MF) System Field Service Engineer shall perform the following:

a. Accept in writing the condition of all concrete basin construction and linings including cleanliness and removal of debris and proper pipework, pump and instrument installation prior to module installation.

b. Provide in writing Instruction to Contractor to start membrane installation.

c. Accept in writing the condition of all membrane modules installed and verify that flushing of preservative has been completed and membrane integrity tests completed on all units.

d. Perform an inspection of the completed installation and provide final acceptance of the MF equipment installation, in writing through a “Notice of Completed Installation”, prior to commencement of startup and testing.

e. Submit a “Detailed Plan of Commissioning Activities” that shall be used as a guideline by the Contractor for startup and testing of the MF System.

f. Retain the services of specific equipment manufacturers as necessary to assist with startup and testing.
g. Facilitate Performance Testing (Acceptance Testing of Membrane Equipment)

h. Provide Operations Assistance, Operation and Maintenance Manuals; and training of operations and maintenance Personnel.

i. Complete all other start-up, testing, and operation experience as defined in the Membrane Filtration System – Installation Section.

The Reverse Osmosis System Supplier (ROSS) Field Service Engineer shall:

a. Accept in writing the condition of ROSS installation including cleanliness and removal of debris and proper installation of pipework and instruments associated with the scope of the ROSS prior to membrane installation in vessels.

b. Accept in writing the condition of all membrane modules installed in vessels.

c. Perform an inspection of the completed installation and provide final acceptance of the equipment installed under the scope of the ROSS, in writing through a “Notice of Completed Installation”.

d. Assist startup and testing activities as appropriate through coordination with the Contractor.

e. Provide Operation and Maintenance Manuals and Training of operations and maintenance personnel as required by the technical specifications.

The Ultraviolet Light Field Service Engineer shall:

a. Accept in writing the condition of piping installation and UV train installation including cleanliness and removal of debris, completeness of pipeline pressure testing, correct installation of UV reactors, lamp sleeves and lamps, proper termination of electrical and control wiring, and all related instrument installation prior to any wet startup and commissioning.

b. All other requirements and manufacturer instructions as specified in Section 13700.

c. Provide Operation and Maintenance Manuals and Training of operations and maintenance personnel as required by the technical specifications.

2-1. SUBMITTALS. Contractor shall submit the following information for specific equipment where specified in individual sections and in this section, in accordance with the submittals section.

a. Names and resumes of proposed field technicians and Startup Manager

b. Manufacturer’s certification of proper installation of all equipment.
c. Startup/Testing plans with schedule for each equipment item and system. Schedules shall list each piece of equipment or component to be tested, as specified in this Section or by the various sections of the Technical Specifications. Schedules shall include sequence and duration for all categories of startup and testing.

d. Testing procedures specified in Process Control System section, prepared by the Process Control System Integrator (PCSI), for Process Control System (PCS) acceptance testing.

e. Operation and Maintenance Manuals for each equipment item and system to be tested.

f. Organization chart for conducting startup and testing activities and experience information (list of projects and owner contact information) for Startup Manager.

g. Instrumentation list with calibration methods and calibration dates.

h. Clearance, Red Tag and equipment release procedures including authorization assignments. Lock-Out and Tag-out procedures, at a minimum, be in accordance to with OSHA, 29 CFR, Part 1926 Construction Industry, Section 1910.1473

i. Acceptance criteria required to release equipment and systems for startup.

j. Field calibration reports.

k. Submit preliminary copies of test data in field report form within two days after completion of each test.

l. Submit daily logs.

m. Submit five bound copies of field test reports of checkout and testing of all equipment.

n. Training material, instruction schedule, outline of lesson plans, lesson plans, and training aids

o. Submit sign-off and acceptance forms for each piece of equipment

3-1. STARTUP AND TESTING REQUIREMENTS. It is not the intent of the Engineer to instruct the Contractor in the startup and testing of the Work; however, the Engineer will be available prior to and during startup to provide technical support and to verify that all Work is performed in accordance with the Contract Documents.

The Contractor and manufacturer shall be responsible for scheduling and coordinating all startup and testing activities with the Owner’s staff and Engineer.
The suggested sequence of activities for each system shall be as follows. A subsequent startup and testing step shall not be commenced until the previous steps are completed.

**Description**

Step 1: Civil Construction, structure hydrotest, and pressure tests

Step 2: Factory Testing and installation of equipment

Step 3: Prestartup Activities and Checks

Step 4: Preoperational Testing

Step 5: Initial Training: general training, maintenance training, PCS training, and OCSD training.

Step 6: Individual System Startup

Step 7: Individual System Acceptance Testing

Step 8: Overall Startup and Acceptance Testing

Step 9: Performance Testing

Step 10: Follow-up Training

It is noted that the **MF Membranes** and UV System equipment have been procured in advance and assigned to the Contractor. Contractor shall refer to the Procurement Documents of each system for coordination with the System Supplier regarding startup, testing, and training activities.

3-1.01 **Factory Testing.** When specified in the specific equipment sections, the equipment will be test run at the location of manufacture, and the test results shall be delivered to Engineer. Such equipment shall not be shipped until Engineer has reviewed the test results and advised the Contractor, in writing, that the equipment is acceptable for shipment. Such acceptance, however, will not be considered as final acceptance, which will only be made on the basis of the test results of the equipment after installation.

For packaged systems, the Factory Testing also includes all PLC and operator interface software.

3-1.02. **Prestartup Activities and Checks.** Prior to testing of all equipment, the Contractor shall clean and check at a minimum the following:
a. Inspect and clean equipment, devices, and connected piping so they are free of foreign material.

b. Lubricate equipment in accordance with manufacturer’s instructions.

c. Turn rotating equipment by hand and check motor-driven equipment for correct rotation.

d. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.

e. Check power supply to electric-powered equipment for correct voltage.

f. Check for proper equipment alignment.

g. Obtain manufacturer’s certification of proper installation.

h. Receive certification from the manufacturer’s field service engineers that the equipment installation complies with manufacturer’s installation instructions and the intent of the Drawings and Specifications.

Ready-To-Test Determination: All equipment shall be determined ready to test by the Engineer based on the following:

a. Notification in writing by the Startup Manager that each equipment and system is readiness for testing.

b. Verification by the Engineer that all lubricants, tools, maintenance equipment, spare parts and approved equipment operation and maintenance manuals have been furnished as specified.

c. Verification by Owner that all spare parts, safety equipment, tools and maintenance equipment, lubricants and approved operation and maintenance information have been received.

d. Submittal and approval of Startup/Testing plans.

e. Cleanliness of equipment, devices, and connected work.

f. Adequate completion of work adjacent to or interfacing with equipment to be tested.
g. Availability and acceptability of manufacturer’s representative’s to assist testing of respective equipment, and satisfactory fulfillment of other specified manufacturers’ responsibilities.

h. Acceptability of civil construction, hydrotests, and pressure tests.

Perform prestartup tests and make adjustments as needed. Pre-startup tests shall include, but not be limited to, the following:

a. Perform calibration tests of all position, pressure, level, flow, temperature, and monitoring instruments.

b. Conduct operating tests for all valves and operators. Inspect, adjust and operate the valves and auxiliary equipment:

c. Verify electrical operation of auxiliaries including: Solenoids, Limit switches, Remote indicating devices, position, pressure, and level transmitters.

d. Inspect and verify proper anchorage and grounding.

e. Perform tests of on-off controls, limit switches, and indicating lamps.

f. Perform tests of alarms, signals, and fail-safe or system shutdown controls.

g. Perform point-to-point circuit continuity tests.

h. Perform trip checks of all electrical equipment to verify the proper functions of all trip and control circuits.

i. Perform all pre-startup tests specified in sections of the Technical Specifications.

j. Perform tests required by manufacturer's catalogs or specifications.

k. Perform additional tests required by manufacturer's modifications to meet specified requirements, or tests required due to failures of Contractor’s furnished equipment, which shall be completed at the Contractor's expense with no additional cost to Owner.

Perform pre-startup testing for the following equipment systems and subsystems in accordance with NETA including tests indicated as optional for the following equipment:
a. Pumps and motors.

b. All valves and operators.

c. Mechanical and process equipment

A label shall be attached to all devices to indicate that testing has been performed, indicating the date that tests were completed and initialed by the person conducting the tests.

3-1.03 Preoperational Testing. Preoperational Testing shall be carried out for all items of process equipment, piping systems, electrical systems, instrumentation and control systems, and auxiliary systems. Preoperational Testing of equipment under power shall not be carried out until prestartup activities and checks, of the electrical equipment, has been completed. Preoperational testing shall include initial equipment operation in the presence of the manufacturer’s representative, where specified in the Contract Documents, and the requirements herein. Preoperational testing shall also include mechanical testing of the MF System, RO System and Ultraviolet Light System by the Contractor as specified in the membrane and UV procurement documents and respective technical specifications sections.

Preoperational Testing shall verify individual equipment component functional operation, and shall not involve complete system operation or specified performance requirement verification. No preoperational test water shall be discharged to the Santa Ana River or storm drains. No preoperational test water shall be discharged to the OCSD outfall pipeline without prior approval by the Owner and Engineer, nor shall it be discharged to the OCSD outfall during peak wet weather storm events. Water discharged to the OCSD outfall must meet all applicable discharge requirements. See Regulatory Requirements and Permits Section for discharge requirements to 66-inch interplant line.

Ancillary facilities necessary to recycle or discharge preoperational test water from any of the facilities being tested shall be operational to facilitate the movement and discharge of test water. The methods for recirculation or disposal of preoperational test water shall be detailed in the Contractor’s Plan.

Preoperational Testing shall include the Contractor’s test operation of each piece of process and mechanical equipment. All moving parts of equipment and machinery shall be carefully tested for operation, and adjusted so all parts move freely and function to secure satisfactory operation. All equipment shall be tested continuously under actual or simulated operating conditions for a sufficient amount of time to demonstrate functionality. All parts shall operate satisfactorily in all respects, under continuous full load and in accordance with the specified requirements. If any part of a unit shows evidence of unsatisfactory or improper
operation during the test period, correction or repairs shall be made and the full test operation, as specified, shall be completed after all parts operate satisfactorily.

Preoperational Testing of all process and pumping equipment and drive motors, including auxiliaries shall be made in accordance with the appropriate and approved test codes, such as by the American Society of Mechanical Engineers, Hydraulic Institute Standards, and IEEE.

Preoperational Testing shall include at least 4 full open-close cycles of operation for all actuated valves. Testing shall be in accordance with the maximum number of operations per hour as recommended by the actuator manufacturer.

Preoperational testing for the PCS shall be as specified in The Process Control System Section.

Prior to Preoperational Testing, the equipment shall be properly filled, by the Contractor, with oil, grease, lubricants, and other necessary liquids and the Contractor shall furnish all personnel, fuels, oil, grease, chemicals, and auxiliaries necessary for conducting Preoperational Testing of the equipment and systems. Chemicals, water, and energy for testing and regular operation of the expanded Plant will be provided by the Owner. Contractor shall notify the Engineer forty-five (45) days prior to any startup activities to allow the Owner time to order chemicals and have them delivered to the site for startup procedures. Contractor shall furnish all additional chemicals required for other uses (i.e., disinfection activities following construction) and not specifically for regular operation of the expanded plant. Refer to the Temporary Facilities section for additional requirements.

All equipment installed under this Contract, including that furnished by others, shall be placed into successful operation according to the written instructions of the equipment manufacturer and the instructions of the manufacturer’s field representative.

Preoperational Testing shall not be considered complete until all testing provides successful results, and all documentation of tests and all manufacturer’s certifications required by the Contract Documents are submitted and accepted by the Engineer.

It is suggested that at a minimum, qualified personnel from the electrical and instrumentation subcontractor’s crew responsible for the installation of the electrical and instrumentation portion of the Work shall be included as test personnel for the Preoperational tests electrical or instrumentation work.
3-1.04 Individual System Startup. Contractor shall conduct Individual System Startup to test operation of each complete process system, (i.e. MF System, RO System, Equalization Tanks, Pump Station, UV System, etc), which shall include the mechanical, electrical, and instrumentation and control equipment, as a complete and functional process system. The Individual System Startup shall be in accordance with the requirements in this section and the technical specifications and procurement documents.

The startup shall continue for not to exceed forty-eight (48) hours without interruption. All moving parts of equipment and machinery shall be carefully tested for operation, and adjusted so all parts move freely and function to ensure satisfactory operation. All equipment shall be tested continuously under actual or simulated operating conditions. All parts shall operate satisfactorily in all respects, under continuous full operation. If any part of a unit shows evidence of unsatisfactory or improper operation during the testing period, correction or repairs shall be made and the full test operation, as specified, shall be completed after all parts operate satisfactorily.

Individual System Startup testing for the PCS shall be as specified in The Process Control System Section.

The Owner will provide operations personnel for observation of equipment during over-night testing. The only action the Owner’s Operator will perform is to Stop the System using Emergency Shutdown or Normal Shutdown provisions, if deemed necessary. Contractor shall provide a contact name and phone number for afterhours issues that occur while Owner is overseeing plant operation.

Ancillary facilities necessary to recycle or discharge preoperational test water from, any of the facilities being tested, must be operational to facilitate the movement and discharge of test water. During testing, the Contractor shall be required to recycle and/or discharge all test water as indicated under the Preoperational Testing.

At a minimum, tests conducted by the Contractor shall demonstrate routine, non-routine, and emergency operation such as: full operation in manual and automatic modes, full startup operation in normal and emergency modes, and full shutdown in normal and emergency modes.

Additional considerations for each system follow:

a. Microfiltration Backwash Waste, Microfiltration Backwash Supply, and Product Water Pump Station Startup

   Conduct preliminary electrical energization tests. Initiate energization of station service transformer including phasing tests.
Pump-motor mechanical run (off-line). Provide instrumentation to measure vibration. Displacement measurements and acceptable field vibration limits shall be in accordance with Hydraulic Institute Standards for vertical pumps.

Operate each pump individually in the “local” control mode up to the limit of flow available. Pump operation for variable speed pumps shall be over the full range of speeds specified for operation.

Measure motor voltage, amperage, pump suction head, and pump discharge head at up to ten (10) points along the pump head-flow curve for each speed.

Pump-motor startup test (on-line). Initiate automatic start, placing each unit on-line. Operate unit at full load until stator temperature stabilizes. Bearing temperatures shall be determined by a contact-type thermometer. A running time of at least 30 minutes at full speed shall be maintained for this test.

Record the following measurements on a strip chart during these tests:

- **Speed**
- **Vibration** (Provide instrumentation to measure vibration. Displacement measurements and acceptable field vibration limits shall be in accordance with Hydraulic Institute Standards for vertical pumps). Contractor shall enlist a third party firm to perform onsite vibration testing after pumps are installed.
- **Motor temperature (RTD’s per motor).**
- **Noise (“A” rated weighted noise level at 3 ft. See Vertical Diffusion Vane Pumps Section for performance requirements).** Contractor shall enlist a third party firm to perform onsite noise testing after pumps are installed.

b. **Microfiltration Startup**

Secondary Effluent, or effluent from the existing MF trains, shall be used as MF feed for the Individual System Startup Testing. All components of the MF system shall be operated to ensure that the entire system can operate together under all control modes. One MF cell shall be brought on-line at a time.

Membrane integrity testing shall be completed before a cell is brought online for Individual System Startup Testing.

During this testing phase, the following shall be confirmed:

i. **Verify filtration sequence**
ii. Verify backwash sequence  
iii. Verify membrane test sequence  
iv. Verify other MF System process sequences  
v. Chemically clean the membrane units

c. Reverse Osmosis Startup

MF Filtrate, or RO permeate from existing units, shall be used as RO Feed. All components of the RO system shall be operated to ensure that the entire system can operate together under all control modes. One RO unit shall be brought on-line at a time.

A 48-hour long orifice test shall be performed on the RO units, prior to membrane installation. An orifice shall be placed inside the vessels to create hydraulic resistance equal to having the membranes installed. This testing shall be used to confirm hydraulic conditions of the system and pressure rating of vessels without risking damage to the membranes. Orifice testing shall be performed with the existing plant off-line. Contractor shall notify Owner in advance of scheduling this test, in accordance with notification requirements in these specifications, for coordination of shutdown times.

During this testing phase, the following shall be confirmed:

i. Hydraulic conditions of the system  
ii. Control sequences with Interstage Booster Pumps  
iii. Control sequences without Interstage Booster Pumps  
iv. Acoustical testing of the RO high pressure feed pumps (in accordance with technical specifications)

d. Ultraviolet Light Startup

UV start-up shall be as defined in the UV Disinfection System Installation section and in accordance with manufacturer’s instructions. Operation of the UV System without all control system interlocks shall be coordinated to prevent the flow rate through a UV train from exceeding the manufacturer’s design limits.

e. Chemical Feed System Startup

Any testing related to chemical feed areas shall be performed in the presence of and under the supervision of operations staff from the Owner and OCSD. Additional requirements are defined in Liquid Chemical Feed Systems section.
f. **Tanks Startup**

Verify proper operation of all electrical, mechanical, instrumentation and communication systems at the tanks’ sites.

g. **SEFE Pump Station Startup**

The Secondary Effluent Flow Equalization (SEFE) pumping system shall be operated using a temporary “test loop” furnished and installed by Contractor. Startup tests of the pumping system shall be conducted to verify proper operation of the electrical system from the line interconnection through to the pump motors, and the pumping equipment and auxiliary systems. Startup tests using the temporary test loop shall include, but not be limited to the following:

1. Section 11140: Pump operation – operate each pump individually in the “local” control mode as specified. Verify proper operation and control of pumps, motors and accessories, and of discharge piping, valves and appurtenances.

2. Section 16150, Par. 3-2.03: AFD operation – perform “field acceptance test” on each AFD as specified, expect the drives shall be tested under actual operating conditions.

3. Section 16345, Par 3-2.03: Switchgear operation – verify proper operation of switchgear, breakers and breaker settings, and relay settings based on Coordination Study results.

4. Section 16395, Par 3-2.03: Motor control equipment operation – verify proper operation of equipment. Verify settings of motor protection relay.

Verify proper operation and field settings of equipment, auxiliary systems and building systems, such as those specified in:

1. Section 16425, “Switchboards”, and Section 16480, “Motor Control Centers.”

2. Section 11630, “Compressed Air Equipment.”

**3-1.05 Individual System Acceptance Testing (Acceptance Test).** Contractor shall conduct Individual System Acceptance Testing of each complete process system (i.e. MF System, RO System, Tanks, Pump Stations, etc.) as a complete and functional process system. The individual systems shall undergo a series of Acceptance Tests designed to verify that the individual system meets the specified performance requirements in the Contract Documents. The start dates of the testing periods shall be on a date that is mutually agreed between Owner and Contractor. Manufacturer shall receive a minimum 30 day notice prior to the start
of each of the Acceptance Tests. The Contractor shall furnish the services of authorized manufacturer’s representatives, as necessary, to correct faulty system operation. Representatives of the Manufacturer may provide advice during the Acceptance Tests, but they shall not operate the equipment. The representatives of the Manufacturer shall be at the site during Acceptance Tests as specified in the technical specifications. The representative shall be available on call the remainder of the time.

The Acceptance Test shall continue for up to five (5) days without interruption. The Acceptance Test will be used to demonstrate that the system operates satisfactorily as a complete, functional system meeting the specified performance requirements. Each system shall be tested continuously under actual or simulated operating conditions. If any part of a system shows evidence of unsatisfactory or improper operation during the testing period, correction or repairs shall be made and the full testing operation shall start again until successful operation is observed, unless the test is interrupted for any of the following reasons:

- Loss of secondary effluent water delivered to the OCWD facilities beyond the control of the Contractor.
- Loss of power to the OCWD facilities such as a local power failure.
- Inability of the Barrier Injection Well System or Recharge Basins to accept the water produced by the OCWD facilities if water is approved to be discharged to the Barrier and/or Recharge Basins.
- Inability to discharge any water produced in an acceptable manner.

If the test is interrupted for any of the reasons above, the Contractor is still responsible for completion of the Acceptance Test from the time of failure to the completion of the test once whatever caused the shutdown has been resolved at no additional cost to the Owner. The testing shall include testing of all alarms, such as high and low range set points to confirm settings and operation and system shall be operated in all control modes.

Individual System Acceptance testing for the PCS shall be as specified in The Process Control System Section.

During this testing period a licensed plant operator provided by the Owner will provide continuous observation of all commissioning activities at all times. During the Individual System Acceptance Test, the individual system does not meet the product water quality criteria for that stage of treatment, then it returns either to the head of the OCSD facilities or to the OCSD outfall. If the water does meet the product water quality criteria for that stage, it continues to the next process.
for further treatment or, in the case of post-treatment acceptance testing, to the product water/barrier water pump station.

The operator will operate under the Contractor’s direction whenever water is produced for delivery, however the operator may at any point in the commissioning process halt commissioning for any reason.

During this testing period water shall be diverted to ultimate use as long as specified performance requirements are being met or shall otherwise be recycled to the head of the OCSD facilities. The Contractor shall plan to provide pumping equipment and piping to divert flow.

3-1.06 Overall Startup and Acceptance Testing. Following confirmation that all systems are ready to operate through successful completion of Individual System Acceptance Tests, the Contractor shall conduct an Overall Startup and Acceptance Test. The test shall consist of the requirements listed herein, unless exceptions or additions are indicated in the specific equipment sections.

Overall Startup and Acceptance Testing shall be at least a thirty (30)-day operational run of the entire facility demonstrating that all portions of the facility operate as intended. The test is intended to demonstrate that the facilities are complete, functional and can be continuously operated for their full intended function. During the testing period, the plant shall be operated under all control modes, including manual, remote-manual, and automatic. PLC-PCS Owner’s staff shall operate the facility under the direction of the Startup Manager and Manufacturer’s representatives if applicable.

All systems must properly run continuously 24 hours per day for the test period at flow rates acceptable to Owner. The full AWTF capacity flow of 130 MGD on an average daily basis or the maximum available capacity as defined by the Owner shall be tested. Duty and standby equipment shall be alternated so that all equipment is selected for duty operation for a period of at least (two) 2 days during the test. Unless indicated otherwise, if any item fails, malfunctions or a defect is found during the test, the item shall be repaired and the test restarted at time zero with no credit given for the operating time before the failure, malfunction, or defect was found. Failures, malfunctions, or defects meeting both of the following conditions may, at the Engineer’s discretion, not be considered grounds for restarting the test at time zero:

1. Malfunctions that do not cause an interruption to the operation of the facility because standby equipment can be placed into service.

2. Malfunctions that are corrected within four (4) hours of the time the malfunction is detected. Correction of a malfunction, failure or defect will
be considered complete only when the affected equipment is placed back into service and is operating as intended. It is the Contractor’s responsibility to note the time of failure and to immediately notify Engineer.

The Contractor shall supply all oil, grease, lubricants and other auxiliaries required for Overall Startup and Acceptance Testing. The Owner will supply chemicals, water, and power for operation of the expanded facilities during Acceptance Testing. Contractor shall notify the Engineer forty-five (45) days prior to any testing activities to allow the Owner time to order chemicals and have them delivered to the site for testing procedures. Contractor shall furnish all additional chemicals required for other uses (i.e., disinfection activities following construction) and not specifically for regular operation of the expanded plant. See Temporary Facilities Section for additional requirements.

All failure, malfunctions, defects in materials or workmanship, or other flaws, which appear during this test period, shall be immediately corrected by the Contractor.

All PCS coordination issues and trending requirements shall be finalized so they are tested during this period. Additional requirements for the Overall Startup and Acceptance testing for the PCS shall be as specified in The Process Control System Section.

During this testing period water processed through the OCWD facilities shall be suitable for discharge from the Product Water/Barrier Water Pump Station.

3-1.07. PERFORMANCE TESTING. Performance Testing is for coordination with the requirements of pre-negotiated or pre-procured equipment systems; including the MF System and UV System. Specific requirements for this testing from the procurement documents are highlighted below. The Owner will provide chemicals, water, and power required during performance testing of the new facilities. Contractor shall notify the Engineer forty-five (45) days prior to any testing activities to allow the Owner time to order process chemicals and have them delivered to the site for testing procedure. Contractor shall furnish all additional chemicals required for other uses (i.e., disinfection activities following construction) and not specifically for regular operation of the expanded plant. The Owner will operate the facility.

a. MF System Performance Testing. The MF System shall undergo Performance Testing to satisfy the Acceptance Testing requirements of the MF Membrane Procurement Documents. Performance Testing of the MF System shall include the following.

- Testing shall extend for a period of 90 consecutive days and shall be completed within a total of 120 days after commencement.
• Each membrane cell shall be tested concurrently but shall be evaluated separately for performance.

• Owner shall operate the facility, but the Manufacturer’s Representative shall make a minimum of 3 on-site visits and be available at all times by phone during normal working hours and non-working hours in case of an emergency.

• The Manufacturer’s Representative shall submit a written report including the data and results of the testing at the termination of the period. Report shall confirm that all Membrane System Warranty for performance, as specified in the Procurement Documents, are met.

• During the test, feed water flow shall be divided so one or more membrane cells operate at the design flow, with the other cells equally balanced to treat the remaining raw water available for the 90-day period.

• During the test, the System shall perform in accordance with the guaranteed product water quality to allow the District to discharge treated water.

b. UV System Performance Testing. The UV System testing shall be as specified in the UV Disinfection System Installation Section.

4-1. STARTUP/ TESTING PLANS AND SCHEDULES. The Contractor shall develop a series of plans and schedules for the startup and testing for all facilities included in the Work, and shall submit the plans for review by the Owner and Engineer in accordance with the Submittals section.

Where applicable, testing procedures included in the plans shall be developed in accordance with the requirements in each applicable section of the Contract Documents.

Plans shall include all documentation required to plan and monitor the performance of all startup and testing activities. It is expected that documentation will include selected portions of the Contract Documents, submittals, and manufacturer’s information.

The startup and testing plans shall include detailed startup schedules which are consistent with the Contractor’s current CPM Construction Schedule and applicable requirements of the Contract Documents. The Startup Schedule shall become a subnetwork of the overall Project CPM schedule.

The Contractor shall submit an Overall Startup and Testing Plan, including schedule, to the Engineer no later than 90 calendar days prior to commencing any testing and startup activities.
The Contractor shall submit Factory Testing, Prestartup Activities and Checks, Preoperational Testing, Individual System Startup, Individual System Acceptance Testing, Overall Startup and Acceptance Testing, and Performance Testing Plans to the Engineer no later than 90 calendar days prior to commencing any testing covered by the plans.

The Contractor shall review and present plan in a workshop format. The Engineer, the Owner, and Orange County Sanitation District will review the preliminary test plan and return the plan with comments. The Contractor shall incorporate all comments and shall submit the final plan.

4-1.01. **Overall Startup Plan.** The Overall Startup Plan is the master startup plan document and shall include the following:

- Introduction with a narrative description of the overall testing and startup program planned by the Contractor.
- Summary description of startup team and their assigned responsibilities.
- List of the instruments, equipment, and systems that will undergo startup and testing.
- A preliminary schedule associated with the flowchart described above. Schedule shall include start and end dates for each testing period and major subactivities; dates for "first flow", when water will first be circulated through the plant; "first test water", when test water will be initially introduced to the plant; "first treated water", when treated water meeting all requirements is ready to be released; and dates for energizing permanent power and establishing communication with remote sites.
- General description of required temporary facilities.
- Preliminary checklist of prerequisite activities to be completed before startup activities can begin.
- Name of equipment to be tested, including reference to specification section number and title.
- Summary of power, lighting, chemical, water, etc, needs and identification of who will provide them.
• All required forms to be used to collect and record test data including daily logs.

• Test requirements with references to appropriate standardized testing procedures established by technical organizations (e.g., ASTM, AWWA, etc.)

4-1.02 Preoperational Testing Plan. The Preoperational Testing Plan shall be a comprehensive description of the personnel, equipment, procedures, analyses, and reporting program for all Preoperational Testing required for the Work. The Preoperational Testing Plan shall be subdivided into testing plans for each system. Each system test plan shall include the following:

• The test number.

• Identification information for each component or piece of equipment to be tested as part of the system. All applicable tag numbers shall be included.

• The schedule and duration for the test.

• Prerequisites for the test.

• A narrative description of the purpose and goals of the test.

• Pass/Fail criteria for the test.

• A checklist for tracking testing progress which includes prerequisites for the test and each step of the testing procedure. The check list shall include specified performance criteria that are to be met.

• A listing and copy of pertinent reference documents for each test (Contract Documents, submittal information, other manufacturer's information, and industry standards or specifications applicable to the testing).

• A description of test apparatus used to conduct the test. Where useful, drawings may be included.

• Listing of manufacturer’s representative(s) to be on site during the test.

• Certificates of proper installation, as applicable to the test.

• Step-by-step detailed procedures of how the test will be conducted. The level of detail shall be sufficient for a witness with a rudimentary
technical aptitude to be able to follow the execution of the steps during the test and be confident that the test is being performed as planned. All steps required to proceed through the test in an orderly manner are considered significant and each of these steps shall be included in the procedure.

- Copies of the actual data logs and/or data recording forms that will be used during the test.

- Calculation methodologies to be used to evaluate the data and/or test criteria for the test.

- Sample computations or analyses for the test with results in the same format as the final report. This item is intended to demonstrate how data collected will be used to generate final results. A sample shall be included for each type of computation required for the test and analysis of results.

- Blank sign-off form for the test acknowledging the Contractor’s, the Engineer’s, the Owner’s, and the equipment manufacturer’s acceptance of the test where applicable.

- An example of the System Problem Report is as follows.
<table>
<thead>
<tr>
<th>Project Name: Groundwater Replenishment System Final Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Name:</td>
</tr>
<tr>
<td>Test Number:</td>
</tr>
<tr>
<td>Problem Type: Hardware, Software, Documentation, Unknown, Other</td>
</tr>
<tr>
<td>SYMPTOMS: Time:</td>
</tr>
<tr>
<td>Description:</td>
</tr>
<tr>
<td>Can problem be reproduced at will? Y / N</td>
</tr>
<tr>
<td>DIAGNOSIS: Time:</td>
</tr>
<tr>
<td>Description:</td>
</tr>
<tr>
<td>CORRECTION: Time:</td>
</tr>
<tr>
<td>Description:</td>
</tr>
<tr>
<td>FINAL SIGN OFF Time:</td>
</tr>
</tbody>
</table>
4-1.03 **Individual System Startup Plan.** The Individual System Startup Plan shall be prepared for the entire system. The Individual System Startup Plan shall include the following:

- A description of the purpose and goals of the test.
- A prerequisite checklist, to be acknowledged by the Engineer prior to initiating the test, to demonstrate that all testing and other Work required to be completed prior to the test.
- A listing of all personnel to be used to operate the system and conduct any related monitoring of performance.
- A listing of all test and/or monitoring equipment to be used as part of the startup.
- A listing of standby personnel, equipment, and materials that will be available if needed during the startup period.
- A description of all preparatory work required to facilitate the startup and the continuous operation of the complete system.
- A procedure for startup of the facility.
- Step-by-step procedures for operation during the startup period including a schedule of equipment operation times and duty/standby alternations.
- A description of all data and other information to be reported in support of the completed test, including any blank data logs that may be used.
- Blank sign-off form for the test acknowledging the Contractor’s, the Engineer’s, the Owner’s, and the equipment manufacturer’s acceptance of the test.

4-1.04 **Individual System Acceptance Testing and Overall Startup and Acceptance Testing Plan.** The Individual System Acceptance Testing and Overall Startup and Acceptance Testing Plan shall be prepared for the each system and for all systems combined. The Individual System Acceptance Testing and Overall Startup and Acceptance Testing Plan shall identify the requirements for all systems testing, including subsystems. The Individual System Acceptance Testing and Overall Startup and Acceptance Testing Plan shall include the following:

- A description of the purpose and goals of the test.
- A prerequisite checklist, to be acknowledged by the Engineer prior to initiating the test, that demonstrates that all testing and other Work required to be completed prior to the Individual System Acceptance Testing and Overall Startup and Acceptance Testing is indeed complete.
• A listing of all Owner's personnel to be used to operate the system and conduct any related monitoring of performance and a listing of Contractor's personnel designated to oversee the Owner's operators as required herein.

• A listing of standby personnel, equipment, and materials that will be available if needed during the test period.

• Step-by-step procedures for operation of the facility showing how local and remote control of equipment will be demonstrated.

• A description of all data and other information to be reported in support of the completed test. Include any blank data logs that may be used.

• Blank sign-off form for the test acknowledging the Contractor's, Engineer's, Owner's, and the equipment manufacturer's acceptance of the test.

4-1.05 Startup Schedule. A Startup Schedule shall be prepared, submitted, and kept current. It shall include all testing and related Work. A preliminary version of this schedule shall be included in the Overall Test Plan. The formal Startup Schedule described in this section shall be integrated into the overall Project CPM schedule and shall be prepared as specified for CPM schedules. The Startup Schedule shall be updated weekly to keep it current.

The schedule shall include each system test and all other testing specified in this section and other relevant sections of the Contract Documents.

4-1.06 Startup Reports and Records. Formal reporting and documentation of failures, malfunctions or defects, and repairs made during the startup and/or testing, is required. A “System Problem Report” form is included in this section, and shall be used by the Contractor to document problems that arise during these tests, and their resolution.

Records of all testing shall be compiled by the Contractor and submitted to the Engineer. Prior to being submitted to the Engineer, the Startup Manager shall certify that the test results show that the tested systems comply with the Contract requirements. Records shall include all documentation assembled for the test, all certifications, forms and check lists completed during the test, and sign-off forms. Records for startup and tests shall be compiled as separate documents for each system tested, and shall be submitted within 48 hours of completion of the startup and/or testing for each system. Separate records shall be submitted for the Preoperational Testing and Acceptance Tests. These records shall include “System Problem Report” forms completed during those tests (see above).
Included herein as an exhibit is an example form that the Contractor may use to coordinate, review, and verify the startup and testing requirements for each piece of equipment on the Project.

5-1 TRAINING OF PERSONNEL.

5-1.01 General. Training is generally separated into two categories: Initial Training and Follow-up Training. The Startup Manager shall coordinate all training activities and shall ensure that Manufacturers provide factory-trained operations and maintenance specialist to instruct the Owner’s maintenance and operations personnel in the operation, disassembly, and assembly of major equipment items, start-up, shutdown, safety concerns, troubleshooting, installation, alignment, and recommended corrective and preventive maintenance procedures for all equipment.

5-1.02 Initial Training. Initial Training shall be accomplished at a time approved by the Engineer, after Preoperational Testing but prior to Individual System Startup. Contractor shall provide a combination of classroom and field training. All training shall be conducted at the Project site. Contractor shall be responsible for planning, supervising, and conducting the training, in coordination with the Engineer and Manufacturer's Representatives. The Initial Training shall be planned such that it follows a logical sequence that generally includes the following components:

a. Process – Overview by Engineer, training by Manufacturer's Representatives.

b. Mechanical systems - Training by Manufacturer's Representative.

c. Electrical Systems - Training by Manufacturer's Representative.

d. Instrumentation and Controls - Overview by Engineer, training by Manufacturer's Representative.

e. OCSD training for applicable process

The Owner considers training performed by the manufacturer's representative a critical element of this Project. The Contractor shall provide a qualified videographer to record all training sessions including Follow Up Training. Recorded sessions shall be provided to the Owner on a Digital Video Disc (DVD) in the digital format requested by the Owner.

Contractor shall provide the number of days of training for equipment as indicated in the equipment schedule.
A personnel training day as indicated in the equipment schedule shall mean one full eight (8)-hour period of instruction at the Owner’s facility. Travel and set-up time for manufacturer’s training representatives shall be in addition to the personnel training days indicated. Personnel training days shall be in addition to manufacturer’s field services required as indicated in the equipment and submittals sections.

5-1.03 Instruction Schedule. Contractor shall provide to Engineer a tentative training schedule and contact person 60 days prior to commencement of any training. Manufacturer shall submit for approval a proposed lesson plan for the instruction 30 days prior to commencement of scheduled training. Manufacturer shall submit for approval credentials of its designated instructor. Credentials shall include a brief resume and specific details of the instructor's experience with training on maintenance and operation of the equipment provided.

5-1.04 Instruction Lesson Plan. Manufacturer's proposed lesson plan shall include the elements presented in the outline specified herein. Specific components and procedures shall be identified in the proposed lesson plan. Manufacturer's proposed lesson plan shall detail specific instruction topics. Training aids to be utilized in the instruction shall be referenced and attached where applicable to the proposed lesson plan. "Hands-on" demonstrations planned for the instruction shall be described in the lesson plan. The manufacturer shall indicate the estimated duration of each segment of the training lesson plan.

5-1.04.1 Outline of Instruction Lesson Plan:

1. Equipment operation:
   a. Describe equipment's operating (process) function.
   b. Describe equipment's fundamental operating principals and dynamics.
   c. Identify equipment's mechanical, electrical, and electronic components and features.
   d. Identify all support equipment associated with the operation of subject equipment (i.e., air intake filters, valve actuators, motors).

2. Detailed component description:
   a. Identify and describe in detail each component's function.
   b. Where applicable, group related components into subsystems. Describe subsystem functions and their interaction with other subsystems.
   c. Identify and describe in detail equipment safeties and control interlocks.
3. Equipment preventive maintenance:
   a. Describe preventive maintenance inspection procedures required to:
      (1) Perform an inspection of the equipment in operation.
      (2) Spot potential trouble symptoms (anticipate breakdowns).
      (3) Forecast maintenance requirements (predictive maintenance).
   b. Define the recommended preventive maintenance intervals for each component.
   c. Provide lubricant and replacement part recommendations and limitations.
   d. Describe appropriate cleaning practices and recommended intervals.

4. Equipment troubleshooting:
   a. Define recommended systematic troubleshooting procedures.
   b. Provide component-specific troubleshooting checklists.
   c. Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting.

5. Equipment corrective maintenance:
   a. Describe recommended equipment preparation requirements.
   b. Identify and describe the use of any special tools required for maintenance of the equipment.
   c. Describe component removal/installation and disassembly/assembly procedures.
   d. Perform at least two "hands-on" demonstrations of common corrective maintenance repairs.
   e. Describe recommended measuring instruments and procedures and provide instruction on interpreting alignment measurements, as appropriate.
   f. Define recommended torqueing, mounting, calibration, and/or alignment procedures and settings, as appropriate.
   g. Describe recommended procedures to check/test equipment following a corrective repair.
5-1.05 Training Aids. The manufacturer's instructor shall incorporate training aids as appropriate to assist in the instruction. At a minimum, the training aids shall include text and figure handouts. The manufacturer shall provide Owner one (1) complete set of all slides, transparencies, diagrams, and other written material used for training purposes. Other appropriate training aids are:

a. Audio-visual aids (e.g. films, slides, digital video, posters, blueprints, diagrams, catalog sheets).

b. Equipment cutaways and samples (e.g. spare parts, damaged equipment).

c. Tools (e.g. repair tools, customized tools, measuring, and calibrating instruments).

The manufacturer's instructor shall utilize descriptive class handouts during the instruction. Photocopied class handouts shall be good quality reproductions. Class handouts should accompany the instruction with frequent reference made to them. Customized handouts developed especially for the instruction are encouraged. Handouts planned for the instruction shall be attached with the manufacturer's proposed lesson plan.

5-1.06 Hands-On Demonstrations. The manufacturer's instructor shall present at least two (2) "hands-on" demonstrations of common corrective maintenance repairs so that key operations and maintenance personnel have the opportunity to witness the demonstration. The manufacturer shall provide the tools and equipment to conduct the demonstrations. Requests for supplemental assistance and facilities should be submitted with the manufacturer's proposed lesson plan.

The proposed "hands-on" demonstrations should be described in the manufacturer's proposed lesson plan. In any hands-on training situation where Owner's operations or maintenance personnel participate in disassembly or assembly of equipment components, the manufacturer shall be responsible for such disassembly or assembly and shall provide written certification of proper equipment operation to the Engineer.

5-1.07 Manufacturer's Services. Training for each equipment item in these specifications shall be in accordance with this section unless otherwise specified. All training will be performed during the operating staff's normal business hours or at other times requested or approved by the Owner. In addition to the above criteria, each equipment specification may request minimum times and material for training. These shall include, but not be limited to, installation assistance; startup, checkout, and testing; pre-startup training; and post-startup training. The time specified for these activities shall be in addition to time required for fulfilling the instruction requirements as specified above.
5-1.08 Follow up Training. Contractor shall include 8 hours of follow up training time for each of the following:

- Sodium Hypochlorite System
- Vertical Diffusion Vane Pumps
- RO Feed Pumps
- Instrumentation and Control System

The Manufacturer’s Representatives shall conduct this training to address any follow up issues or concerns at the conclusion of startup and testing. The Startup Manager shall schedule the training and coordinate with Manufacturer’s Representatives for availability.

End of Section
The forms listed below and included in this section are referenced from other sections of the Contract documents:

<table>
<thead>
<tr>
<th>Form No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>01650-1</td>
<td>Equipment Test Report Form</td>
</tr>
<tr>
<td>01650-2</td>
<td>Operation and Maintenance Transmittal Form</td>
</tr>
<tr>
<td>01650-3</td>
<td>Equipment Summary Form</td>
</tr>
<tr>
<td>01650-4</td>
<td>Equipment Record Form</td>
</tr>
<tr>
<td>01650-5</td>
<td>Manufacturer's Installation Certification Form</td>
</tr>
<tr>
<td>01650-6</td>
<td>Manufacturer's Instruction Certification Form</td>
</tr>
<tr>
<td>01650-7</td>
<td>Unit Responsibility Certification Form</td>
</tr>
<tr>
<td>01650-8</td>
<td>Motor Data Form</td>
</tr>
<tr>
<td>01650-9</td>
<td>Wire and Cable Resistance Test Data Form</td>
</tr>
<tr>
<td>01650-10</td>
<td>Installed Motor Test Data Form</td>
</tr>
<tr>
<td>01650-11</td>
<td>Dry Transformer Test Data Form</td>
</tr>
<tr>
<td>01650-12</td>
<td>Motor Control Center Test Form</td>
</tr>
<tr>
<td>01650-13</td>
<td>Medium Voltage Motor Starter Test Form</td>
</tr>
<tr>
<td>01650-14</td>
<td>Medium Voltage Switchgear Test Form</td>
</tr>
<tr>
<td>01650-15</td>
<td>Protective Relay Test Form</td>
</tr>
<tr>
<td>01650-16</td>
<td>Low Voltage Switchgear Test Form</td>
</tr>
<tr>
<td>01650-17</td>
<td>Medium Voltage Load Interrupter Switch Test Form</td>
</tr>
<tr>
<td>01650-18</td>
<td>Liquid-Filled Transformer Test Form</td>
</tr>
<tr>
<td>01650-19</td>
<td>Automatic Transfer Switch Test Form</td>
</tr>
<tr>
<td>01650-20</td>
<td>Loop Wiring and Insulation Resistance Test Data Form</td>
</tr>
<tr>
<td>01650-21</td>
<td>Panel Indicator Calibration Test Data Form</td>
</tr>
<tr>
<td>01650-22</td>
<td>Field Switch Calibration Test Data Form</td>
</tr>
<tr>
<td>01650-23</td>
<td>Transmitter Calibration Test Data Form</td>
</tr>
<tr>
<td>01650-24</td>
<td>Miscellaneous Instrument Calibration Test Data Form</td>
</tr>
<tr>
<td>01650-25</td>
<td>Individual Loop Test Data Form</td>
</tr>
<tr>
<td>01650-26</td>
<td>Loop Commissioning Test Data Form</td>
</tr>
</tbody>
</table>
NOTE: This example equipment test report is provided for the benefit of the Contractor and is not specific to any piece of equipment to be installed as a part of this project. The example is furnished as a means of illustrating the level of detail required for the preparation of equipment test report forms for this project.

---

**ORANGE COUNTY WATER DISTRICT**

**GROUNDWATER REPLENISHMENT SYSTEM**

**FINAL EXPANSION**

ABC Construction Company, Inc., General Contractor
Orange County Water District, Engineer

---

**EQUIPMENT TEST REPORT**

<table>
<thead>
<tr>
<th>Equipment Name:</th>
<th>RO Transfer Pump AO3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment Tag Number:</td>
<td>255-A03-PMP-0400</td>
</tr>
<tr>
<td>Specification Ref:</td>
<td>11140</td>
</tr>
<tr>
<td>Area Reference Code:</td>
<td>255</td>
</tr>
<tr>
<td>Area Description:</td>
<td>RO Transfer Pump Station</td>
</tr>
</tbody>
</table>

Contractor | Date | Engineer | Verified | Date | Verified |
---------- |------|----------|----------|------|----------|

---

**PREOPERATIONAL CHECKLIST**

**Mechanical**

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lubrication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alignment</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Anchor bolts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seal water system operational</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment rotates freely</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety guards</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valves operational</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hopper purge systems operational</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedimentation tank/hopper clean</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O&amp;M manual information complete</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturer's installation certificate complete</td>
<td></td>
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</tr>
</tbody>
</table>

---

Orange County Water District
Groundwater Replenishment System
Final Expansion

01650A
-2-
August 2018
DS2 Submittal
<table>
<thead>
<tr>
<th><strong>Electrical</strong> (circuit ring-out and functionality tests)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuits:</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Power to MCC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control to HOA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicators at MCC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red (running)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green (power)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amber (auto)</td>
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<td></td>
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<tr>
<td>Indicators at local control panel</td>
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</tr>
<tr>
<td>Wiring labels complete</td>
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<tr>
<td>Nameplates:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control station</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control panel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment bumped for rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Piping Systems</strong></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaned and flushed:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure tests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary piping screens in place</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Instrumentation and Controls</strong></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flowmeter calibration</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Calibration Report No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow recorder calibrated against transmitter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VFD speed indicator calibrated against independent reference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge overpressure shutdown switch calibration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simulate discharge overpressure Shutdown</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### FUNCTIONAL TESTS

**Mechanical**

- Motor operation temperature satisfactory
- Pump operating temperature satisfactory
- Unusual noise, etc?
- Pump operation:
  - Measurement
  - Flow
  - Pressure
  - Test gage number
  - Alignment hot
  - Dowelled in

**Remarks:**

---

**Electrical**

- Local switch function:
  - Runs in **HAND**
  - No control power in **OFF**
  - Timer control in **AUTO**
- Overpressure protection switch functional in both **HAND** and **AUTO**
- Overpressure protection switch setting: set at ____________
- PLC set at 24-hour cycle, 25 min **ON**

### OPERATIONAL TEST

48-hour continuous test. Pump cycles as specified, indicators functional, controls functional, pump maintains capacity, overpressure protection remains functional, hour meter functional

### RECOMMENDED FOR BENEFICIAL OCCUPANCY

---

**Engineer** ________________  Date ____________

**ACCEPTED FOR BENEFICIAL OCCUPANCY**

---

**District’s Representative** ________________  Date ____________

---

Orange County Water District 01650A TESTING, STARTUP AND TRAINING FORM
Groundwater Replenishment System -4- August 2018 DS2 Submittal
Final Expansion
**Checklist**

<table>
<thead>
<tr>
<th>Checklist</th>
<th>Contractor</th>
<th>Construction Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Table of contents</td>
<td>Satisfactory</td>
<td>N/A</td>
</tr>
<tr>
<td>2. Equipment record forms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Manufacturer information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Vendor information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Safety precautions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Operator prestart</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Start-up, shutdown, and post shutdown procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Normal operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Emergency operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Operator service requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Environmental conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Lubrication data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Preventive maintenance plan and schedule</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Troubleshooting guides and diagnostic techniques</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Wiring diagrams and control diagrams</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Maintenance and repair procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Removal and replacement instructions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Spare parts and supply list</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Corrective maintenance man-hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Parts identification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Warranty information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Personnel training requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Testing equipment and special tool information</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**

Contractor's Signature
## EQUIPMENT SUMMARY FORM:

1. **EQUIPMENT ITEM**

2. **MANUFACTURER**

3. **EQUIPMENT IDENTIFICATION NUMBER(S)**
   (maps equipment number)

4. **LOCATION OF EQUIPMENT**

5. **WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS)**

6. **NAMEPLATE DATA**
   - Horsepower
   - Amperage
   - Voltage
   - Service Factor (S.F.)
   - Speed
   - ENC Type
   - Capacity
   - Other

7. **MANUFACTURER'S LOCAL REPRESENTATIVE**
   - Name
   - Address
   - Telephone Number

8. **MAINTENANCE REQUIREMENTS**

9. **LUBRICANT LIST**

10. **SPARE PARTS (recommendations)**

11. **COMMENTS**

---

## EQUIPMENT RECORD FORM:

Orange County Water District  01650A
Groundwater Replenishment System  -6-
Final Expansion  DS2 Submittal
### MECHANICAL INFORMATION

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Type</td>
</tr>
<tr>
<td>Loop Tag No.</td>
</tr>
<tr>
<td>Loop</td>
</tr>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Area</td>
</tr>
</tbody>
</table>

| Drive Bushing | Shaft Size |
| Drive Belt Insert | Chain Amount |
| Drive Bushing | Shaft Size |
| Drive Belt Insert | Chain Amount |

| Input RPM | Output RPM | Ratio |
| Frame Rotation | Mech. Size |
| Service Factor | Cylinders HP |
| Lubrication Amount | Volume |
| Type | PSI |

### DRIVEN UNIT INFORMATION

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Dynamic Head Impeller Material</td>
<td></td>
</tr>
<tr>
<td>Impeller Size Wear Ring Material</td>
<td></td>
</tr>
<tr>
<td>Trim Size Front Seal</td>
<td></td>
</tr>
<tr>
<td>Suction Size Shaft Seal</td>
<td></td>
</tr>
<tr>
<td>Discharge Size Front Bearing</td>
<td></td>
</tr>
<tr>
<td>Bhp Required End Shaft Bearing</td>
<td></td>
</tr>
<tr>
<td>Discharge Capacity Lubrication</td>
<td></td>
</tr>
<tr>
<td>Driven Unit RPM Frame</td>
<td></td>
</tr>
<tr>
<td>Coupling Data</td>
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Orange County Water District 01650A TESTING, STARTUP AND TRAINING FORM Groundwater Replenishment System -7- August 2018 Final Expansion DS2 Submittal
<table>
<thead>
<tr>
<th></th>
<th>Speed</th>
<th>Min.</th>
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<tbody>
<tr>
<td>Lubrication</td>
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<tr>
<td>Frame</td>
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<tr>
<td>Class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drive End Bearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opposite Bearing</td>
<td>Voltage</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>Fuse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breaker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thrust Bearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horsepower</td>
<td></td>
<td>KVA</td>
</tr>
<tr>
<td>Service Factor</td>
<td></td>
<td>Impedance</td>
</tr>
<tr>
<td>Starter Size</td>
<td></td>
<td>Hz</td>
</tr>
<tr>
<td>Heater Size</td>
<td></td>
<td>Phase</td>
</tr>
<tr>
<td>Description</td>
<td>Asset Type</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td>Loop Tag No.</td>
<td>Manufacturer</td>
<td></td>
</tr>
<tr>
<td>Loop Vendor</td>
<td></td>
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</tr>
<tr>
<td>Location Model No.</td>
<td></td>
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<tr>
<td>Area Serial No.</td>
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<table>
<thead>
<tr>
<th>PLC Address</th>
<th>Part No.</th>
<th>Catalog No.</th>
</tr>
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<tbody>
<tr>
<td>Current Type Voltage</td>
<td>Kva Watts Amps</td>
<td></td>
</tr>
<tr>
<td>Circuit No.</td>
<td>MCC No.</td>
<td></td>
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<tr>
<td>Liner Material</td>
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<table>
<thead>
<tr>
<th>Isolation Fuse No.</th>
<th>Isolation Fuse Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duty</td>
<td>Instrument Rating</td>
</tr>
<tr>
<td>Accuracy</td>
<td>Operating Temperature</td>
</tr>
<tr>
<td>Control Function</td>
<td>Style</td>
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<table>
<thead>
<tr>
<th>Output Range</th>
<th>Signal Output</th>
<th>No. of Outputs</th>
</tr>
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<tbody>
<tr>
<td>Input Range</td>
<td>Signal Input</td>
<td>No. of Channels</td>
</tr>
<tr>
<td>Totalizer Factor</td>
<td>Enclosure Type</td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Sensor Type</td>
<td></td>
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<tr>
<td>Repeatability</td>
<td>Mounting Configuration</td>
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<table>
<thead>
<tr>
<th>IC Power Source</th>
<th>Primary Power Unit</th>
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<tbody>
<tr>
<td>Reference Volts</td>
<td>Unit Control Panel No.</td>
</tr>
<tr>
<td>Items Controlled</td>
<td></td>
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<table>
<thead>
<tr>
<th>Process Fluid</th>
<th>Unit</th>
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<tbody>
<tr>
<td>Max. Differential</td>
<td>Throat Diameter</td>
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<tr>
<td>Operating Pressure</td>
<td>Unit</td>
</tr>
<tr>
<td>Description</td>
<td></td>
</tr>
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<tr>
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<td>Manufacturer</td>
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<td>Loop</td>
<td>Vendor</td>
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<td>Model No.</td>
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<table>
<thead>
<tr>
<th>Breaker</th>
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<tr>
<td>Amps</td>
</tr>
<tr>
<td>Catalog</td>
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<table>
<thead>
<tr>
<th>Starter</th>
<th>Size</th>
<th>Volts</th>
<th></th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
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<table>
<thead>
<tr>
<th>Heaters</th>
</tr>
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<tbody>
<tr>
<td>Contact No.</td>
</tr>
<tr>
<td>Coil No.</td>
</tr>
<tr>
<td>Series</td>
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<table>
<thead>
<tr>
<th>Transformer</th>
<th>Part No.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KVA</td>
<td>Fuse</td>
</tr>
<tr>
<td>Transformer Type</td>
<td>Amps</td>
<td></td>
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</tbody>
</table>
MANUFACTURER’S INSTALLATION CERTIFICATION FORM:

Contract No: ___________________________ Specification section: ___________________________

Equipment name: ____________________________________________________________

____________________

Contractor: ________________________________________________________________

____________________

Manufacturer of equipment item: _____________________________________________

____________________

The undersigned manufacturer of the equipment item described above hereby certifies that he has checked the installation of the equipment and that the equipment, as specified in the project manual, has been provided in accordance with the manufacturer’s recommendations, and that the trial operation of the equipment item has been satisfactory.

Comments: ______________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

Date  Manufacturer

____________________

Signature of Authorized Representative

____________________

Date  Contractor

____________________

Signature of Authorized Representative
MANUFACTURER'S INSTRUCTION CERTIFICATION FORM:

Contract No: __________________________ Specification section: __________________________
Equipment name: __________________________
Contractor: __________________________
Manufacturer of equipment item: __________________________

The undersigned manufacturer certifies that a service engineer has instructed the water treatment plant operating personnel in the proper maintenance and operation of the equipment designated herein.

Operations Check List (check appropriate spaces)

Start-up procedure reviewed ____________
Shutdown procedure reviewed ____________
Normal operation procedure reviewed ____________

Others: __________________________
______________________________
______________________________

Maintenance Check List (check appropriate spaces)

Described normal oil changes (frequency) ____________
Described special tools required ____________
Described normal items to be reviewed for wear ____________
Described preventive maintenance instructions ____________
Described greasing frequency ____________

Others: __________________________
______________________________
______________________________

______________________________
Date Manufacturer

______________________________
Signature of Authorized Representative

______________________________
Date Signature of District's Representative

______________________________
Date Signature of Contractor's Representative
<table>
<thead>
<tr>
<th>Notary Public</th>
<th>Name of Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commission expiration date</td>
<td>Address</td>
</tr>
<tr>
<td>Seal:</td>
<td>By: ____________________</td>
</tr>
<tr>
<td></td>
<td>Duly Authorized Official</td>
</tr>
<tr>
<td></td>
<td>Legal Title of Official</td>
</tr>
<tr>
<td></td>
<td>Date: ____________________</td>
</tr>
</tbody>
</table>

In accordance with the contract documents, the undersigned manufacturer accepts unit responsibility for all components of equipment furnished under specification Section __________. We hereby certify that these components are compatible and comprise a functional unit suitable for the specified performance and design requirements.
**MOTOR DATA FORM:**

Equipment Name ___________________________  Equipment No(s). __________

Site Location __________________________________________

**Nameplate Markings**

<table>
<thead>
<tr>
<th>Mfr</th>
<th>Mfr Model</th>
<th>Frame</th>
<th>HP</th>
<th>Volts</th>
<th>Phase</th>
<th>RPM</th>
<th>Service factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLA</th>
<th>LRA</th>
<th>Freq</th>
<th>Amb temp rating</th>
<th>degrees C</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Time rating</th>
<th>Design letter</th>
<th>(NEMA MG1-10.35)</th>
<th>(NEMA MG-1.16)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

KVA code letter ____________

Insulation class ____________

The following information is required for explosion proof motors only:

A. Approved by UL for installation in Class _____, Div ______

B. UL frame temperature code _____;  Group _____ Atmosphere
   (NEC Tables 500-2 and 500-2(b))

The following information is required for all motors 1/2 horsepower and larger:

A. Guaranteed minimum efficiency __________________________

B. Nameplate or nominal efficiency __________________________

**Data Not Necessarily Marked on Nameplate**

Type of enclosure __________________________

Enclosure material __________________________

Temp rise __________________________ degrees C (NEMA MG1-12.41,42)

Space heater included? ______ Yes _______ No; if Yes, _______ watts _______ volts

Type of motor winding over temperature protection, if specified: __________________________

Use the space below to provide additional information on other motor modifications, if specified:

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________
<table>
<thead>
<tr>
<th>Location of Test</th>
<th>Insulation resistance, megohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
</tr>
</tbody>
</table>

CERTIFIED _______________________________ Date _______________________________
Contractor's Representative

WITNESSED _______________________________ Date _______________________________
District's Representative
01650-10  INSTALLED MOTOR TEST FORM:

Motor Equipment Number ___________________________ Date of test ________________
Equipment Driven ________________________________
MCC Location ________________________________ Ambient temp ________ °F

Resistance:
  Insulation resistance phase-to-ground megohms:
<table>
<thead>
<tr>
<th>Phase</th>
<th>Megohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>_______</td>
</tr>
<tr>
<td>B</td>
<td>_______</td>
</tr>
<tr>
<td>C</td>
<td>_______</td>
</tr>
</tbody>
</table>

Current at Full Load:
<table>
<thead>
<tr>
<th>Phase</th>
<th>Current, amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>_______</td>
</tr>
<tr>
<td>B</td>
<td>_______</td>
</tr>
<tr>
<td>C</td>
<td>_______</td>
</tr>
</tbody>
</table>

Thermal Overload Device: Manufacturer/catalog # ________________ Amperes ______
Circuit breaker (MCP) setting: ______________________________

Motor Nameplate Markings:
<table>
<thead>
<tr>
<th>Mfr</th>
<th>Mfr type</th>
<th>Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mfr type</td>
<td>_______</td>
<td>______</td>
</tr>
<tr>
<td>HP ______</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volts _______</td>
<td>Phase ______</td>
<td>RPM ______</td>
</tr>
<tr>
<td>Amps _______</td>
<td>Freq ______</td>
<td>Ambient temp rating ______ °C</td>
</tr>
<tr>
<td>Time rating ______</td>
<td>**Design letter (NEMA 1-10.35)</td>
<td>(NEMA MG-1.16)</td>
</tr>
<tr>
<td>Code letter ______</td>
<td>Insulation class ______</td>
<td></td>
</tr>
</tbody>
</table>

**Required for 3-phase squirrel cage induction motors only.

CERTIFIED ___________________________________________ Date__________________________
________ Contractor’s Representative

WITNESSED ___________________________________________ Date__________________________
________ District’s Representative
01650-11 DRY TRANSFORMER TEST DATA FORM:

Equipment No. ____________________________ Temperature ____________________________
Location ____________________________
Winding: Primary ____________________________ Secondary ____________________________

A. INSULATION-RESISTANCE TEST:

The test shall be made with a megohmmeter at the test voltage for a period of 1 minute.

<table>
<thead>
<tr>
<th>Voltage rating</th>
<th>Test voltage</th>
<th>Test results (megohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-600</td>
<td>1000</td>
<td>A-GRD __  A-B _____</td>
</tr>
<tr>
<td>601-5000</td>
<td>2500</td>
<td>B-GRD __  B-C _____</td>
</tr>
<tr>
<td>5000+</td>
<td>5000</td>
<td>C-GRD __  C-A _____</td>
</tr>
</tbody>
</table>

Resistance readings less than the manufacturer’s recommended value or less than 10 megohms shall be brought to the attention of the Engineer.

B. DIELECTRIC-ABSORPTION TEST:

The test shall be made with a megohmmeter at the test voltage for a period of 10 minutes.

1. TEST RESULTS: (megohms) Phase Phase
   | Phase        Phase       |
   | A-GRD __  A-B _____ |
   | B-GRD __  B-C _____ |
   | C-GRD __  C-A _____ |

2. POLARIZATION INDEX:

\[
\frac{10 \text{ minute reading}}{1 \text{ minute reading}} = \text{polarization index}
\]

(from paragraph "A" above)

| Phase        Phase       |
| A-GRD __  A-B _____ |
| B-GRD __  B-C _____ |
| C-GRD __  C-A _____ |

Polarization index values less than 2 shall be brought to the attention of the Engineer.

CERTIFIED ____________________________ Date____________________
Contractor’s Representative

WITNESSED ____________________________ Date____________________
District’s Representative
01650-12  MOTOR CONTROL CENTER TEST FORM:

Equipment No. ___________________________  Ambient room temperature ___________________________

Location ____________________________

A.  MECHANICAL CHECK:

All bolted connections either bus to bus or cable to bus shall be torqued to the manufacturer's recommendations.

B.  ELECTRICAL TESTS:

1.  Measure insulation resistance of each bus section phase to phase and phase to ground for one minute using a megohmmeter at 1000 volts.

   Test results (megohms)
   
<table>
<thead>
<tr>
<th>Phase</th>
<th>Phase</th>
<th>Test result (megohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-GRD</td>
<td>A-B</td>
<td>______</td>
</tr>
<tr>
<td>B-GRD</td>
<td>B-C</td>
<td>______</td>
</tr>
<tr>
<td>C-GRD</td>
<td>C-A</td>
<td>______</td>
</tr>
</tbody>
</table>

2.  Set the circuit breaker in the starter unit to comply with the requirements of NEC, Article 430-52 and Table 430-152.

3.  Motor overload heater elements shall be sized and installed based on the actual nameplate full load amperes of the motor connected to the starter.

CERTIFIED ____________________________  Date_____________________
  Contractor's Representative

WITNESSED ____________________________  Date_____________________
  District’s Representative

Orange County Water District  01650A  TESTING, STARTUP AND TRAINING FORM
Groundwater Replenishment System -18-  August 2018
Final Expansion  DS2 Submittal
MEDIUM VOLTAGE MOTOR STARTER TEST FORM:

Equipment No.______________________________________________________________

Location _________________________________________________________________

Room Temperature _________________________________________________________

The protective devices shall be set in accordance with the specification before the tests are performed.

1. Measure contact resistance (micro-ohms)
   Phase: A____ B____ C_______
   Contacts shall be replaced if resistance exceeds 50 micro-ohms.

2. Perform an insulation resistance test (1000 volts DC for 1 minute).
   
<table>
<thead>
<tr>
<th>Phase</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole to ground</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Across open pole</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pole to pole</td>
<td>AB</td>
<td>BC</td>
<td>CA</td>
</tr>
<tr>
<td></td>
<td>megohms</td>
<td>megohms</td>
<td>megohms</td>
</tr>
</tbody>
</table>

3. Perform minimum pickup voltage tests on trip and close coils.

4. Motor RTDs shall be tested by using a hot oil bath. The temperature at which the sensor trips shall be recorded for each RTD.

5. The Contactor shall be tripped by operation of each protective device.
The protective devices shall be set in accordance with the specification before the tests are performed.

1. Measure contact resistance (micro-ohms)
   Phase: A_ B_ C_
   Contacts shall be replaced if resistance exceeds 50 micro-ohms.

2. Perform an insulation resistance test (1000 volts DC for 1 minute).
   Phase A B C
   Pole to ground _ _ _ megohms
   Across open pole _ _ _ megohms
   Pole to pole AB BC CA megohms

3. Perform minimum pickup voltage tests on trip and close coils.

4. Verify the instrument transformer ratios. Check the transformer’s polarity electrically.

5. The Contractor shall be tripped by operation of each protective device.
01650-15   PROTECTIVE RELAY TEST FORM:

Location ________________________________________________________________

Switchgear Breaker No. ________________________________________________

Protective Relay Description __________________________________________

The protective relays shall be tested in the following manner:

1. Each protective relay circuit shall have its insulation resistance tested to ground.

2. Perform the following tests on the specified relay setting:
   a. Pickup parameters on each operating element.
   b. Timing test shall be performed at three points on the time dial curve.
   c. Pickup target and seal-in units.

The results shall be recorded and signed. A copy shall be given to the Engineer in accordance with paragraph 16010-1.05 B.
01650-16 LOW VOLTAGE SWITCHGEAR TEST FORM:

Equipment No. __________________________________________________________

Location ______________________________________________________________

Room Temperature ______________________________________________________

The protective devices shall be set in accordance with the specification before the tests are performed.

1. Measure contact resistance (micro-ohms)
   
   Phase: A______ B______ C____
   
   Contacts shall be replaced if resistance exceeds 50 micro-ohms.

2. Perform an insulation resistance test (1000 volts DC for 1 minute).
   
   Phase            A    B    C
   Pole to ground   __  __ __ megohms
   Across open pole AB  BC  CA __ megohms
   Pole to pole     AB     BC  CA __ megohms

3. Minimum pickup current shall be determined by primary current injection.

4. Long time delay shall be determined by primary injection at three hundred percent (300%) pickup current.

5. Short time pickup and time delay shall be determined by primary injection of current.

6. Instantaneous pickup current shall be determined by primary injection.

7. Trip unit reset characteristics shall be verified.

8. Auxiliary protective devices, such as ground fault or under voltage relays, shall be activated to ensure operation of shunt trip devices.
01650-17 MEDIUM VOLTAGE LOAD INTERRUPTER SWITCH TEST FORM:

Equipment Number ____________________________________________________________

Location ________________________________________________________________

Date ________________________________________________________________

1. Measure switch blade resistance (micro-ohms).
   Phase: A_____ B_____ C_____  
Contacts shall be replaced if resistance exceeds 50 micro-ohms.

2. Perform an insulation resistance test (1000 volts DC for 1 minute).

<table>
<thead>
<tr>
<th>Phase</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole to ground</td>
<td>_</td>
<td>_</td>
<td>megohms</td>
</tr>
<tr>
<td>Across open pole</td>
<td>_</td>
<td>_</td>
<td>megohms</td>
</tr>
<tr>
<td>Pole to pole</td>
<td>AB</td>
<td>BC</td>
<td>CA</td>
</tr>
</tbody>
</table>

The results shall be recorded and signed. A copy shall be given to the Engineer in accordance with paragraph 16010-2.06 B.

CERTIFIED ____________________________ Date________________________
Contractor's Representative

WITNESSED ____________________________ Date________________________
District’s Representative
01650-18   LIQUID-FILLED TRANSFORMER TEST FORM:

Equipment Number ____________________________________________________________

Location ________________________________________________________________

Date/Weather Conditions __________________________________________________

A. Perform the "Insulation-Resistance Test" and "Dielectric Absorption Test" using Form 01650-11, Dry Transformer Test Data Form.

B. Perform an applied voltage (low frequency dielectric) test in accordance with ANSI C57.12.90, paragraph 10.5, Applied Voltage Test. Applied voltage levels shall be 75 percent of recommended factory test levels or recommended test levels of ANSI C57.12.00, Table 5.

C. Insulating oil shall be sampled and shall be laboratory tested for the following:
   1. Dielectric strength.
   2. Acid neutralization.
   3. Interfacial tension.
   5. Power factor.

D. Perform a turns ratio test between the windings for all tap positions.

E. The temperature and pressure switches shall be tested using a hot oil bath and air pump.

The results shall be recorded and signed by the Contractor and Engineer. Any readings which are abnormal to ANSI industry standards shall be reported to the Engineer.
01650-19  AUTOMATIC TRANSFER SWITCH TEST FORM:

Equipment Number ________________________________

Location __________________________________________

Date _____________________________________________

1. Perform an insulation resistance test (1000 volts DC for 1 minute):

   Phase
   A    B    C
   Pole to ground ___ ___ ___ megohms
   Pole to pole    AB__ BC__ CA__megohms

2. Perform the following operations and initial:
   a. Manual transfer ________________
   b. Loss of normal power; ____sec delay
   c. Return to normal power; ____sec delay

The results shall be recorded and signed. A copy shall be given to the Engineer in accordance with paragraph 16010-2.06 B.

CERTIFIED ________________________________ Date____________________

Contractor's Representative

WITNESSED ________________________________ Date____________________

District's Representative
Loop WIRING AND INSULATION RESISTANCE TEST DATA FORM:

Loop No:

List all wiring associated with a loop in table below. Make applicable measurements as indicated after disconnecting wiring.

<table>
<thead>
<tr>
<th>Wire No.</th>
<th>Panel</th>
<th>Field Tie</th>
<th>Continuity Resistance&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Insulation Resistance&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TB</td>
<td>Cond. / Cond. / Shield / Cond.</td>
<td>Cond. / Shield / Cond. / Gnd.</td>
</tr>
<tr>
<td>A</td>
<td>--</td>
<td>(A/SH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>(A/B)</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>(A/C)</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>(A/D)</td>
<td>--</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Continuity Test. Connect ohmmeter leads between wires A and B and jumper opposite ends together. Record resistance in table. Repeat procedure between A and C, A and D, etc. Any deviation of ±2 ohms between any reading and the average of a particular run indicates a poor conductor, and corrective action shall be taken before continuing with the loop test.

b. Insulation Test. Connect one end of a 500 volt megger to the panel ground bus and the other sequentially to each completely disconnected wire and shield. Test the insulation resistance and record each reading.

CERTIFIED ____________________________ Date ____________________________
Contractor’s Representative

WITNESSED ____________________________ Date ____________________________
District’s Representative
# PANEL INDICATOR CALIBRATION TEST DATA FORM:

Tag No. and Description: 

Make and Model No.:  

Serial No.: 

Input: 

Scale:  

Range: 

## PV Scale Calibration

<table>
<thead>
<tr>
<th>% of Range</th>
<th>Input</th>
<th>Expected Reading</th>
<th>Actual Reading</th>
<th>% Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

% Deviation Allowed:

CERTIFIED_________________________________  Date_____________________

Contractor’s Representative 

WITNESSED_________________________________  Date_____________________

District’s Representative
FIELD SWITCH CALIBRATION TEST DATA FORM:

Tag No. and Description: ________________________________________________

Make and Model No.: ___________________________ Serial No.: ____________

Input: ____________________________________________

Range: ____________________________________________

Set Point(s): _______________________________________

Simulate process variable (flow, pressure, temperature, etc.) and set desired set point(s). Run through entire range of switch and calculate deadband.

<table>
<thead>
<tr>
<th>Set Point</th>
<th>Incr. Input Trip Point</th>
<th>Decr. Input Trip Point</th>
<th>Calc. Deadband</th>
<th>Required Deadband</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CERTIFIED ______________________________ Date ______________________________
Contractor’s Representative

WITNESSED ______________________________ Date ______________________________
District’s Representative

Orange County Water District 01650A 01650A AND TRAINING FORM
Groundwater Replenishment System -28- August 2018 DS2 Submittal
01650-23 TRANSMITTER CALIBRATION TEST DATA FORM:

Tag No. and Description: ________________________________________________________________

Make and Model No.: ___________________________ Serial No.: __________________________

Input: __________________________________________________________

Output: __________________________________________________________

Range: ___________________________________ Scale: __________________________

Simulate process variable (flow, pressure, temperature, etc.) and measure output with appropriate meter.

<table>
<thead>
<tr>
<th>% of Range</th>
<th>Input</th>
<th>Expected Output</th>
<th>Actual Output</th>
<th>% Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

% Deviation Allowed: ________________________________________________________________

CERTIFIED __________________________ Date __________________________

Contractor’s Representative

WITNESSED __________________________ Date __________________________

District’s Representative

Orange County Water District 01650A TESTING, STARTUP AND TRAINING FORM
Groundwater Replenishment System -29- August 2018
Final Expansion DS2 Submittal
MISCELLANEOUS INSTRUMENT CALIBRATION TEST DATA FORM:

(For instruments not covered by any of the preceding test forms, the Contractor shall create a form containing all necessary information and calibration procedures.)

CERTIFIED _______________________________ Date________________________
Contractor’s Representative

WITNESSED _______________________________ Date________________________
District’s Representative
01650-25    INDIVIDUAL LOOP TEST DATA FORM:

Loop No.: ____________________________  

Description: (Give complete description of loop's function using tag numbers where appropriate.) 

P&ID No.: (Attach copy of P&ID.)  

a. Wiring tested:  
   (Attach test form 01650-20)  

b. Instrumentation tubing/piping tested:  

c. Instruments calibrated:  
   (Attach test forms 01650-20 through 24)  

d. List step-by-step procedures for testing loop parameters. Test loop with instruments, including transmitters and control valves, connected and functioning. If it is not possible to produce a real process variable, then a simulated signal may be used with the Construction Manager's approval.  

CERTIFIED ____________________________  Date___________________________  
       Contractor's Representative  

WITNESSED ____________________________  Date___________________________  
       District's Representative  

Orange County Water District  01650A  TESTING, STARTUP  AND TRAINING FORM  
Groundwater Replenishment System  -31-  August 2018  
Final Expansion  DS2 Submittal
01650-26 LOOP COMMISSIONING TEST DATA FORM:

Loop No.: ______________________________________

   a. Loop tested:
      (Attach test form 01650-25)

   b. Controlled or connected equipment tests confirmed:

   c. Give complete description of loop’s interface with process.

   d. With associated equipment and process in operation, provide annotated chart trace of loop response to changes in set points for verification of performance. This chart should demonstrate 1/4-amplitude damping as output adjusts to set point change. Show set points, starting and finishing times on chart, as well as any other pertinent data.

      Connect 2-pen recorder to process variable (PV) and to controller output. Use inch/second chart speed.

      Pen 1 - PV - Connections:

      Pen 2 - Output - Connections:

CERTIFIED ___________________________ Date________________________
      Contractor’s Representative

WITNESSED ___________________________ Date________________________
      District’s Representative
Section 01770

CLOSEOUT PROCEDURES

1-1. GENERAL-EQUIPMENT START-UP. After all acceptance tests have been completed by the Contractor, but prior to final acceptance, the Contractor shall recheck all equipment for proper alignment and adjustment, check oil levels, relubricate all bearing and wearing points, and, in general, assure that all equipment is in proper condition for regular continuous operation.

Section includes: Contract closeout requirements including:

1. Final cleaning,
2. Preparation and submittal of closeout documents,
3. Final completion certification.

1-2. FINAL CLEANING.

1-2.01. Final Clean Up. Before final inspection of the Work, the Contractor shall promptly remove from the vicinity of the completed work, all rubbish, trash, unused materials, concrete forms, construction equipment, tools, and temporary structures and facilities used during construction. All surrounding site areas, including the temporary construction trailer, equipment and material storage areas shall be restored to their original state, including grading as required. All parts of the Work shall be left in a neat and presentable condition.

Contractor shall provide for a professional cleaning service to clean, dust, sanitize as necessary, and provide a mop or vacuum clean condition for the complete project and in particular in all offices, control rooms, restrooms, laboratory, shop processes areas, and any other enclosed area subject to daily or periodic personnel use and shall complete this cleaning service no later than the commencement of the acceptance testing.

Contractor shall provide for weekly professional cleaning services after initial cleaning and sanitizing for the complete project and in particular in all offices, control rooms, restrooms, laboratory, shop, process areas and any other enclosed area subject to daily or periodic personnel use and maintain the weekly cleaning service from commencement of Acceptance Testing until issuance of Project Completion.
1-2.02. Final Building Clean Up. On all building projects and wherever else applicable, besides general broom cleaning, the following special cleaning shall be performed at completion of the Work:

A. Perform final cleaning prior to inspections for Final Acceptance.

B. Employ skilled workers who are experienced in cleaning operations.

C. Use cleaning materials which are recommended by manufacturers of surfaces to be cleaned.

D. Prevent scratching, discoloring, and otherwise damaging surfaces being cleaned.

E. Clean roofs, gutters, downspouts, and drainage systems.

F. Broom clean exterior paved surfaces and rake clean other surfaces of sitework.

G. Remove dust, cobwebs, and traces of insects and dirt.

H. Clean grease, mastic, adhesives, dust, dirt, stains, fingerprints, paint, blemishes, sealants, plaster, concrete, and other foreign materials from sight-exposed surfaces, and fixtures and equipment.

I. Remove non-permanent protection and labels.

J. Polish waxed woodwork and finish hardware.

K. Wash tile.

L. Wax and buff hard floors, as applicable.

M. Wash and polish glass, inside and outside.

N. Wash and shine mirrors.

O. Polish glossy surfaces to clear shine.

P. Vacuum carpeted and soft surfaces.

Q. Clean permanent filters and replace disposable filters when heating, ventilation, and air conditioning units were operated during construction.

R. Clean ducts, blowers and coils when units were operated without
filters during construction.

S. Clean light fixtures and replace burned-out or dim lamps.

1-3. WASTE DISPOSAL.

A. Arrange for and dispose of surplus materials, waste products, and debris off-site.

1. Prior to making disposal on private property, obtain written permission from Owner of such property.

B. Do not fill ditches, washes, or drainage ways which may create drainage problems.

C. Do not create unsightly or unsanitary nuisances during disposal operations.

D. Maintain disposal site in safe condition and good appearance.

E. Complete leveling and cleanup prior to final acceptance of the Work.

1-4. TOUCH-UP AND REPAIR.

A. Touch-up or repair finished surfaces on structures, equipment, fixtures, and installations that have been damaged prior to inspection for Final Acceptance.

B. Refinish or replace entire surfaces which cannot be touched-up or repaired satisfactorily.

1-5. CLOSEOUT DOCUMENTS.

A. Submit following Closeout Submittals upon Completion and at least seven (7) days prior to submitting Application for Final Payment:

1. Evidence of Compliance with Requirements of Governing Authorities.

2. Project Record Documents.

3. Operation and Maintenance Manuals.

4. Warranties and Bonds.

5. Electronic version of all approved project submittals in pdf format.
form.


7. Evidence of Payment and Release of Liens and Stop Payment Notices as outlined in Conditions of the Contract.


9. Survey Record Documents as specified in the Field Engineering section.

10. Certificate of Final Completion.

1-6. PROJECT RECORD DOCUMENTS.

A. Maintain at Project site, available to Owner and Engineer, one (1) copy of the Contract Documents, shop drawings and other submittals, in good order.

1. Mark and record field changes and detailed information contained in submittals and change orders.

2. Record actual depths, horizontal and vertical location of underground pipes, duct banks and other buried utilities. Reference dimensions to permanent surface features.

3. Identify specific details of pipe connections, location of existing buried features located during excavation, and the final locations of piping, equipment, electrical conduits, manholes, and pull boxes.

4. Identify location of spare conduits including beginning, ending and routing through pull boxes, and manholes. Record spare conductors, including number and size, within spare conduits, and filled conduits.

5. Provide to the Engineer schedules, lists, layout drawings, and wiring diagrams inclusive of any applicable Contractor derived CAD drawings pertinent to equipment installation.

6. Make annotations with erasable colored pencil conforming to the following color code:

<table>
<thead>
<tr>
<th>Additions:</th>
<th>Red</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deletions:</td>
<td>Green</td>
</tr>
</tbody>
</table>
B. Maintain documents separate from those used for construction.
   1. Label documents "RECORD DOCUMENTS."

C. Keep documents current.
   1. Record required information at the time the material and equipment is installed and before permanently concealing.

D. Deliver record documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.

E. Record documents shall be available for the Engineer to review to ascertain that changes have been recorded. Engineer shall review Contractor's record documents on a monthly basis to determine that documents have been updated.

F. Failure of the Contractor to keep current with the updating of the Record Documents shall be grounds for withholding monies from partial payment estimates.

Requests for partial payments will not be approved if the record drawings are not kept current, and not until the completed record drawings, showing all variations between the Work as actually constructed and as originally shown on the Contract Drawings or other Contract Documents, have been inspected by the Owner.

Final payment will not be approved until the Contractor-prepared record drawings have been delivered to the Owner. Said up-to-date record drawings may be in the form of a set of prints with carefully plotted information overlaid in pencil.

Upon substantial completion of the Work and prior to final acceptance, the Contractor shall complete and deliver a complete set of record drawings to the Owner conforming to the construction records of the Contractor. This set of drawings shall consist of corrected plans showing the reported location of the Work. The information submitted by the Contractor and incorporated into the Record Drawings will be assumed to be reliable, and the Owner will not be responsible for the accuracy of such information, nor for any errors or omissions which may appear on the Record Drawings as a result.
The Contractor within 30 days after Notice of Substantial Completion date, shall submit the following items in the form of a Final Project Report to the Engineer:

1. A final updated master schedule indicating actual completion date, schedule of values and cash flow curves.

2. Written warranties, guarantees and information for each mechanical, electrical, process equipment, architectural and other materials, products or equipment specified in the contract documents.

3. Operations and Maintenance Manuals, both in hard copy and electronic form.

4. Certificate of Completion for each component of the Project.

5. New permanent cylinders and key blanks for all locks.

6. Maintenance stock items: spare parts; special tools and record of missing items.

7. Final completed and verified record drawings in both hard copy format and electronic PDF format. Contractor shall refer to the Submittals section for the record drawing electronic PDF format requirements.

8. Final photographs and all progress photographs in both electronic and hard copy formats. Hard copies shall be included in photo-album binders.

9. Warranties, Guarantees or Bonds that cover the warranty period of each contract such as for roofing, landscape maintenance, etc., as required.

10. Certificates of inspection and acceptance by local governing agencies having jurisdiction.

11. Affidavit of Release of Liens – Releases from all parties who are entitled to claims against the subject project property, or improvement pursuant to the provisions of law.


14. Affidavit of Payment of All Taxes.
15. Affidavit of Payment.
17. Contractor’s Certification of Completion.
18. Final completed punchlist.
19. Electronic version of all approved project submittals in pdf format.

1-6.01 GUARANTEE. The Contractor shall provide a one-year guarantee per the General Provisions “GUARANTEES” Section. Contractor shall submit a complete binder containing copies of all specified warranties and bonds per the Product Warranties and Bonds section.

Prior to the expiration of the Guarantee period, the Owner reserves the right to hold a meeting and require the attendance of the Contractor. The purpose of the meeting is to review warranties, bonds, and maintenance requirements, and determine required repair or replacement of defective items.

End of Section
PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Compile specified warranties and bonds.
B. Compile specified service and maintenance contracts.
C. Co-execute submittals when so specified.
D. Review submittals to verify compliance with Contract Documents.
E. Submit to Engineer for review and transmittal to Owner.
F. Schedule of submittals.

1.02 SUBMITTAL REQUIREMENTS

A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.
B. Number of Original Signed Copies Required: Two each.
C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
   1. Product or work item.
   2. Firm, with name of principal, address and telephone number.
   4. Date of beginning of warranty, bond or service maintenance contract.
   5. Duration of warranty, bond or service maintenance contract.
   6. Provide information for Owner's personnel:
      a. Proper procedure in case of failure.
      b. Instances which might affect the validity of warranty or bond.
   7. Contractor, name of responsible principal, address and telephone number.

1.03 FORM OF SUBMITTALS

A. Prepare in duplicate packets.
B. Format:
   1. Size 8-1/2 by 11 inch.
   2. Punch sheets for standard ring binder.
   3. Fold larger sheets to fit into binders.
   4. Cover:
a. Identify each packet with typed or printed title "WARRANTIES AND BONDS."

b. List the following:
   1) Title of Project.
   2) Name of Contractor.

C. Binders: Commercial quality, three-ring, 2 inch with durable and cleanable plastic covers, white.

1.04 TIME OF SUBMITTALS

A. Make submittals within 10 days after Date of Substantial Completion, prior to final request for payment.

B. For items of Work, where acceptance is delayed materially beyond Date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

C. For items of Work, where equipment is available to be placed into service for Owner's beneficial occupancy prior to Substantial Completion, Owner may, in writing accept beneficial occupancy prior to use of equipment. Within 10 days after this acceptance of beneficial use, Contractor shall supply Owner with an interim submittal of the warranties, bonds, and service and maintenance contracts as specified herein. This interim information shall again be included in the final submittal required after Substantial Completion regardless of the warranty start and end dates.

1.05 SCHEDULE OF SUBMITTALS

A. Submit warranties, bonds and service and maintenance contracts as specified in individual sections.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

End of Section
DIVISION 2 – Sitework
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PART 1 - GENERAL

1-1. SCOPE. This section covers dewatering and shall consist of the design, furnishing, installation, operation, maintenance, monitoring, reporting, and removal of a dewatering system(s) to achieve proper completion of all work performed on OCWD property. The Contractor shall secure all necessary permits to complete the requirements of this Section of the Specifications. The Contractor shall perform the dewatering in accordance with the Stormwater Pollution Prevention Plan (SWPPP) as described in the Regulatory Requirements and Permits and the Temporary Facilities sections.

Groundwater was encountered at depths that ranged from about 11 to 12 feet below ground surface. However, based on previous geotechnical reports, the groundwater level has been measured as high as 5 feet below ground surface. At a minimum, the Contractor shall assume the groundwater level to be at 5 feet below ground surface for the design of the dewatering system.

1-2. GENERAL REQUIREMENTS. The Contractor shall furnish, install, operate, and remove any and all additional machinery, appliances, and equipment necessary to keep excavations free from water during construction, and shall dewater and dispose of the water so as not to cause injury to public or private property, or to cause nuisance or a menace to the public. The Contractor must plan the dewatering and excavation sequence carefully so that stable and dry excavations are maintained throughout the construction sequence.

1-3. SUBMITTALS. Prior to commencement of excavation, the Contractor shall submit a detailed plan and operation schedule for dewatering of excavations. The plan shall be coordinated with and be in accordance with the SWPPP, as described in the Regulatory Requirements and Permits and the Temporary Facilities sections. The Contractor may be required to demonstrate the system proposed will satisfy the requirements specified herein and to verify that adequate equipment, personnel, and materials are provided to dewater the excavations at all locations and times. The Contractor’s dewatering plan is subject to review by the Engineer.

The plan shall include anticipated dewatering flow rates and a means for monitoring actual flow rates during construction. The plan shall also describe the disposal of water from construction dewatering into nearby drainages or the storm drain system. Contractor shall be responsible for obtaining permits required to discharge water into nearby sanitary sewer facilities. Contractor shall provide a plan for abandoning the groundwater monitoring wells at the completion of construction work, unless otherwise
directed by the Engineer. A plan for treating, stabilizing, and disposing of chemically affected groundwater shall also be provided.

1-4. QUALITY CONTROL. It shall be the sole responsibility of the Contractor to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.

All dewatering operations shall be the responsibility of the Contractor and shall be adequate to assure the integrity of the finished project.

Contractor shall establish reference points where critical structures or facilities exist immediately adjacent to areas of proposed dewatering. Reference points shall be observed at frequent intervals to detect any settlement which may develop. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the Contractor. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor.

The Contractor shall monitor and record all dewatering pump rates and volumes. Dewatering equipment shall be equipped with meters and totalizers or similar equipment acceptable to the Engineer, to adequately measure the instantaneous and total flow from the equipment. Initial dewatering volumes and averaged rates shall be recorded at least once every 6 hours until the pumping has reached a uniform flow. Subsequent pumping volumes and averaged rates shall be recorded at least twice a day, once at the beginning of the work shift and once at the end of the work shift. A certified record of all pumping rates and volumes shall be provided to the Engineer on a weekly basis.

1-5. EQUIPMENT. Dewatering, where required, may include the use of well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, ditches, drainage trenches, and other means. Standby pumping equipment shall be maintained on the job site.

PART 2 - PRODUCTS - Not used

PART 3 - EXECUTION.

3-1. DEWATERING. Dewatering for structures and pipelines shall commence when groundwater is first encountered, and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.

Contractor’s dewatering operations shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom
Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with fill material specified by the Engineer at no additional cost to the Owner.

Surface water should be directed away from open excavations, and water should not be allowed to accumulate in the bottoms of excavations.

Excavations that will be left open for an extended period (i.e., more than a couple of days) likely will require more elaborate dewatering measures.

The Contractor shall maintain the water level three feet below the bottom of the excavation in all work areas where groundwater occurs during construction, backfilling and until acceptance of the Work.

Flotation shall be prevented by the Contractor by maintaining a positive and continuous removal of water. The Contractor shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.

3-2. SITE DRAINAGE. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.

3-3. WELL AND WELL POINTS. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering. They shall be packed with sand and/or other porous medium to prevent pumping of fine sands or silts from the subsurface. A continual check by the Contractor shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

3-3.01. Well Abandonment. Contractor shall remove the pumps from the casing and shall excavate and cut pipe casing 12 inches below grade. Concrete shall be tremie pumped from a depth within 20 feet from the bottom of the well until the concrete fully displaces the water in the well and overflows at the top of the casing in the excavated area to form a “mushroom” cap. The concrete shall be left to set. Concrete shall be class D7 as defined in the Cast in Place Concrete section.

3-4. DISPOSAL OF WATER. Contractor shall dispose of water in a suitable manner without damage to adjacent property. The Contractor shall be responsible for obtaining any permits that may be necessary to dispose of the water. No water shall be drained into work built or under construction without prior consent of the

Orange County Water District
Groundwater Replenishment System
Final Expansion

GWRS 02140
- 3 -
DEWATERING
August 2018
DS2 Submittal
Engineer. Water shall be filtered using an approved method to remove sand and fine-sized soil particles before disposal into any drainage system. The dewatering system shall not allow migration and pumping of soil fines with the discharge water. Treated groundwater shall be discharged to OCSD’s outfall through either SEJB6 or SEJB7. The Contractor shall be responsible for applying for and complying with all permit requirements including, but not limited to, the OCSD Internal Dewatering Permit. The permit includes requirements for metering flow, desilting, discharge water quality, and monitoring requirements. The location of SEJB6 and SEJB7 is shown on Drawing No. XXX-X-XXX. The proposed path of the dewatering discharge line and location of de-silting tanks are shown on Drawing No. XXX-X-XXX.

3-5. **TERMINATION OF DEWATERING.** The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, and pipelines.

End of Section
PART 1 - GENERAL

1-1. SCOPE. This section covers earthwork and shall include the necessary clearing, grubbing, and preparation of the site; removal and disposal of all debris; excavation; handling, storage, transportation, and disposal of all excavated material; all necessary sheeting, shoring, and protection work; preparation of sub-grades; pumping and dewatering as necessary; protection of adjacent property; backfilling; construction of fills and embankments; grading; and other appurtenant work performed on OCWD property.

1-2. GENERAL. With reference to the terms and conditions of the construction standards for excavations set forth in Cal/OSHA “Construction Safety Orders”, Subchapter 4 (Article 6) Section 1540, Contractor shall employ a competent person and, when necessary based on the regulations, a registered professional engineer to act upon all pertinent matters of the work of this section.

In-place density tests will be performed in accordance with ASTM D1556, ASTM D6938, or by other means acceptable to the Engineer. The Contractor shall cooperate in making such tests, allowing a reasonable time for the tests to be performed. Contractor shall make all excavations as required by Engineer for field testing and observations. Excavation, backfilling, and compaction necessary for soil testing and observation purposes shall be done by Contractor at no additional cost to the Owner.

Contractor shall remove fill as required in any area where its uniformity, gradation, placement, moisture content, or density does not fully comply with these specifications. After notification by Engineer, Contractor shall promptly remove and replace all fill that does not comply with these specifications. Engineer’s failure to observe or notify the Contractor shall not relieve Contractor of his responsibility to fully comply with the specifications. At Contractor’s discretion, Contractor may blend, disc, moisten, re-compact, or otherwise rework the fill until it complies with the specified requirements. Additional costs for all remedial measures needed to achieve the specified requirements for the fill material shall be borne by Contractor.

Contractor shall notify Engineer at least 3 days before completion of any excavation and shall allow Engineer a review period of at least one day before the exposed excavation subgrade is disturbed or is covered with backfill or with any construction material.
1-3. **SUBMITTALS.** Drawings, specifications, and data covering the proposed materials shall be submitted in accordance with the Submittals section.

1-3.01. **Filter Fabric Data.** Complete descriptive and engineering data for the fabric shall be submitted in accordance with the Submittals section. Data submitted shall include:

- A 12 inch square sample of fabric.
- Manufacturer's descriptive product data.
- Installation instructions.

1-3.02. **Excavation and Dewatering Plan.** At least 30 days before starting construction, submit an excavation and dewatering plan for each planned excavation. The submittal shall include locations of the planned excavation support systems/protection systems. The excavation and dewatering plan shall be prepared by a professional engineer licensed or registered in the State of California. The submittal shall also include a monitoring plan for monitoring movement of the existing improvements that may be subject to distress or damage during the planned construction. Additional instructions are provided in the Dewatering section.

1-4. **BASIS FOR PAYMENT.**

1-4.01. **Ground Support for Structures.** No additional payment above the Contract Price will be made for excavation support systems left in place (with Engineer’s approval) in excavations for structures because of impracticality of removal.

1-5. **INSURANCE.** Professional Liability insurance shall be provided as specified in the General and Special Provisions.

**PART 2 - PRODUCTS**

2-1. **MATERIALS.**

2-1.01. **Filter Fabric.** Filter fabric shall be provided in rolls wrapped with covering for protection from mud, dirt, dust, and debris.

2-1.01.01. **Woven Geotextile.** Woven geotextile shall be TCI Mirafi “600X”, Amoco Fabrics and Fibers Company “Amoco 2006”, TNS Advanced Technology “W300”, or equal.
2-1.01.02. **Nonwoven Geotextile.** Geotextile for use in temporary drainage trenches shall be nonwoven and conform to the requirements for underdrains described in Caltrans Standard Specifications Section 88, paragraph 1.03 “Filter Fabric”.

2-1.02. **Vapor Barrier.** Plastic vapor barrier shall be 10 millimeters thick and shall satisfy the requirements of ASTM E 1745 (Class “A”). Vapor barrier shall have a water vapor transmission rate (WVTR) of 0.00 and testing tolerance of a WVTR of 0.008 when tested per ASTM E 96. Vapor barrier shall be installed per ASTM E 1643 and shall have joints taped and overlapped by a minimum of 6 inches.

2-1.03. **General Fill and Embankment Materials.** Not Used.

2-1.04. **Granular Fill.** Not Used.

2-1.05. **Select Backfill.** Select backfill shall be defined as the material placed around and outside of structures and within a minimum distance of 5 feet from the wall. When a structure is constructed in an excavation with laid back slopes, the entire backfill between the structure walls and the excavation slopes shall be considered select backfill. Select backfill shall meet the following criteria:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum particle size (inches)</td>
<td>1</td>
</tr>
<tr>
<td>Maximum liquid limit (%)</td>
<td>25</td>
</tr>
<tr>
<td>Maximum plasticity index (%)</td>
<td>15</td>
</tr>
<tr>
<td>Maximum percentage passing the No. 200 sieve (%)</td>
<td>10</td>
</tr>
<tr>
<td>Maximum sand equivalent</td>
<td>20</td>
</tr>
</tbody>
</table>

Silts, sandy silts, or clays (ASTM D2487) shall be used in the top two feet of the finished grade below the topsoil to be placed in areas that will not receive pavements, structures, or concrete pads.

2-1.05.03. **Clean Sand Structure Backfill.** Not used.

2-1.06. **Import Fill.** Import fill shall be defined as the material placed beneath the structure foundations and slabs below any granular material layer, crushed layer or lean concrete slab indicated on the Drawings. Import fill shall be used to replace any unsuitable material below the structure foundations and slabs and to raise the site grades below and within 5 feet of structural footprints and at locations indicated on the Drawings. Import fill shall be used in all areas for which a fill is not specified. Import fill shall meet the following criteria:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum particle size (inches)</td>
<td>4</td>
</tr>
<tr>
<td>Maximum liquid limit (%)</td>
<td>40</td>
</tr>
<tr>
<td>Property</td>
<td>Value</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Maximum plasticity index (%)</td>
<td>20</td>
</tr>
<tr>
<td>Maximum percentage passing the No. 200 sieve (%)</td>
<td>40</td>
</tr>
</tbody>
</table>

2-1.06.03. **Clean Sand Select Fill.** Not used.

2-1.07. **Gravel Base Beneath Slabs.** Not used.

2-1.08. **Controlled Low Strength Material (CLSM).**

Controlled low strength material (CLSM), shall meet the requirements specified in SSPWC Greenbook, Section 201-6, Controlled Low Strength Material (CLSM), except as modified herein.

The 28-day compressive strength shall be within the allowable range of 100 psi to 150 psi when used as backfill beneath structures, and 50 psi to 110 psi when used as pipe embedment and trench backfill.

Contractor shall design and test the CLSM. Contractor shall submit the mix design and test results to Engineer for review and acceptance. Initial set time shall be 8 hours plus or minus one hours as determined by ASTM C403. CLSM shall have an efflux time of 10 to 26 seconds through a special flow cone with a 1/2 inch discharge tube.

The batch proportions accepted by Engineer shall apply only for materials from the same source and having the same characteristics as the materials used in the mix design. Materials from any other source shall be used only with the acceptance of Engineer.

If a change in sources of materials is proposed, a new mix design shall be developed by Contractor before the new material is used. When unsatisfactory results or other conditions make it necessary, Contractor shall develop a new mix design to get the desired results.

During the progress of the work, no change shall be made in the batch proportions of the ingredients without the acceptance of Engineer.

2-1.08.01. **Class A CLSM.** Not used.

2-1.08.02. **Class B CLSM.** Not used.

2-1.08.03. **Class C CLSM.** Not used.

2-1.09. **Imported Sand.** Imported sand shall be clean, cohesionless material with 100 percent (by weight) passing 3/8-inch sieve and at least 90 percent
passing a No. 4 sieve. The sand equivalent value shall be equal to or greater than 30 as determined in accordance with ASTM Test Method D2419.

2-1.10. **Crushed Rock.** Crushed rock shall be an imported material that consists of durable rock and gravel that is free of deleterious material and free from slaking or decomposition under the action of alternate wetting and drying. Crushed rock shall be 3/4-inch and shall meet the gradation requirements specified in Greenbook Table 200-1.2(A).

2-1.11. **Geocomposite Sheet Drains.** The geocomposite sheet drains shall consist of a continuous plastic three dimensional drainage core wrapped on one side in a non-woven filter fabric permeable to water flow. The filter fabric shall be bonded to the individual dimples of the molded plastic core to minimize fabric intrusion into the flow channels caused by the backfill pressure. The fabric shall extend beyond the edges of the core to provide overlap for the adjacent panels. The geocomposite sheet drain shall be Miradrain 6000 as manufactured by Mirafi, Inc., or Ameridrain 200 as manufactured by American Wick Drain Corporation, or equal.

2-1.12 **Permeable Material.** Not used.

2-2. **MATERIAL TESTING.**

2-2.01. **Preliminary Review of Materials.** As stipulated in the Quality Control section, all tests required for preliminary review of materials shall be made by an acceptable independent testing laboratory at the expense of Contractor. Two initial gradation tests shall be made for each type of select backfill, import fill, or other specified material, and one additional gradation test shall be made for each additional 500 tons of each material delivered to the jobsite.

All material testing on CLSM shall be made by an independent testing laboratory at the expense of Contractor.

2-2.02. **Field Testing Expense.** All moisture-density (Proctor) tests and relative density tests on the materials, and all in-place field density tests, shall be made by an independent testing laboratory at the expense of Owner. Contractor shall provide access to the materials and work area and shall assist the laboratory as needed in obtaining representative samples. Contractor shall bear the cost of all the failing tests performed by the Owner’s laboratory.

2-2.03. **Required Field Tests.** For planning purposes the following guidelines shall be used for frequency of field tests. Additional tests shall be performed as necessary for job conditions and number of failed tests. Test results shall be submitted as indicated in the Submittals section.
a. Two moisture-density tests in accordance with ASTM D1557 for each type of select import fill, or other material proposed.

b. One in-place field density and moisture test for every 100 to 200 cubic yards of select backfill or import fill.

c. One in-place density and moisture test whenever there is a suspicion of a change in the quality of moisture control or effectiveness of compaction.

d. At least one test for every full shift of compaction operations on mass earthwork.

e. Additional gradation, moisture density and relative density tests whenever the source or quality of materials changes.

f. Testing of CLSM shall be as follows.

**Compressive Strength.** For every 200 cubic yard of flowable fill placed, fill four 6 by 12 inch plastic cylinder molds to overflowing and then tap sides lightly. Cure cylinders in the molds covered until time of testing, at least 14 days. Strip the cylinders carefully using a knife to cut away the plastic mold. Cap the cylinders with high strength gypsum plaster or other capping process that will not break these low strength materials. Test cylinders in accordance with ASTM C39. Two cylinders shall be tested at 7 days and the other two cylinders shall be tested at 28 days.

**Flow of Fill.** Once each day that flowable fill is placed, test the fill material in accordance with ASTM C939 for the efflux time. Wet screening may be required to remove coarse particles.

**Unit Weight and Yield.** Once each day that flowable fill is placed, determine unit weight and yield in accordance with ASTM C138.

**Air Content.** Once each day that flowable fill is placed, determine air content in accordance with ASTM C231.

**Penetration Resistance.** Once each day that flowable fill is placed, determine early bearing strength in accordance with ASTM C403 penetration procedure.

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**PART 3 - EXECUTION**

3-1. **SITE PREPARATION.** All sites to be occupied by permanent construction or embankments shall be cleared of all logs, trees, roots, brush, tree trimmings, and other objectionable materials and debris. All stumps shall be grubbed. Subgrades for fills and embankments and sites to be occupied by permanent construction shall be cleared and stripped of all surface vegetation, sod, and organic topsoil. Holes created by the grubbing process shall be backfilled with compacted earth fill. The upper approximately 6 inches of soil containing organics and suitable for plant growth shall be stripped and stockpiled separately.
for later use in landscaping. The actual depth of topsoil stripping shall be established in the field at the time of construction to ensure all material containing organics is removed while exercising care to not remove or mix any inert soil with the topsoil. All waste materials shall be removed from the site and disposed of by and at the expense of Contractor.

3-2. **EXCAVATION.**

3-2.01. **General.** Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.

Sub-grade surfaces shall be clean and free of loose material of any kind when concrete is placed thereon.

Excavations for manholes and similar structures constructed of masonry units shall have such horizontal dimensions that not less than 6 inches clearance is provided for outside plastering.

Information regarding existing utilities and structures shown on the Drawings is based on the as-built construction drawings provided by the Owner and limited pothole investigations completed during the design. Hand excavation to the depth shown on the Drawings will be required in areas where the need for sheeting and shoring is indicated in order to expose power and other utility lines in the area.

3-2.02. **Classification of Excavated Materials.** No classification of excavated materials will be made for payment purposes. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the work, regardless of the type, character, composition, or condition thereof.

3-2.04. **Unauthorized Excavation.** Except where otherwise authorized, indicated, or specified, all materials excavated below the bottom of concrete walls, footings, slabs on grade, and foundations shall be replaced with import fill at the expense of Contractor.

3-2.05. **Blasting.** Blasting or other use of explosives for excavation will not be permitted.

3-2.06. **Dewatering.** See Dewatering section.

3-2.07. **Sheeting Shoring and Excavation Support System.** Except where banks are cut back on a stable slope, excavations for structures and trenches shall be supported as necessary to prevent caving or sliding. Wherever sloped
Excavations are planned, temporary constructions excavations greater than 3 feet but less than 10 feet deep shall have slopes no steeper than 1.5H:1V (horizontal to vertical). To avoid surcharging, excavated soils shall be stockpiled 15 feet or more from the sloped face.

Excavation support systems shall be furnished and installed as necessary to limit the extent of excavations for the deeper structures and necessary backfill under adjacent shallower structures, and to protect adjacent structures and facilities from damage due to excavation and subsequent construction. At a minimum, the excavation support system shall extend below the bottom of the excavation at least one-half the difference between the groundwater elevation and the excavation bottom elevation. The excavation support system embedment depth shall be determined by the Contractor with respect to the proposed construction dewatering scheme and groundwater levels encountered at the time of construction. Trench shields are not acceptable methods of providing excavation support. Contractor shall assume complete responsibility for, and install adequate protection systems for prevention of damage to existing facilities.

Excavation support systems and sheeting and shoring shall be removed or left in place as shown on the Drawings unless otherwise permitted by Engineer.

The design of the excavation support system shall be such as to permit complete removal while maintaining safety and stability in the excavation at all times. If the support system is left in place, it shall be off 3 feet below finished grade but not below adjacent foundation slabs of structures.

Installation of the support systems must not affect nearby structures/facilities. The subsurface conditions at the site also may limit the type of ground support measures that can be implemented during construction. The support systems shall be left in place where shown on the Drawings or if their removal might cause: (1) the excavation bottom or adjacent ground to become disturbed, (2) the excavation wall to collapse, and/or (3) damage a nearby structure or facility or the newly-completed structure/facility. Any voids created by the removal of support systems shall be completely filled with CLSM or neat cement grout, as appropriate.

The Contractor shall anticipate developing a program to continually monitor existing improvements to detect movement and allow for remedial actions. In addition, a complete survey of existing utilities, pavements, and structures adjacent to those portions of the proposed excavations that will be shored should be performed. The purpose of this review would be to evaluate the ability of the existing features to withstand horizontal and vertical movements associated with a shored and/or dewatered excavation. If movements are greater than the tolerance of existing project features, tie-backs, dead-man anchors, cross bracing, or alternative shoring or dewatering systems may be needed to reduce deflections.
Excavation support systems shall be checked frequently for lateral and vertical movement. If tension cracks appear in the ground surface adjacent to the shoring, the cracks shall be monitored and sealed to prevent infiltration of water, and the significance of the cracks shall immediately be evaluated. If large deflections (greater than 0.5 percent of the shoring height) are noted, the excavation support systems shall be checked and strengthened as needed.

Existing facilities and structure foundations adjacent to the required excavations may require underpinning during construction. Structures, pipelines, and any other improvement that may be subject to distress/damage during construction shall be periodically monitored and/or surveyed. If movement is detected, measures shall be undertaken immediately to prevent additional movement and damage. The Contractor shall be responsible for the repair of all damage that results from the new construction.

Excavation support systems shall be designed by a civil or structural professional Engineer, who is retained by the Contractor, and is registered in the State of California. Systems shall be designed to resist the earth pressure exerted by the retained soil plus any additional lateral force due to surcharge leading, i.e., construction equipment, foundations, roadways, etc., at or near the shoring.

3-2.08. Stabilization. Sub-grades for concrete structures shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workers.

Sub-grades for concrete structures which are otherwise solid, but which become mucky on top due to construction operations, shall be reinforced with crushed. The stabilizing material shall be placed in such a manner that no voids remain in the crushed rock. All excess crushed rock with unfilled void space shall be removed. The finished elevation of stabilized sub-grades shall not be above sub-grade elevations indicated on the Drawings.

3-2.09. Ring-wall Excavation. Not used.

3-2.10. Roadway Excavation. Excavation for the roadways, drives, and parking areas shall conform to the lines, grades, cross sections, and dimensions indicated on the Drawings and shall include the excavation of all unsuitable material from the subgrade. After shaping to line, grade, and cross section, the subgrade shall be compacted to a depth of at least 12 inches and shall meet the following:

- Test method to determine maximum density and moisture: ASTM D1557.
- Relative compaction and moisture: 95%.
content relative to the optimum.

Moisture content relative to the optimum. 1% to 3%.

This operation shall include any reshaping and wetting or drying required to obtain proper compaction. All soft or otherwise unsuitable material shall be removed and replaced with suitable material.

3-3. **GENERAL FILLS AND EMBANKMENTS.** Not used.

3-4. **DESIGNATED FILLS.** Fills required or indicated to be designated fills shall be constructed using the specific materials and placement requirements as specified. In addition to the specific requirements specified herein, all requirements for general fills and embankments shall apply. These requirements include, but are not limited to organic or deleterious materials, subgrade preparation, lift thickness, and moisture conditioning requirements. All designated fills shall be constructed to the lines and grades indicated on the Drawings.

3-4.01. **Granular Fill.** Not used.

3-4.02. **Select Backfill.** Backfill materials shall be deposited in approximately horizontal layers not to exceed 8 inches in uncompacted thickness and shall meet the following requirements:

- Test method to determine maximum density and moisture: ASTM D1557.
- Relative compaction: 90% minimum
- Moisture content relative to the optimum: -1% to +3% or more restrictive within the range, if required to achieve the specified relative compaction.

Compaction of select backfill shall be performed in such a manner that damage to the structure is prevented. Equipment weighing more than 10,000 pounds shall not be used closer to the wall than the horizontal distance equal to the depth of the fill at the time fill is placed. Compaction of select backfill by inundation with water will not be permitted.

No backfill shall be deposited or compacted in water.

Particular care shall be taken to compact select backfill which will be beneath pipes, drives, roads, parking areas, walks, curbs, gutters, or other surface construction or structures. In addition, wherever a trench pipe is to pass through select backfill, the select backfill shall be placed and compacted to an elevation.
not less than 12 inches above the top of pipe elevation before the trench is excavated. Compacted areas, in each case, shall be adequate to support the item to be constructed or placed thereon.

3-4.03  Import Fill. Import fill shall be placed in nearly horizontal layers in uncompacted lift thickness of 8 inches or less and shall meet the following requirements:

   Test method to determine maximum density and moisture.  
   ASTM D1557.

   Relative compaction.  
   90 %.

   Moisture content relative to the optimum.  
   0 % to 3%.

3-4.04.  Gravel Base Beneath Slabs. Not used.

3-4.05.  Controlled Low Strength Material (CLSM) Fill. Batching, mixing, and placing of CLSM may be started when weather conditions are favorable and when the temperature is at least 34°F and rising. At time of placement of CLSM the temperature shall be at least 40°F. Mixing and placing shall stop when the temperature is 38°F and falling. Each filling stage shall be as continuous an operation as is practicable.

CLSM shall be discharged from the mixer by an acceptable procedure into the area to be filled. CLSM shall be placed to limits indicated on the Drawings. Mixing CLSM with in-situ soil shall be avoided.

When CLSM is placed as backfill against structures, the fill shall be placed in lifts of 2 to 3 feet and the next lift shall not be placed until the previous lift has taken initial set and at least 16 hours have elapsed from the end of placement. Lift thickness shall be reduced as necessary to prevent floatation of the structure.

When CLSM is placed over culverts or pipelines, they shall be anchored to prevent flotation during the placement of CLSM. Unless otherwise required, CLSM shall be placed to one foot below subgrade elevation if the subgrade elevation is not more than 5 feet over the top of the culvert or pipe. If the finished grade is more than 5 feet over the top of the culvert or pipe fill, CLSM shall be placed to an elevation 2 feet over the top of the culvert or pipe, and the remainder shall be backfilled with soil designated by Engineer.

3-4.06.  Crushed Rock. Thickness of crushed rock layer shall be a minimum of two feet unless otherwise indicated on the Drawings. Crushed rock shall be moistened thoroughly and compacted to a relative compaction of at least 90 percent, using approved plate or roller type vibratory compaction equipment.

3-4.07.  Ringwall Fill. Not used.
3-5. STRUCTURE FOUNDATION SUBGRADE PREPARATION.

3-5.01. Excavation. Excavation below proposed foundations and slabs-on-grade, concrete pads, and concrete duct banks shall consist of removing all loose, soft or otherwise unsuitable material below the bearing level to the level of firm natural soils. Excavation shall be performed using methods and equipment that prevent disturbance of the bearing materials. Should bearing materials become disturbed due to excavation operations, they shall be removed and replaced with import fill to produce a firm, dense and thoroughly compacted and consolidated subgrade to the satisfaction of Engineer.

3-5.02. Limits of Excavation. Excavations of unsuitable materials shall extend beyond the edge of the footing a distance equal to the depth of overexcavation below the bottom of the concrete element or 2 feet, whichever is greater. In no case, however, shall proposed excavations undermine existing foundations. Foundations and slabs of existing structures shall be positively supported by means suitable to prevent damage to structures.

Damage to existing structures as a result of the Contractor’s operations shall be corrected by the Contractor to the satisfaction of Engineer at no additional cost to the Owner.

3-5.03. Subgrade Preparation. Prior to placing fills below footings and slabs, the subgrade shall be inspected and tested for soft, loose, or unsuitable materials. All such materials shall be removed.

If after excavation to the required grades the exposed soil surface is adequately firm and uniform, and has not been disturbed (as determined by Engineer), the exposed surface shall be compacted with at least six passes of a smooth, vibrating drum roller that weights no less than 10,000 pounds to provide a reasonably smooth surface.

If the exposed soil surface is not sufficiently firm, is non-uniform, or has been disturbed (as determined by Engineer), the upper 8 inches of soil shall be scarified, plowed, disked, and bladed until it is uniform and free of large unbroken soil clods. The moisture content of the scarified soil shall be brought to within the optimum and +3 percent of the optimum and compacted to not less than 90 percent relative compaction per ASTM D1557. The compacted surface shall be bladed/trimmed and rolled with a smooth drum roller to provide a reasonably smooth surface upon which to build the structure pad.

3-5.04. Replacement Materials. Materials used to replace existing unsuitable materials shall meet the quality, classification and compaction requirements of import fill.
3-5.05 **Protection of Subgrade.** All exposed foundation and slab subgrades shall be protected as specified for protection of subgrades for fill from erosion, air or water slaking, and changes in moisture content. All granular-fill building pads shall be placed as quickly as possible after exposed surfaces are prepared and inspected. All damaged subgrades as a result of prolonged exposure shall be undercut and replaced with import fill of aggregate base material at no added cost to the Owner.

3-6. **FINAL GRADING AND PLACEMENT OF TOPSOIL.** Not Used.

3-7. **DISPOSAL OF EXCAVATED MATERIALS.** Suitable excavated materials may be used in fills and embankments as needed. All excess excavated material shall be disposed of off-site at the expense of Contractor.

All debris, stones, logs, stumps, roots, and other unsuitable materials shall be removed from the site and disposed of by, and at the expense of, Contractor.

3-8. **RESODDING.** Not used.

3-9. **SETTLEMENT.** Contractor shall be responsible for all settlement of backfill, fills, and embankments and structures that may settle due to dewatering which may occur within the correction period stipulated in the General Conditions.

Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from Engineer or Owner.

End of Section
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PART 1 - GENERAL

1-1. SCOPE.

A. This section covers all the earthwork required for construction of the work on OCSD property. The earthwork shall include, but not be limited to necessary clearing, grubbing, loosening, removing, loading, transporting, depositing, grading and compacting in its final location of all materials wet and dry, as required for the purposes of completing the work specified in the Contract Documents, which shall include, but not be limited to, the furnishing, placing, and removing of sheeting, shoring and bracing necessary to safely support the sides of all excavation; supporting structures above and below ground; all pumping, ditching, draining, dewatering, and other required measures for the removal or exclusion of water from the excavation; stabilization of the bottom of the excavation, filling and compacting to elevations shown on the Contract Documents; all backfilling around structures and pipe and all backfilling of trenches and pits; the disposal of excess and unsuitable excavated materials; borrow of materials to make up deficiencies for fills; and all other incidental earthwork, all in accordance with the requirements of the Contract Documents.

B. The elevations shown on the Plans as existing are taken from the best available data and are intended to give reasonably accurate information. The Contractor is responsible for determining exact quantities of excavation and fill required.

C. Pits and fills used for the erection of the Contractor’s construction facilities shall be filled or removed upon the completion of the work and leveled to meet the existing contours of the adjacent ground.

D. After all structures have been completed, the ground surface shall be brought to the finished grade elevations and relative compaction indicated on the Contract Documents.

E. All finished ground surfaces shall be bladed and dressed to present a surface not varying over 0.10 foot at local humps or depressions and to the satisfaction of the Engineer. Local depressions, which can contain water shall be no more than 0.05-foot deep.
F. A Geotechnical Site Investigation Report has been prepared. The report describes the subsurface conditions at the project site and is provided to the Contractor for information purpose only. The Contractor shall notify the Owner immediately and in writing of differing site conditions in accordance with the Public Contract Code, Section 7104.

1-2. RELATED WORK SPECIFIED ELSEWHERE.

A. Division 01, Work Restrictions
B. Division 02, Other Sections, as applicable
C. Section 15000 Piping, General

1-3. REFERENCE SPECIFICATION, CODES AND STANDARDS. With reference to the terms and conditions of the construction standards for excavations set forth in Cal/ OSHA “Construction Safety Orders”, Subchapter 4 (Article 6) section 1540, Contractor shall employ a competent person and, when necessary based on the regulations, a registered professional engineer to act upon all pertinent matters of the work of this section.

A. Comply with the applicable reference specifications as specified in the General Requirements.

B. Comply with the current provisions of the following codes and standards:

1. Commercial Standards:
   
   
   ASTM D422 Standard Test Method for Particle-Size Analysis of Soils
   
   ASTM D1556 Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
   
   AASHTO T180 Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in (457-mm) Drop
   
   ASTM D1633 Standard Test Method for Compressive Strength of Molded Soil-Cement Cylinders
   
   ASTM D2166 Standard Test Method for Unconfined Compressive Strength of Cohesive Soils
   

ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D2901 Standard Test Method for Cement Content of Freshly-Mixed Soil-Cement

ASTM D6938 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

UBC No. 29-2 Standard Test Method for Expansion Index of Soils

2. Standard Specifications:

SSPWC Sections 203-1, 203-2, 203-3 - Bituminous Materials

SSPWC Section 211 - Soil and Aggregate Tests

SSPWC Section 300 - Earthwork

SSPWC Section 306-1- Open Trench Operations


1-4. CONTRACTOR SUBMITTALS.

A. Submittals, including samples of materials, shall be in accordance with the General Requirements.

B. The Contractor's attention is directed to the provisions for "Shoring and Bracing Drawings" in Section 6705 of the California Labor Code and SSPWC Section 306-1.1. The Contractor, prior to beginning any trench or structure excavation 5 feet deep or over shall submit to the Engineer and shall be in receipt of the Engineer's written acceptance of the Contractor's detailed plan showing design of all shoring, bracing, sloping of the sides of excavation, and other provisions for worker protection against the hazard of caving or heaving ground during the excavation of such trenches or structure excavation. The plans shall be prepared by a qualified civil or structural engineer licensed in the State of California and employed by an independent design consultant firm insured against errors and omissions to the extent required by the Engineer. The submittal(s) shall include a site location map referencing existing features; detailed plans; elevations, and various sections indicating all excavation slopes, shoring components and connections and showing all structures and utilities potentially
influenced by the performance of shoring, trenching or structure excavation along with supporting calculations; notes including sequence of construction, materials, and other clarification as required by the California Labor Code, SSPWC, and the contract documents.

C. The Contractor shall submit for the Engineer’s review, drawings and data showing his proposed design and plan for dewatering of all work areas, which shall include the planned method of dewatering, excavation and shoring, the location and capacity of such facilities as dewatering wells, well points, pumps, sumps, collection and discharge lines, flowmeters, the standby units proposed, and protective fills and ditches required for control of groundwater and surface water. The plan for dewatering shall be submitted to the Engineer 15 days prior to the start of construction. The Contractor shall furnish such other information as may be required for the complete understanding and analysis of the dewatering and excavation plan by the Engineer.

D. The Contractor shall submit an Excavation Plan for the Project. The plan shall show excavation areas and haul routes on a monthly basis. The plan shall contain truck traffic counts and planned use of local “public streets”. Explain the method and means for meeting the requirements of SCAQMD Rule 403, Fugitive Dust emissions.

E. Review by the Engineer shall not relieve the Contractor of the responsibility for the adequacy of the dewatering and excavation plans or for furnishing all equipment, labor, and materials necessary for performing the various parts of the work. If, during the progress of the work, it is determined by the Engineer that the dewatering system and excavation plan are inadequate or the Contractor’s plan of construction inoperative, the Contractor shall, at his expense, furnish, install and operate such additional dewatering equipment as may be necessary to perform the work in a manner satisfactory to the Engineer.

F. Provide a Stormwater Pollution Control Plan (SWPPP) as outlined in the Stormwater Pollution Control Plan section.

1-5. DEWATERING.

A. Discharge of water from dewatering operations is governed by a National Pollutant Discharge Elimination System (NPDES) permit issued by the Regional Water Quality Control Board. The Contractor shall design, provide and maintain, at all times during construction, ample means and devices with which to promptly remove and properly dispose of all water from any source, including water migrating through the bedding of existing trunk sewers, entering the excavations or other parts of the work. Dewatering shall be accomplished by methods that will ensure a dry and firm, unyielding excavation and preserve the final lines and grades of the bottoms of excavations. Said methods may
include deep wells, well points, sump pumps, suitable rock or gravel placed below the required bedding for draining and pumping purposes, temporary pipelines, or other approved means. The proposed method and proposed point of discharge of dewatering effluent shall be submitted to the Engineer for review and approval prior to excavation and installation of dewatering equipment.

B. Soft and wet conditions are expected for excavations below approximately EL5 to EL8 where static ground water was encountered. Construction dewatering can be designed for this range of groundwater level. Little to no perched water is expected above EL8. If perched water is encountered, it can be collected with sumps. Groundwater depths should be verified before construction to account for potential variation due to groundwater recharge activities, seasonal variations, or higher water levels in wet years. For design of permanent structures, a groundwater level of EL15 should be used in order to cope with wet years and potential impact from the adjacent groundwater recharge activities over the design life of the proposed structures. Dewatering wells should not penetrate into the Talbert Aquifer.

C. The dewatering shall be accomplished in a manner that will prevent loss of fines from the foundation, will maintain stability of all excavated slopes and bottoms of excavations, and will permit construction operations to be performed in the dry. Dewatering of excavations shall be performed to the extent required to permit placement of compacted fill materials in the dry and to prevent sloughing of the excavation side slopes.

D. Ground water table, and locally perched ground water tables, shall be lowered in advance of the excavation and maintained at least 5 feet below the bottom of the excavation. During placement and compaction of fill materials, the lowered level of ground water shall be maintained as described above until final grade is reached. Floatation of pipelines and structures shall be prevented by maintaining a positive and continuous removal of water until the construction is completed to the design grades.

E. No concrete or masonry footings, foundations, manhole bases, or floors shall be constructed in water, nor shall water be allowed to rise over them until the concrete or mortar has set at least 24 hours. Water shall not be allowed to rise unequally against walls until concrete has attained its 28-day strength. Water shall not be allowed to rise above pipe subgrade during pipe laying operations.
F. Dewatering equipment shall not cause noise nuisance. Noise levels shall, at a minimum, comply with the requirements of local jurisdictions or permitting agencies.

G. The Contractor shall construct and maintain all permanent and temporary slopes, dikes, levees, drainage ditches, and sumps necessary for removal of water from work areas.

H. Any damage or settlement to the foundation or other work or any existing structures caused by temporary or permanent failure or operation of the dewatering system shall be repaired to the satisfaction of the Engineer at the Contractor’s expense. The Contractor should consider the use of recharge systems or other methods of protection of existing facilities. The Contractor shall monitor settlement, and groundwater levels around existing structures during dewatering. Records of settlement and groundwater levels shall be kept and evaluated on a daily basis. The Contractor shall notify the Engineer immediately if excessive settlement or a significant drop in groundwater is recorded.

I. Standby pumping equipment shall be on the job-site. A minimum of one standby unit (a minimum of one for each ten in the event well points are used) shall be available for immediate installation should any well unit fail. The design and installation of well points or deep wells shall be suitable for the accomplishment of the work. Drawings indicating the proposed dewatering system shall be submitted to the Engineer for review.

J. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with pipe bedding material or crushed rocks underlain by geotextiles as needed to stabilize the foundation soils at no cost to the Owner.

K. The Contractor shall dispose of the water from the work in a suitable manner without damage to adjacent property. Conveyance of the water shall not interfere with traffic flow or the operation of the treatment facilities. No water shall be drained into work built or under construction without prior consent of the Engineer. Upon written approval of the Engineer, water may be disposed of in the treatment plant effluent system or trunk sewer at a point designated by the Engineer. Water shall be desanded and desilted before disposal. Each disposal point to sewers or other Owner facilities must have a flowmeter to track the discharges into the facilities. The Contractor shall submit weekly reports showing the total discharge at each point with meter readings and other data as necessary to support the

L. Records of settlement and groundwater levels shall be kept and evaluated on a daily basis. The Contractor shall notify the Engineer immediately if excessive settlement or a significant drop in groundwater is recorded.
quantity reported. Disposal point and maximum flow rate for
dewatering waste is subject to the Engineer’s review. The Engineer
shall have the right to limit the maximum flow rate per disposal point
and may direct the Contractor to provide additional disposal points as
required at no additional cost.

L. The system used for desanding and desilting the water shall be a
baffled structure and shall provide not less than 5 minutes detention
time and have a "flow-through" velocity not exceeding 0.2 feet per
second at the anticipated peak flow. The desanding and desilting box
shall be cleaned as required to maintain the detention time and flow-
through limitations specified above. The system used for desanding
and desilting shall be attached with a stainless steel sampling port so
that OCSD staff may collect dewatering flow samples from this port,
and it will have a drip container below the port to capture any excess
water spilled during sampling. The system used for desanding and
desilting shall be located in a safe and easy access location so
sampling can be performed by OCSD Environmental Sciences
Laboratory staff. The method of desanding and desilting and point of
disposal of water shall be subject to the Engineer’s approval. Water
shall be disposed of in such a manner as not to be a menace to the
public health and shall be done in accordance with Environmental
Protection Agency and State Water Quality Control Board
requirements. The total suspended solids (TSS) content of the water
shall not exceed 100 mg/L.

M. Contractor shall dewater all water migrating from the bedding of
existing sewers at no additional cost to the Owner.

N. Upon completion of the dewatering and control of water operation, all
temporary works and dewatering facilities shall be removed in a
manner satisfactory to the Engineer.

O. The treated groundwater shall be discharged to the Owner’s outfall
through XXXX or XXXX. The Contractor shall notify the Owner when
discharge to XXXX or XXXX occurs so that sampling of the
groundwater can be performed to verify that the discharged
groundwater complies with the treatment requirements identified
herein.
1-6. SHORING OF EXCAVATIONS.

A. The Contractor shall be fully responsible for providing and constructing shoring and bracing to prevent slides or cave-ins and to protect all existing improvements in the vicinity from damage as required.

1. Shoring and sheeting shall also be installed during excavation as necessary to prevent disturbing material that is under or adjacent to an existing structure or pipe. Displacements at the shoring face and at selected points adjacent to pipelines or structures shall be monitored. Groundwater conditions shall be verified prior to designing temporary shoring. Excavation below current groundwater level will require shoring and dewatering.

2. Whenever the Engineer considers any Owner facility in jeopardy due to excavation, the Contractor shall take the measures necessary, subject to approval of the Engineer, to protect the facility in question. All costs associated with these protective measures shall be borne by the Contractor. Backfill of any "unauthorized excavation" shall be performed as directed by the Engineer. Damage to existing structures due to "unauthorized excavation" shall be immediately repaired or replaced to the satisfaction of the Engineer at the Contractor's expense.

3. All piling required for shoring shall be installed by drilling. Driven piles of any types will not be allowed without the approval of the Engineer.

4. The Contractor shall not begin excavation operations until the shoring drawings have been reviewed by the Engineer. Review of the Contractor's shoring plans shall not be construed to invalidate other provisions of these Specifications or relieve the Contractor of the responsibilities inherent in the pursuance of the work. The Contractor shall, at its cost and for all its shoring work, obtain permits from all regulatory agencies as required.

5. The Contractor shall furnish all labor, equipment, and materials to construct, install, and remove the entire shoring system including removal of lagging, soldier beams, and bracing and de-tensioning of tiebacks. Full compensation for the shoring and its removal shall be considered as included in the Contract Price and no additional compensation will be allowed.

6. Design of shoring shall be in accordance with the applicable requirements of the Safety Orders of the Division of Industrial Safety, State of California. All temporary shoring must comply with current CAL-OSHA requirements. The Contractor shall be responsible for providing more extensive shoring or bracing systems than those required by the Construction Safety Orders when necessitated by
conditions indicated on the drawings, specified, or otherwise required by the Work.

7. The shoring and bracing shall be designed in accordance with the data provided in the Geotechnical Investigation Report and shall consider all surcharge loads imposed.

8. Where the shoring support system is within 10 feet of a street, it shall be designed to withstand a minimum surcharge load equivalent to 2 feet in height of earth added to the active earth pressure in the upper 10 feet of shoring. Shoring support systems adjacent to other structures shall be designed to withstand all loads applied to the shoring system from adjacent structures.

9. Lateral earth design pressures for the design of temporary earth-retaining structures are dependent upon retaining structure movement, type of structure, and combination of imposed forces from soil, water (if allowed to accumulate), and surcharge loads. Such shoring system shall be designed by the Contractor. However, lateral pressures used in the design of a shoring system shall not be less than those shown in Figure 02200-2. A minimum 250 psf (equivalent to approximately 2 feet of soil) aerial surcharge shall be assumed at the top and around the excavated area to account for the adjacent structural and equipment loads, and where applicable, hydrostatic pressure shall be included.

   a. The embedment depth of the wall required to provide toe stability shall be determined by moment equilibrium about the top for cantilever walls, or about the tieback level for anchored walls. Sheet piles shall extend through alternating sand, silt, and clay layers, extending a minimum 20 feet below the bottom of the mass excavation. Temporary tieback anchors can be used with shoring systems so long as the tieback installation will not interfere with structural integrity of the adjacent pipeline and facilities.

   b. Facilities located beyond a distance of one times the depth of the excavation from the shoring limits (potential impact zone) will experience minimal impact from the excavation and foundation installation. Mitigation techniques such as deep soil mixing, grouting, secant piles, or alternative methods can be used and should be designed by a California State Licensed Civil or Structural Engineer and submitted by the Contractor for the Engineer’s record. Maximum deflection at the top of shoring shall be limited to ½-inch, horizontal and vertical.

10. Where shoring will support adjacent structures or facilities and excessive deflection can lead to structure settlement, braced or tieback shoring shall be utilized. Braced or tieback shoring supporting adjacent nearby facilities shall be designed and
constructed to limit the maximum horizontal deflection of the shoring to 1/2 inch or less at the shoring face, and ½-inch or less (horizontal deflection and vertical settlement) at a clear distance of 10 feet from the protected structure or pipeline as directed by the Engineer. Deflection of the shoring system shall be monitored on a weekly basis by a licensed surveyor employed by the Contractor. Monitoring of the shoring shall be performed in the presence of the Engineer, with a written report to be submitted to the Engineer within 24 hours. Installation of tiebacks should avoid damages to the adjacent pipelines and the associated backfill materials. Casings shall be used during installation of tiebacks under pipelines and existing structures, and the tieback alignment should be kept at a minimum clearance of 10 feet from the pipelines and foundations.

a. Temporary tieback anchors shall be installed at spacing no more than 8-foot on center. The anchor’s unbonded zone shall extend at least 20 feet beyond the active wedge. Drilling and grouting of tieback anchors shall be conducted such that the drilled holes will not collapse and loss of ground can be prevented. Casing should be made available at the site and be used as required.

b. The frictional resistance of an anchor is dependent on many factors, including soil consistency, groundwater conditions, and the contractor’s method and care of installation. Because of the many factors that may affect anchor capacity, the Contractor shall perform anchor testing to develop a final anchor design capacity. An allowable bond stress of 2,000 psf can be assumed for preliminary design; however the results from the anchor testing shall be used for the final design capacity. The anchors shall be installed at an inclination no steeper than 15 degrees from the horizontal. The minimum anchor bond length should be at least 20 feet. Tieback anchor installation and testing shall be conducted in accordance with “recommendations for Prestressed Rock and Soil Anchors” (PTI, 1996).

11. Any delay and/or expense incurred due to excess shoring deflection shall be at the Contractor’s expense.

12. Shoring and sheeting/bracing needs to be installed and removed carefully such that the bedding surrounding the installation of pipes does not slough or move within the pipe zone which would affect the proper support for bedding material under the haunches of the pipe. If the bedding material moves from under the pipe haunches after removal of shoring or sheeting/bracing, Contractor shall re-compact the bedding underneath the pipe haunches at no additional cost to the Contract. Where holes are left from beams used
for shoring, Contractor shall use pea-gravel or sand-cement grout to consolidate beam hole.

13. Contractor shall use the vibration method to install sheet piling in order to reduce construction noise.

1-7. **SAFETY MEASURES.**

A. Safe conditions shall be maintained at the jobsite meeting all provisions of the California OSHA and all other applicable safety codes. Barricades and lighting meeting the requirements of all agencies having jurisdiction shall be placed at each end of all excavations and at such places as may be necessary along excavations to warn all pedestrians and vehicular traffic of such excavations. Lights shall also be placed along excavations from sunset each day to sunrise of the next day until such excavation is entirely backfilled, compacted, and paved. All excavations within the treatment plant fenced property shall be barricaded and lighted in such a way as to prevent persons from falling or walking into any excavation. All excavations outside the treatment plant confines shall be fenced with a minimum 7-foot high chain link fence during all non-working hours. This fence shall be constructed to prevent any person from entering the excavation. Signs stating "Danger, Deep Hole" shall be clearly displayed on all sides of the excavation.

B. Safe and suitable ladders that project 2 feet above the top of the trench shall be provided for all trenches greater than 4 feet in depth. A minimum of one ladder shall be provided for each 50 feet of open trench.

1-8. **QUALITY ASSURANCE.**

A. General. All soils testing will be done by a testing laboratory of the Engineer’s choice at Owner’s expense except as specified in Subsection C and E below.

B. The Owner will pay for the initial cost of all compaction tests. If any compaction fails to meet the relative compaction tests set forth, the Contractor shall pay for subsequent compaction tests by deducting their costs from the Contract amount.

C. The Contractor shall make all necessary excavations for compaction tests as directed by the Engineer, and all work in connection with compaction testing by the Contractor shall be included in the various contract bid prices, and no additional allowance will be made therefore. Safe access shall be provided to conduct the test.

D. In accordance with Owner’s Plans and Standard Drawings, soil material is required to be compacted to a ASTM D 2922 percentage of maximum dry density. The maximum dry density at optimum
moisture content will be determined in accordance with the latest version of ASTM D 1557, except for work completed in the CALTRANS right of way. In-place field density tests will be performed in accordance with ASTM D 1556, (sand cone) and/or and ASTM D 6938 (nuclear gauge). The type, number and location of field density tests will be determined by the Engineer. One sand-cone test (ASTM D 1556) will be taken for every four nuclear tests (ASTM D 2922 and 6938). If soil material is not within two (2) percentage points of optimal moisture content, the Contractor shall either add water or dry the soil material by moving the soil to aerate it sufficiently such that the optimum moisture content is achieved at no additional cost to the Owner.

E. All imported fill material shall be sampled and tested at the Contractor’s expense and shall be subject to approval by the Engineer.

F. Where imported fill material is required to possess certain gradation, strength, and settlement properties, the grain size distribution of soils will be determined using ASTM D 422, the gradation of concrete aggregate and base materials will be determined using ASTM C 136, the sand equivalent of soils will be determined using ASTM D 2419, the consolidation of soils will be determined using ASTM D 2435, the unconfined compressive strength of soils will be determined using ASTM D 2166, and the expansion index of soils will be determined using UBC No. 29-2.

G. Testing of soils shall also comply with any permit conditions included as part of this contract.

PART 2 - PRODUCTS

2-1. ONSITE EXCAVATED MATERIALS.

A. General. The subsurface soils are highly variable and generally consist of several feet of fill materials, underlain by alluvial deposits of alternating layers of very loose to dense silty sand and sand, medium stiff to hard clays and clayey silts, and some Peat deposits and organic soils overlying the Talbert Aquifer which was reported at a depth of approximately 50 to 55 feet below the ground surface.

It is estimated that ½ to ¾ of the on-site soils to be excavated from the top 20 feet generally consist of silty sand (SM) and clean sand (SP) and can be used for compacted fill. The suitability of potential import sources, if required, should be evaluated by sampling and laboratory testing prior to shipment to the project site. Imported fill
should consist of sandy soils with less than 50% fines, and be free from debris, vegetation and roots, organics, contaminants, or rock particles larger than 6 inches.

B. Excavated Material Classification. Excavated material will be classified as either suitable or unsuitable for backfill around the structures as shown in Figure 02200-1. Unsuitable soil will be segregated further into subcategories depending on the characteristics of the soil. A general description of each category is shown below:

1. **Suitable Material.** Excavated sandy soils with less than 50 percent fines (passing the No. 200 Sieve) and free of vegetation and roots, peat, organics, sludge, debris, grit, and broken concrete fragments or rock larger than 6 inches.

2. **Unsuitable Material.** Material containing excessive amounts of organic matter, peat, blue clay, trash or debris; or as designated by the Engineer; or debris produced by clearing, grubbing, and demolition of existing structures, pavement, or pipe; or soil classified by test method ASTM D2486 as groups other than SP or SM; or not meeting the grading or classification specified in 2.1.c.1. Unsuitable material shall be segregated into the following subcategories:

   a. **Uncontaminated.** The uncontaminated soil is any material determined to be unsuitable for backfill that is free from sludge, debris, or material uncharacteristic with the natural alluvium.

   b. **Contaminated.** Contaminated soil is any material that is determined to be associated with the sludge disposal practice as described in 2.1.B. This will include soil that is adversely impacted by the sludge disposal, either by mixing of materials or leaching of contaminants.

   Contaminated soil is further segregated into the following subcategories:

   (1) **Non-Hazardous.** Material determined to be non-hazardous for the purpose of disposal of investigation derived wastes.

   (2) **Hazardous.** Material determined to be hazardous, requiring special handling and disposal requirements.

3. Any material that does not meet the requirements of “suitable material” or is not incorporated into the project shall be disposed of as described in 3.9.
4. The Contractor shall bear the cost of all sampling, testing and permitting required to dispose of excess excavated material.

2-2. **SUITABLE FILL MATERIAL REQUIREMENTS.**

A. **General.** Fill materials shall be suitable selected or processed clean, fine earth, rock, or sand; free from peat, grass, roots, brush, and other organic materials; and free from debris, contamination, or deleterious material.

Suitable materials may be obtained from onsite excavations, may be processed onsite materials, or may be imported provided these materials meet all the requirements in the contract documents. If imported materials are required to meet the requirements of this Section or to meet the quantity requirements of the project, the Contractor shall provide the imported fill materials and the required reports of test results at no additional expense to the Owner.

B. **Unclassified Fill.** Unclassified fill shall be used for non-structural embankment fill unless otherwise designated. Unclassified fill shall conform to the requirements of SSPWC Section 300-4, subject to the Engineer’s approval.

C. **Imported Sand.** Wherever the term “imported sand” is used in the Contract Documents, it shall be defined as sand having a minimum sand equivalent of 70 as determined by the latest revision of the State of California, Department of Transportation, Test Method No. CA 217.

D. The following types of imported granular materials are designated and defined as follows:

1. **Crushed Aggregate Base (CAB)** shall conform to the requirements of SSPWC Section 200-2.2.

2. **Crushed Miscellaneous Base (CMB)** shall conform to the requirements of SSPWC Section 200-2.4.

3. **Crushed Rock:** Crushed rock shall be the product of crushing rock or gravel. Fifty percent of the particles retained on a 3/8-inch sieve shall have their entire surface area composed of faces resulting from fracture due to mechanical crushing. Not over 5 percent shall be particles that show no faces resulting from crushing. Less than 20 percent of the particles that pass the 3/8-inch sieve and are retained on the No. 4 sieve shall be waterworn particles. Gravel shall not be added to crushed rock.
Where crushed rock is specified on the Contract Documents, it shall conform to the following gradation:

<table>
<thead>
<tr>
<th>Sieve Sizes</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 inches</td>
<td>-</td>
</tr>
<tr>
<td>1 1/2- inches</td>
<td>-</td>
</tr>
<tr>
<td>1 inch</td>
<td>100</td>
</tr>
<tr>
<td>3/4 inch</td>
<td>90-100</td>
</tr>
<tr>
<td>1/2 inch</td>
<td>30-60</td>
</tr>
<tr>
<td>3/8 inch</td>
<td>0-20</td>
</tr>
<tr>
<td>No. 4</td>
<td>0-5</td>
</tr>
<tr>
<td>No. 8</td>
<td>-</td>
</tr>
</tbody>
</table>

4. Drainrock shall be crushed rock or gravel and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall meet the following gradation requirements:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percentage Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-inch</td>
<td>100</td>
</tr>
<tr>
<td>3/4-inch</td>
<td>90 - 100</td>
</tr>
<tr>
<td>3/8-inch</td>
<td>40 - 100</td>
</tr>
<tr>
<td>No. 4</td>
<td>25 - 40</td>
</tr>
<tr>
<td>No. 8</td>
<td>18 - 33</td>
</tr>
<tr>
<td>No. 30</td>
<td>5 - 15</td>
</tr>
<tr>
<td>No. 50</td>
<td>0 - 7</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 - 3</td>
</tr>
</tbody>
</table>

The drainrock shall have a sand equivalent value not less than 75. The finish-graded surface of the drainrock immediately beneath hydraulic structures shall be stabilized to provide a firm, smooth surface upon which to construct reinforced concrete floor slabs.

E. Structure Backfill material shall conform to the requirements of SSPWC Section 300-3.5.1. Excavated sandy soils with less than 50 percent fines free from peat, debris, grit, broken concrete and rock fragments larger than 6 inches, organic contaminants, and other deleterious materials can be stockpiled for use as backfill provided they are environmentally acceptable.
F. Pervious Backfill material shall conform to the requirements of SSPWC Section 300-3.5.2.

G. Pipe Bedding Material. Unless otherwise indicated, pipe-bedding material shall be crushed rock, aggregate fill, granular soil with less than 7% fines, imported sand, or 3/4-inch maximum gravel as specified herein.

1. Type A Bedding material shall conform to the requirements for 3/4-inch Crushed Rock, 1-inch Crushed Rock, No. 3 Concrete Aggregate, No. 4 Concrete Aggregate, or Portland Cement Concrete Sand in SSPWC Section 200-1 for pipes larger than 24 inches in diameter. Type A Bedding material shall conform to the requirements for Type B Bedding material or the requirements for Portland Cement Concrete Sand in SSPWC Section 200-1 for pipes 24 inches or smaller in diameter.

2. Type B Bedding material shall conform to the requirements for 1-inch Crushed Rock or No. 4 Concrete Aggregate in SSPWC Section 200-1.

3. Type C Bedding Material. On-site sandy soils free of debris, organic matter, oversize particles (greater than 3 inches) and other deleterious substances can be used for backfill in the pipe zone, and should be compacted to a minimum 90% relative compaction. Jetting can be used to densify the backfill in the pipe zone if the sand equivalent (SE) value of the soil is greater than 30.

4. Pipe zone materials for ductile iron pipe with polyethylene wrap shall be granular soil, imported sand, or 3/8-inch maximum gravel in conformance with the requirements of SSPWC Section 200-1.

5. Pipe zone materials for System 2 steel piping shall be imported sand.

H. Sand-Cement Slurry material shall conform to the requirements of SSPWC Section 201-1 for Trench Backfill Slurry.

I. Soil Cement material shall conform to the requirements of SSPWC Section 301-3.1.

J. Topsoil material shall conform to the requirements of SSPWC Section 212-1.1.

2-3. USE OF FILL MATERIAL TYPES.

A. The Contractor shall use the types of materials as designated herein for all required fill, backfill, and embankment construction.
Material limits within pipe zone and trench zone are shown on the Contract Drawings.

B. Fill and backfill types shall be used in accordance with the following provisions:

1. Embankment fills shall be constructed of unclassified fill material, unless otherwise designated.

2. Pipe zone backfill, as defined under "Pipe and Utility Trench Backfill" herein, shall consist of the following materials for each pipe material listed below:
   a. Mortar coated pipe, concrete pipe, and uncoated ductile iron pipe shall be provided Type A Bedding, Type B Bedding, or Concrete Pipe Bedding materials as defined herein for pipe zone backfill material.
   b. Coal tar enamel coated pipe, polyethylene encased pipe, tape wrapped pipe, and other non-mortar coated pipe shall be backfilled with Portland cement concrete sand conforming to SSPWC Section 200-1 or Concrete Pipe Bedding material as defined herein for pipe zone backfill material.
   c. Plastic pipe and vitrified clay pipe shall be backfilled with 3/4-inch Crushed Rock conforming to SSPWC Section 200-1 or Concrete Pipe Bedding material as defined herein for pipe zone backfill material.

3. Trench zone backfill for pipelines as defined under "Pipe and Utility Trench Backfill" shall be on-site sandy soils free of debris, organic matter, oversize particles (greater than 6 inches) and other deleterious substances can be used for backfill in the trench zone.

4. Final backfill material for pipelines under paved areas, as defined under "Pipe and Utility Trench Backfill" shall be Crushed Aggregate Base (CAB) or Crushed Miscellaneous Base (CMB) material as defined herein.

5. Trench backfill in the pipe zone and final backfill for pipelines under structures shall be the same material as used in the pipe zone, except where concrete encasement is required by the Contract Documents.

6. Backfill around or behind structures shall consist of Structure Backfill as defined herein unless indicated otherwise in the Contract Documents.

7. Fill materials beneath structures shall be as follows:
a. Fill beneath hydraulic structures or other water retaining structures with underdrain systems shall be Drainrock material, as defined herein, constructed to the limits and thicknesses shown or specified.

b. Fill beneath structures without underdrain systems shall be a 2-ft thick layer of compacted crushed rock as defined herein. The crushed rock shall extend a minimum of 5-ft beyond the perimeter of the structure.

8. Backfill used to replace pipeline trench over-excavation shall consist of Type B Bedding material as defined in Subsection 2.1.G.2.

9. Backfill around manholes in public streets above the concrete cast-in-place base and below the street zone shall be by sand-cement slurry with at least 1.5 sacks of cement for each cubic yard of slurry.

PART 3 - EXECUTION

3-1. CLEARING, GRUBBING AND STRIPPING.
   A. Prior to conducting any grading operation, existing structures and active underground utilities shall be protected and/or rerouted. Obstructions and any debris, remnants of manmade features, previously abandoned foundations, and pavements shall be removed. Soils containing peat, organic materials or debris shall be removed and not used as backfill material.

3-2. GRADING AND STOCKPILING.
   A. The Contractor shall control grading in a manner to prevent water from running into excavations. Obstruction of surface drainage shall be avoided and means shall be provided whereby storm water flow is not interrupted in existing gutters, and other surface drains, or temporary drains. Storm water management plans shall be as specified in the General Requirements of these Specifications. Material for backfill or for protecting excavation in public roads from surface drainage shall be neatly placed and kept shaped so as to cause the least possible interference with public travel. Free access must be provided to all fire hydrants, water gates, meters, and private drives.
   B. Finished grading at any point shall not vary more than 0.10 foot above or below the grade established by the Contract Documents.
3-3. **STRUCTURE, ROADWAY, AND EMBANKMENT EXCAVATION.**

A. **General.** Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the work. The removal of said materials shall conform to the lines and grades shown or ordered. Unless otherwise provided, the entire construction site shall be stripped of all vegetation, debris, and all deleterious materials, and such materials shall be removed from the site prior to performing any excavation or placing any fill. The Contractor shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching, or other measures for the removal or exclusion of water, including taking care of storm water, groundwater (dewatering if required), and wastewater reaching the site of the work from any source so as to prevent damage to the work or adjoining property.

Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State of California safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926), and the Contract Documents. If sufficient space is available, temporary excavations in firm silty and clayey soils extending to a depth of approximately 15 feet may be sloped at 1:1 (horizontal:vertical). In the areas where poorly graded sand is encountered, temporary excavation slope should be maintained at 1.5:1 (h:v) or flatter. Temporary shoring will be required for steeper and deeper excavations. Permanent slopes should be maintained no steeper than 2:1 (h:v).

The excavated area should be observed by the project geotechnical engineer for any potential sign of distress within or around the excavated area, and to clear all loose and soft spots and possible disturbance to existing facilities. Excavation below the existing groundwater level (approximately EL5 to EL8) will encounter wet and soft clays, peat, and organic materials, and will require the use of excavators with low contact pressure. The bottom of the excavation will require stabilization prior to mobilization of heavy construction equipment.

Structure excavation shall conform to the dimensions and elevations indicated on the Contract Documents for each structure including trenching for adjacent piping. In locations where soil of suitable bearing value is encountered at a different elevation from that indicated on the Contract Documents, the Engineer may direct
in writing that the excavation be carried to elevations above or below those indicated on the Contract Documents. Excavation shall extend at least 24 inches from walls and footings to allow for placing and removal of forms, installation of services, and inspection. Undercutting will not be permitted.

Where a structure would be located partially on fill and partially on undisturbed native material, the entire area shall be over-excavated to a depth of 6 inches below the elevations indicated and recompacted as directed in the tabulation in Article 3.13.E of this specification section.

Safe and suitable ladders that project 2 feet above the top of the trench shall be provided for all trenches greater than 4 feet in depth. A minimum of one ladder shall be provided for each 50 feet of open trench.

B. Excavation Beneath Structures and Embankments. Except where otherwise specified for a particular structure or ordered by the Engineer, excavation shall be carried to the grade of the bottom of the footing or slab. Where shown or ordered, areas beneath structures or fills shall be over-excavated. The subgrade areas beneath embankments shall be excavated to remove not less than the top 8 inches of native material and where such subgrade is sloped, the native material shall be benched. When such over-excavation is shown, both over-excavation and subsequent backfill to the required grade shall be performed by the Contractor. When such over-excavation is not shown on the plan and not specified but is ordered by the Engineer, such over-excavation and any resulting backfill will be paid for under a separate unit price bid item if such bid item has been established and approved by the Engineer prior to commencing the work; otherwise payment will be made in accordance with a negotiated price. After the required excavation or over-excavation has been completed, the exposed surface shall be scarified to a depth of 8 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain the required relative compaction.

B. Excavation in Poor Soil. If excessively wet, soft, spongy, unstable, or otherwise unsuitable material, as determined by the Engineer, is encountered at the bottom of the excavation or the surface upon which the pipe bedding material is to be placed including the vertical sides of a specified pipe trench, the unsuitable material shall be removed to a depth as required by the Engineer, disposed of, and replaced with a minimum 2 feet of ¾-inch crushed rock to provide foundation support and to stabilize the mass excavation subgrade where soft soils are encountered and cannot effectively support conventional construction equipment. A Geotex 1601, or
equal, non-woven geotextile shall be used as a separation layer between the excavated subgrade and the crushed rock to avoid the rocks from sinking into the soft subgrade materials.

Removal and replacement of material so ordered shall be paid for by the Owner as "Extra Work" unless provided for in the Schedule of Prices. The Contractor shall maintain adequate dewatering procedures to ensure that an otherwise stable foundation will not be rendered unfit due to accumulation or movement of water in the excavation. If the necessity for such additional excavation and material has been occasioned by an act or failure to act on the part of the Contractor, the Contractor shall bear the full expense of the additional excavation and backfill to the required depth.

C. Overexcavation. A minimum of 2-ft of over-excavation shall be required for foundation support on all below grade, water bearing structures. Where excavation is carried below the limits shown on the Contract Documents, adjustments shall be made as determined by the Engineer to meet requirements incurred by the deeper excavation beneath pipe or structure. Overdepth excavation in such locations shall be rectified by backfilling with approved fill or bedding material or other means specified. Overexcavation not required by the Contract Documents or directed by the Engineer shall be rectified at the expense of the Contractor.

D. Excavation Beneath Paved Areas. Excavation under areas to be paved shall extend to the bottom of the aggregate base, if such base is called for; otherwise it shall extend to the paving thickness. After the required excavation has been completed, the exposed surface shall be scarified to a depth of at least 12 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain a minimum percent of maximum dry density compaction as directed in the tabulation in Article 3.13.E of this specification section.

E. Excavation Subgrade and Below Subgrade:

1. Excavate and shape subgrade to line, grade, and cross-section shown on Drawings. Following receipt of written acceptance for the subgrade by the Engineer, compact the subgrade with approved equipment until the top 6-inches is compacted to 95 percent of maximum dry density at optimum moisture content as determined by ASTM D 1557, depending upon the appropriate zone or location of fill in accordance with the requirements of the tabulation in Article 3.13.E “Compaction Requirements” of this specification section. Remove all soft, loose, or otherwise unsuitable material and replace with suitable sandy material. The finished subgrade shall be firm, hard and unyielding. The
subgrade shall be considered to extend over the full width of the base course. Compaction shall extend 18 inches beyond the edge of paving, curb, or form.

2. Where the Engineer deems subgrade material to be unsatisfactory, excavation below subgrade will be required to such depths as necessary to remove the unsatisfactory material. Excavation below grade shall be of the same classification as that above it provided it is removed in the same operation as the normal excavation. Special equipment or hand excavation may be required because of the presence of shallow utilities or other unforeseen conditions.

F. Notification of Engineer. The Contractor shall notify the Engineer at least 2 working days in advance of completion of any structure excavation and shall allow the Engineer a review period of at least one day before the exposed foundation is scarified and compacted or is covered with backfill or with any construction materials.

3-4. PIPELINE AND UTILITY TRENCH EXCAVATION.

A. General. Any water evident in the excavation shall be pumped out or otherwise removed per Subsection 1.5 as necessary to keep the bottom of the excavation free and clear of water during the progress of the work.

B. Pipes Over 42-inches In Diameter. The overall trench width for pipes with diameters larger than 42 inches shall not be more than 24 inches nor less than 12 inches wider than the largest outside diameter of the pipe to be laid therein, measured at a point 12 inches above the top of the pipe, exclusive of branches. Excavation and trenching shall be true to the line so that the pipe is centered within the trench and a clear space of not more than 12 inches nor less than 6 inches in width is provided on each side of the largest outside diameter of the pipe in place. For this purpose, the largest outside diameter shall be the outside diameter of the bell on bell and spigot pipe.

C. Pipes Under 42-inches In Diameter. The overall trench width for pipes with diameters of 42 inches or less shall not be more than 16 inches nor less than 12 inches wider than the largest outside diameter of the pipe to be laid therein, measured at a point 12 inches above the top of the pipe, exclusive of branches. Excavating and trenching shall be true to line so that the pipe is centered within the trench and a clear space of not more than 8 inches nor less than 6 inches in width is provided on each side of the largest outside diameter of the pipe in place. For this purpose, the largest outside diameter shall be the outside diameter of the bell, on bell and spigot pipe.
Where the trench width, measured at a point 12 inches above the top of the bell of the pipe is wider than the maximum set forth above for all pipe sizes, the trench area around the pipe shall be set with steel reinforcing and backfilled with Class C concrete to form a cradle for the pipe as shown on the Figure 02200 S-020. Special care shall be used when pouring the concrete cradle around the pipe so no displacement will occur. In the event of movement, the Contractor shall remove and replace all pipe and cradle affected. Concrete cradle work as required above shall be performed at the expense of the Contractor and shown on the record drawings.

D. Limit of Open Trench. Except by express written permission of the Engineer, the maximum amount of open trench permitted in any one location shall be 500 feet, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is less. All trenches shall be fully backfilled and paved with the first course of pavement at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. Base paving finished to grade shall be flush with existing grade and finished smooth to create a smooth ride. The above requirements for backfilling or use of steel plate will be waived in cases where the trench is located further than 100 feet from any traveled roadway or occupied structure. In such cases, however, barricades and warning lights meeting OSHA requirements shall be provided and maintained. The maximum working length allowed without the first course of pavement is 500 feet, unless otherwise approved by the Engineer.

E. Trench Bottom. The bottom of the trench shall be excavated uniformly to at least 12 inches below the grade of the bottom of the pipe. The pipe bedding of 12 inches minimum thickness shall then be placed on the trench bottom and shall be given a final trim, using a string line for establishing grade, such that each pipe section when first laid will be continually in contact with the ground along the extreme bottom of the pipe. Rounding out the trench to form a cradle for the pipe will not be allowed. Trench bottom raked by toothed excavators is not acceptable.

F. Trench Over-Excavation. Where the Drawings indicate that trenches shall be over-excavated, they shall be excavated to the depth shown, and then backfilled to the grade of the bottom of the pipe.

G. Excavation in Poor Soil. If excessively wet, soft, spongy, unstable, or otherwise unsuitable material, as determined by the Engineer, is encountered at the bottom of the excavation or the surface upon
which the pipe bedding material is to be placed including the vertical sides of a specified pipe trench, the unsuitable material shall be removed to a depth as required by the Engineer, disposed of, and replaced with approved fill, crushed rock, or bedding material wrapped in geotextile. Removal and replacement of material so ordered shall be paid for by the Owner as "Extra Work" unless provided in the schedule of prices. The Contractor shall maintain adequate dewatering procedures to ensure that an otherwise stable foundation will not be rendered unfit due to accumulation or movement of water in the excavation. If the necessity for such additional excavation and material has been occasioned by an act or failure to act on the part of the Contractor, the Contractor shall bear the full expense of the additional excavation and backfill to the required depth.

H. Where pipelines are to be installed in embankment or structure fills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.

I. Obtain Engineer’s approval before beginning excavation. Complete clearing and grubbing prior to the start of trenching. Do not permit excavated materials to cover brush or trees prior to disposal.

3-5. OVER-EXCAVATION NOT ORDERED, SPECIFIED, OR SHOWN.

A. Any over-excavation by the Contractor carried below the grade not ordered, specified, or shown, shall be backfilled to the required grade with the specified material and compaction. Such work shall be performed by the Contractor at his own expense.

3-6. EXCAVATION IN LAWN AREAS.

A. Where excavation occurs in lawn areas, the sod shall be carefully removed and stockpiled to preserve it for replacement. Excavated material may be placed on the lawn; provided, that a drop cloth or other suitable method is employed to protect the lawn from damage. The lawn shall not remain covered for more than 72 hours. Immediately after completion of backfilling, compaction and testing of the pipeline, the sod shall be replaced in a manner so as to restore the lawn as near as possible to its original condition and to the satisfaction of the Engineer. Contractor shall provide new sod if stockpiled sod has remained so for more than 72 hours within the scope of the contract. The top 3" of backfill shall remain uncompacted to promote growth. Existing irrigation lines shall be marked, isolated and replaced in kind.
3-7. **EXCAVATION IN VICINITY OF TREES.**

A. Except where trees are shown to be removed, trees shall be protected in place from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the Engineer. Trees shall be supported and irrigated during excavation by means previously reviewed by the Engineer. The Contractor shall replace all trees that die that are shown on the Contract Drawings as being protected in place.

3-8. **ROCK EXCAVATION.**

A. Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and unstratified masses which cannot be removed without systematic drilling and blasting; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of solid rock and which cannot be removed without systematic drilling and blasting.

Where solid rock, or rock excavation as defined above, is encountered, it shall be removed below grade and the excavation backfilled with approved pipe-bedding material to provide a compacted foundation cushion with a minimum thickness of 3 inches under the pipe bell. Removal of rock and additional pipe bedding material over and above bedding required in the Contract Documents shall be paid for by the Owner as "Extra Work" unless provided for in the Schedule of Prices.

Cobbles or boulders encountered at the trench bottom or pipe subgrade shall be removed a minimum of 12-inches beneath the pipe and replaced with approved pipe bedding material. Bedding material shall be compacted as directed in the tabulation in Article 3.13.E of this specification section and per the Contract Documents to provide uniform support and a firm foundation.

B. Said rock excavation shall be performed by the Contractor; provided, that should the quantity of rock excavation be affected by any change in the scope of the work, an appropriate adjustment of the contract price will be made under a separate bid item if such bid item has been established; otherwise payment will be made in accordance with a negotiated price.

C. **Explosives and Blasting.** Blasting will not be permitted, except by express permission of the Engineer and other governing agencies on a case-by-case basis. The use of explosives will be subject to the approval and regulations of all agencies having jurisdiction. If
blasting is utilized at the site of the Work, the Contractor shall take all precautions and provide all protective measures necessary to prevent damage to property and structures or injury to person. Prior to blasting, the Contractor shall secure all permits required by law for blasting operations and shall provide any additional hazard insurance required by the Owner. The Contractor shall have fully qualified and experienced blasting personnel and foreman in charge of all blasting operations.

D. All operations involving the handling, storage, and use of explosives shall be conducted in accordance with the requirements of the OSHA Standards for Construction, and in accordance with all local laws and regulations.

3-9. DISPOSAL OF EXCESS EXCAVATED MATERIAL.

A. The Contractor shall remove and legally dispose of all excess excavated material at a site selected by the Contractor and reviewed by the Engineer. All incurred expenses including soil handling, transportation and tipping fees, if applicable, shall be borne by the Contractor.

B. All unsuitable and surplus material outside of the confines of the treatment plants shall be disposed of in a legal manner by the Contractor and all costs associated with disposal shall be borne by the Contractor. No unsuitable or surplus material shall be dumped on private property unless written permission is furnished by the owner of the property and unless a grading permit is issued from the local jurisdiction. In addition to written permission from land owner, the land owner and contractor shall provide the Owner with release of all claims arising from said dumping of materials.

C. Unsuitable and surplus material within the confines of the treatment plants shall be disposed of by the Contractor as specified above.

D. Excess unsuitable and surplus materials shall be kept separated from materials of other CONTRACTORS working in the same area.

3-10. PROTECTION OF SUBGRADE

A. After preparing the subgrade as specified, all traffic on the subgrade shall be avoided. Should it be necessary to haul over the prepared subgrade, the Contractor shall drag and roll the traveled way as frequently as may be necessary to remove ruts, cuts, and breaks in the surface. All cuts, ruts, and breaks in the surface of the subgrade that are not removed by the above operations shall be raked and hand tamped. All equipment used for transporting
materials over the prepared subgrade shall be equipped with pneumatic tires.

B. Continued use of sections of prepared subgrade for hauling, so as to cut up or deform it from the true cross-section, will not be permitted. The Contractor shall protect the prepared subgrade from all traffic.

C. The Contractor will be required to plank the subgrade before hauling materials or equipment over it.

D. The subgrade shall be maintained in the finished condition until the first layer of structural base placed.

E. The Engineer has the right to test the reworked subgrade and approve or disapprove the subgrade depending on its condition.

3-11. FILL – GENERAL.

A. Fill consists of the preparation and placement of materials for crushed rock base under structures, pipeline bedding, backfill for excavations and fill for roadways and embankments. In public rights-of-way, the requirements of the local agency having jurisdiction shall take precedence over these Specifications.

B. Fill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained specified strength to withstand the loads imposed. Backfill around water retaining structures shall not be placed until the structures have been hydrostatically tested and coated, and the structures shall be full of water while backfill is being placed.

C. Material used in the work shall be uniform and shall contain no trash, wood, vegetation, sludge, peat and no rocks or clods larger than the size allowed by the Contract Documents. No material greater than 4 inches in any dimension shall be placed within 1 foot of any pipe, manhole or structure. Excavated material and material from borrow sites may be used where they meet the requirements of the Contract Documents. Blending or other processing may be necessary before a material is acceptable to the Engineer. All costs for testing, processing and transporting materials are included in the Contract price.

D. Except for drainrock materials being placed in over-excavated areas or trenches, fill shall be placed after all water is removed from the excavation.

E. For vaults and yard structures located within the top 15-feet of grade, a minimum 2 feet of compacted fill shall be used. The compacted fill shall extend a minimum of 5-feet beyond the perimeter of the footings or foundation mat. The compacted fill can
be placed on stiff clays or dense sands. Local loose and soft spots should be removed and replaced with compacted fill. Excavated sandy soils with less than 50% fines free from peat, debris, grit, broken concrete, and rock fragments larger than 6 inches, organic contaminants, and other deleterious materials can be stockpiled for use as backfill. A schematic diagram of the fill profile is shown in Figure 02200-3.

F. For heavy structures extending more than 15-feet below grade, piles shall be used unless otherwise noted on the Drawings. A minimum of 2-feet of compacted crushed rock shall be provided under the foundations. The compacted crushed rock can be placed on stiff clays or dense sands. Local loose and soft spots should be removed and replaced with compacted fill prior to placing rock. A schematic diagram of the fill profile is shown in Figure 02200-3

3-12. PLACING AND SPREADING OF BACKFILL MATERIALS.

A. Fill materials shall be carefully placed, leveled and compacted in horizontal layers of the depth specified in the Contract Documents. Structural fill shall be placed in uniform, horizontal loose lifts not exceeding 8 inches in thickness, moisture conditioned to within 2% of the optimum moisture content, and compacted by mechanical means to at least 95% relative compaction determined by the ASTM Test Method D1557. The fill should be tested a minimum one test per lift for compliance with the specified relative compaction. Each layer of fill material shall cover the length and width of the area to be filled before the next layer of material is placed. The moisture content of the material shall be controlled and water shall be applied as necessary to achieve the specified compaction and for the prevention of dust nuisance. No fill or rock shall be placed on standing water in any excavation.

B. Structural Base. The fill under structures, including fill to replace unsuitable material removed below the specified excavation or unauthorized over-excavation, shall be constructed in horizontal layers of crushed rock not to exceed 8 inches in depth, or if under footings, the heights of the walls or footings shall be increased, or space shall be refilled with Class C concrete at the expense of the Contractor, as may be directed by the Engineer. Any fill material used shall be compacted to a minimum relative compaction of 95 percent throughout.

Where the underlying soil has been disturbed by any activity, such as clearing and grubbing, it shall be compacted to a minimum relative compaction of 95 percent before placing any fill.

C. Structural Backfill. All backfill around structures shall be made with select material or imported sand compacted to a minimum relative
Compaction of 95 percent up to the street zone, moisture conditioned to within 2% of the optimum moisture content. Compaction shall be performed in uniform, horizontal loose lifts not to exceed 8 inches in thickness. No backfill shall be placed against concrete structures until the 28-day concrete strength has been reached as specified. The fill should be tested a minimum one test per lift for compliance with the specified relative compaction.

D. During spreading each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone backfill materials shall be manually spread around the pipe so that when compacted the pipe zone backfill will provide uniform bearing and side support.

E. Where the backfill material moisture content is below the optimum moisture content water shall be added before or during spreading until the proper moisture content is achieved.

F. Where the backfill material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory, at or slightly above optimum moisture content.

3-13. COMPACTION OF FILL MATERIALS.

A. Each layer of fill shall be mechanically compacted using proper compaction equipment (not rubber tire or wheel rolling) to the specified percentage of maximum dry density at optimum moisture content. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content.

The fill shall be placed in horizontal layers of the specified depths or of such depths approved by the Engineer and compatible with the compacting equipment being used and the backfill material being placed. Each layer shall be evenly spread, properly moistened, or dried as necessary and compacted to the specified relative compaction. Any damage or displacement to pipes or structures as a result of the Contractor’s operation shall be repaired or replaced at the Contractor’s expense.

B. Fill on reservoir and structure roofs shall not be placed until at least 30 days after the concrete roof slab has been placed or the concrete has reached design strength as approved by the Engineer. Equipment weighing more than 10,000 pounds when loaded shall not be used on a roof. A roller weighing not more than 8,000 pounds shall be used to compact fill on a roof.
C. Flooding, ponding, or jetting shall not be used to densify any fill materials with the exception of holes remaining from the extraction of H-beams, plates and piles or otherwise approved by the Engineer.

D. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the depth of the fill at that time, but not less than 5 feet. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.

E. **Compaction Requirements.** The following compaction test requirements shall be in accordance with ASTM D 1557. Where agency or utility company requirements govern, the highest compaction standards shall apply.

<table>
<thead>
<tr>
<th>Location or Use of Fill</th>
<th>Percentage of Maximum Density</th>
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<tbody>
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<tr>
<td>Trench zone backfill material</td>
<td>90</td>
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<td>Street zone backfill of compacted sub base and base material</td>
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<tr>
<td>Street zone final backfill, not beneath paved areas or structures</td>
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<td>Embankments, not beneath paved areas or structures</td>
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<td>Embankments, beneath paved areas or structures</td>
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<td>Backfill around structures, on reservoir or structure roof</td>
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<td>Trench Zone backfill, beneath paved areas, within a depth of 12-inches</td>
<td>95</td>
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<tr>
<td>Trench Zone backfill, beneath paved areas, below 12-inches</td>
<td>90</td>
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</table>
3-14. PIPE AND UTILITY TRENCH BACKFILL.

A. **Pipe Zone Backfill.** The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane 12 inches below the bottom surface of the pipe, i.e., the trench subgrade foundation line, and a plane at a point 12 inches above the top surface of the pipe. The bedding for flexible the pipe is defined as that portion of pipe zone backfill material between the trench subgrade foundation line and 12 inches above the bottom top of the pipe.

All backfill shall be placed in uniform, horizontal loose lifts not exceeding 8 inches in thickness, moisture conditioned as necessary, and compacted to at least 90% of the maximum dry density determined by the ASTM Test Method D1557. The fill shall be tested a minimum one test per lift and every 25 cubic yards of backfill for compliance with the specified relative compaction.

B. **Bedding.** The bottom of a pipe trench excavation indicated on Figure 02200 S-010 is the foundation line where pipe-bedding material is placed. Contractor shall replace any material below the foundation line that has been disturbed or removed during excavation at no additional cost to the Owner. Material shall be replaced with crushed rock bedding, CAB, CMB as directed by the Engineer. Bedding shall be compacted to minimum relative density of 90 per cent before laying pipe. Crushed rock bedding shall be mechanically consolidated to the satisfaction of the Engineer before laying pipe. Where poor soil is encountered, it shall be replaced as specified in the Pipeline and Utility Trench Excavation section of this specification.

At least 12 inches of bedding materials should be placed at the bottom of the trench prior to pipe placement. In areas where the native soil exposed at the bottom of the excavation is adequate for use as bedding material, it shall be scarified to a depth of six inches and compacted.

C. **After compacting the bedding the Contractor shall perform a final trim using a string line for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe. Prior to backfilling, Contractor shall ensure that pipe spigot is fully pressed and locked into pipe bell per manufacturer’s requirements.**

Pipe shall be carefully bedded as shown on Figure 02200 S-010. Particular attention shall be given to the underside of the pipe and fittings to provide a firm bedding support along the full length of the pipe. The Contractor shall be responsible for accurately shaping the
bedding underneath the pipe bells such as bell holes shaped to allow the pipe bell to be fully supported, including full support along the pipe barrel without point loading.

Each bell and spigot joint shall be recessed in the bedding material in such a manner as to minimize loading on the bell of the pipe. CAB and CMB material shall be compacted to a minimum relative density of 95 percent. Backfilling shall be carried on simultaneously on each side of the pipe to prevent displacement. Care shall be exercised in backfilling to avoid damage to the pipe. Contractor shall sluice the bedding material mechanically by hand underneath pipe haunches prior to covering pipe completely with compacted bedding material.

D. The pipe zone shall be backfilled with the specified backfill material. The Contractor shall exercise care to prevent damage to the pipeline coating, cathodic bonds, or the pipe itself during the installation and backfill operations.

E. **Pipe Zone.** On-site sandy soils free of debris, organic matter, oversize particles (greater than 3 inches) and other deleterious substances can be used for backfill in the pipe zone, and should be compacted to a minimum 90 percent relative compaction. Jetting can be used to densify the backfill in the pipe zone if the sand equivalent (SE) value of the soil is greater than 30. However, jetting should be assisted by using vibratory or mechanical devices to ensure no voids or loose spots are left within the backfill materials. If the SE value of soils is less than 30, jetting may not be the most appropriate compaction method, in which case the pipe zone backfill should be manually compacted without damaging the pipe. In both cases, care should be taken to densify the soils below the spring line of the pipe.

F. Backfill at materials for manholes over 60-inches in diameter shall be the same specified backfill material composition and compaction as in the adjacent pipe trench. Backfill materials for manholes 60-inches and less in diameter shall be backfilled with sand-cement slurry per Subsection 2.2.H.

G. **Trench Zone Backfill.** After the pipe zone backfill has been placed as specified above, and after all excess water has completely drained from the trench, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section lying between a plane 12 inches above the top surface of the pipe and a plane at a point 30 inches below the finished surface grade, or if the trench is under pavement, 18 inches below the roadway subgrade. If concrete or sand-cement slurry backfill are used, the Contractor shall secure the pipe to prevent flotation. On-site sandy soils free of debris, organic matter,
oversize particles (greater than 6 inches) and other deleterious substances can be used for backfill in the trench zone. Trench backfill under pavement shall be compacted to a minimum 95% of the maximum laboratory dry density within a depth of 12 inches below the pavement section, and a minimum 90% below 12 inches. All aggregate base for pavements shall be compacted to 95% relative compaction. The trench zone may be compacted mechanically provided that the compaction equipment does not affect the pipe integrity.

H. Final Backfill. Final backfill is all backfill in the trench cross-sectional area within 18 inches of finished grade, or if the trench is under pavement, all backfill within 18 inches of the roadway surface. Street zone backfill shall also include provision for a minimum thickness of 30 inches of compacted sub-base material below final aggregate base subgrade material under paved areas. The street zone backfill shall be compacted as directed in the tabulation in Article 3.13.E of this specification section.

3-15. EMBANKMENT CONSTRUCTION.

A. Embankments and roadway fills shall mean all earth fills in holes, pits or depressions necessary to bring the final grade or pavement subgrade to the specified contours.

B. The area where an embankment is to be constructed shall be cleared of all vegetation, roots and deleterious materials. Following this, the surface shall be moistened, scarified to a depth of 6 inches, and rolled or otherwise mechanically compacted. Embankment fill material shall be placed and spread evenly in horizontal layers. Each layer shall be moistened or aerated, as necessary. Each layer shall not exceed 6 inches of compacted thickness. The embankment fill and the scarified layer of underlying ground shall be compacted to 90 or 95 percent of maximum dry density per the requirements of the Article 3.13.E. of this specification section.

C. Material for embankments or roadway fills may consist of excavated material from structures or of a mixture of such excavated materials and materials borrowed by the Contractor from other approved sources. The material shall have no rocks or clods larger than 6 inches and shall be compacted in 8-inch maximum lifts to a minimum relative compaction of 90 percent, up to the street zone.

D. If the ground surface is in a loose, uncompacted condition, it shall be compacted to a minimum relative compaction as directed in the tabulation in Article 3.13.E of this specification section if included in the street zone.
E. No material shall be placed beyond the sloping lines of embankment unless so ordered by the Engineer. Compaction shall be as specified for each zone.

F. When an embankment fill is to be made and compacted against hillsides or fill slopes steeper than 4:1, the slopes of hillsides or fills shall be horizontally benched to key the embankment fill to the underlying ground. A minimum of 12 inches normal to the slope of the hillside or fill shall be removed and recompressed as the embankment fill is brought up in layers. Material thus cut shall be recompressed along with the new fill material at the Contractor’s expense. Hillside or fill slopes 4:1 or flatter shall be prepared in accordance with Paragraph A, above.

G. Where embankment or structure fills are constructed over pipelines, the first 4 feet of fill over the pipe shall be constructed using light placement and compaction equipment that does not damage the pipe.
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P = P_q + P_s
   = 0.4q + 40H_1 \ (300 \text{ psf minimum})

P_D = 300 \frac{h}{2} < 2,000 \text{ psf}
      \text{(applied over twice the pile width)}

B = 10–15 \text{ degrees}
C = 10 \text{ ft (minimum)}

l_u = \text{Unbonded length, } 20' \text{ min beyond active wedge (not to be used for tieback capacity)}

l_b = \text{Bonded length, } 20' \text{ min (allowable tieback length for capacity)}

f_a = \text{Allowable tieback friction/square foot surface area } = 2,000 \text{ psf}

Notes:

1. All values of height (H) in feet, pressure (P) and surcharge (q) in pounds per square foot (psf).
2. Values for temporary excavations in medium stiff to stiff clay using braced flexible walls.
3. For traffic surcharge, assume a 250 psf uniform pressure along the top 10 feet.
4. Earth pressures assume no hydrostatic pressures. If hydrostatic pressures are allowed to build up, the incremental earth pressures below the groundwater level should be reduced by 50 percent and added to hydrostatic pressure for total lateral pressure.
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SCHEMATIC FILL PROFILE

**STRUCTURAL BACKFILL**

**UNCLASSIFIED FILL**

**SLOPE AS SHOWN ON DRAWINGS OR AS SPECIFIED HEREIN**

**2'-0" CRUSHED ROCK OR COMPACTED CAB**

**GEOTEXTILE AS REQ'D BASED ON SOIL CONDITIONS**

**PILES AS SHOWN ON DRAWINGS**

**GEOTEXTILE**

**2'-0" MIN. CRUSHED ROCK**

**PILES AS SHOWN ON DRAWINGS**

**5' MIN.**

**> 15'**

**< 15'**
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NOTE:
TRENCH WIDTH, BEDDING AND BACKFILL MATERIALS, COMPACTION AND
PAVING PER SPECIFICATIONS.
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PART 1 – GENERAL

1-1. SECTION INCLUDES.

A. Separation and Stabilization Geotextile:
   1. This section is applicable to the use of a geotextile in wet, saturated conditions to provide the coincident functions of separation and filtration. In some installations, the geotextile may also provide reinforcement. This section shall only be used for work performed on OCSD property.

1-2. RELATED SECTIONS.

A. OCSD Earthwork section.
B. OCSD Preparation of Pavement Subgrade section.

1-3. REFERENCES.


B. AASHTO Test Standards:
   1. T 88 – Standard Test Method for Particle Size Analysis of Soils
   3. T 99 – Standard Practice for Determination of the Moisture Density Relations of Soils Using a 5.5 lb hammer and 12 in drop (Standard Proctor)

C. American Society for Testing and Materials (ASTM):
   3. D1883 – Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils


E. Geosynthetic Accreditation Institute - Laboratory Accreditation Program (GAI-LAP).


### DEFINITIONS

A. California Bearing Ratio (CBR): The ratio of (1) the force per unit area required to penetrate a soil mass with a 3 sq in circular piston (approximately 2 in diameter) at the rate of 0.05 in/min. to 2 that required for corresponding penetration of a standard material, refer to ASTM D 1883.

B. Minimum Average Roll Value (MARV): Property value calculated as typical minus two standard deviations. Statistically, it yields a 97.7
percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.

C. Typical Roll Value: Property value calculated from average or mean obtained from test data.

1-5. SUBMITTALS.

A. Submittals, including samples of materials, shall be in accordance with the General Requirements.

1. Certification:
   a. The Contractor shall provide the Engineer a certificate stating the name of the geotextile manufacturer, product name, style, chemical compositions of filaments or yarns and other pertinent information to fully describe the geotextile.
   b. The Manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available upon request.
   c. The manufacturer’s certificate shall state that the furnished geotextile meets MARV requirements of the specification as evaluated under the manufacturer’s quality control program. The certificate shall be attested to by a person having legal authority to bind the Manufacturer.

2. Manufacturing Quality Control (MQC) test results shall be provided upon request.

1-6. DELIVERY, STORAGE, AND HANDLING.

A. Geotextile labeling, shipment and storage shall follow ASTM D 4873.

B. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.

C. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer’s certificate.

D. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.

E. The protective wrapping shall be maintained during periods of shipment and storage. If the wrapping is damaged prior to installation, the outer wrap of geotextile material must be discarded before installation.
F. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: Site construction damage, extended exposure to ultraviolet (UV) radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperatures in excess of 160 deg F and any other environmental condition that might damage the geotextile.

1-7. QUALITY ASSURANCE SAMPLING, TESTING, AND ACCEPTANCE.

A. Geotextile:

1. Geotextiles shall be subject to sampling and testing to verify conformance with this specification. Sampling for testing shall be in accordance with ASTM D 4354.

2. Acceptance shall be in accordance with ASTM D 4759 based on testing of either conformance samples obtained using Procedure A of ASTM D 4354, or based on manufacturer’s certifications and testing of quality control samples obtained using Procedure B of ASTM D 4354.


B. Sewn Seams:

1. For seams that are to be sewn in the field, the Contractor shall provide at least a 6 ft length of sewn seam for sampling by the Engineer before the geotextile is installed.

2. For seams that are sewn in the factory, the Engineer shall obtain samples of the factory seams at random from and roll of geotextile that is to be used on the project.

3. If seams are to be sewn in both directions, samples of seams from both directions shall be provided.

4. For seams that are field sewn, the seams sewn for sampling shall be sewn using the same equipment and procedures as will be used for the production seams.

5. The seam assembly description shall be submitted by the Contractor along with the sample of the seam. The description shall include the seam type, sewing thread, and stitch density.
PART 2 – PRODUCTS

2-1. MATERIALS.

A. Geotextile:

1. The geotextile construction shall be woven slit film polypropylene geotextile; individual slit films woven together in manner to provide dimensional stability relative to each other including selvages.

2. Resistant to UV degradation and biological and chemical environments normally encountered in soils.

3. Minimum Average Roll Values (MARV) for woven geotextile (SI Geosolutions’ Geotex 4x4, Mirafi’s Geolon HP570, or equal):

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Units</th>
<th>Property Requirement (Machine Direction x Cross-machine Direction)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide Width Tensile Strength (at ultimate)</td>
<td>ASTM D 4595</td>
<td>lb/ft</td>
<td>4,800 x 4,800</td>
</tr>
<tr>
<td>Wide Width Tensile Strength (at 2% strain)</td>
<td>ASTM D 4595</td>
<td>lb/ft</td>
<td>480 x 840</td>
</tr>
<tr>
<td>Wide Width Tensile Strength (at 5% strain)</td>
<td>ASTM D 4595</td>
<td>lb/ft</td>
<td>2,400 x 2,400</td>
</tr>
<tr>
<td>Wide Width Tensile Strength (at 10% strain)</td>
<td>ASTM D 4595</td>
<td>lb/ft</td>
<td>3,900 x 3,900</td>
</tr>
<tr>
<td>Grab Tensile Strength</td>
<td>ASTM D 4632</td>
<td>lbs</td>
<td>450 x 410</td>
</tr>
<tr>
<td>Grab Elongation</td>
<td>ASTM D 4632</td>
<td>Percent</td>
<td>12 x 6</td>
</tr>
<tr>
<td>Puncture Strength</td>
<td>ASTM D 4833</td>
<td>lbs</td>
<td>195</td>
</tr>
<tr>
<td>Mullen Burst</td>
<td>ASTM D 3786</td>
<td>psi</td>
<td>1,200</td>
</tr>
<tr>
<td>Trapezoidal Tear</td>
<td>ASTM D 4533</td>
<td>lbs</td>
<td>180 x 180</td>
</tr>
<tr>
<td>Apparent Opening Size</td>
<td>ASTM D 4751</td>
<td>US Std. Sieve</td>
<td>30</td>
</tr>
<tr>
<td>Property</td>
<td>Test Method</td>
<td>Units</td>
<td>Property Requirement</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------</td>
<td>----------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Grab Tensile Strength</td>
<td>ASTM D 4632</td>
<td>kN (lbs)</td>
<td>1.69 (380)</td>
</tr>
<tr>
<td>Grab Elongation</td>
<td>ASTM D 4632</td>
<td>Percent</td>
<td>50</td>
</tr>
<tr>
<td>Puncture Strength</td>
<td>ASTM D 4833</td>
<td>kN (lbs)</td>
<td>1.05 (235)</td>
</tr>
<tr>
<td>Mullen Burst</td>
<td>ASTM D 3786</td>
<td>kPa (psi)</td>
<td>5098 (740)</td>
</tr>
<tr>
<td>Trapezoidal Tear</td>
<td>ASTM D 4533</td>
<td>kN (lbs)</td>
<td>0.62 (140)</td>
</tr>
<tr>
<td>Apparent Opening Size (Maximum Avg. Roll Value)</td>
<td>ASTM D 4751</td>
<td>mm (US Std.) Sieve</td>
<td>0.150 (100)</td>
</tr>
<tr>
<td>Permittivity</td>
<td>ASTM D 4491</td>
<td>Sec-1</td>
<td>0.7</td>
</tr>
<tr>
<td>Water Flow Rate</td>
<td>ASTM D 4491</td>
<td>l/min/m² (gpm/ft²)</td>
<td>2,037 (50)</td>
</tr>
<tr>
<td>UV Resistance (percent retained at 500 hours)</td>
<td>ASTM D 4355</td>
<td>Percent</td>
<td>70</td>
</tr>
</tbody>
</table>

4. Minimum Average Roll Values for non-woven geotextile (Geotex 1601, Mirafi 1160N, or equal):

5. Quality Control
   a. exceeding ASTM D 4354.
B. Sewing Thread (if required)
   1. Sewing thread shall consist of high strength polypropylene or polyester (Nylon shall not be used).
   2. The thread shall be of a contrasting color to the geotextile.

PART 3 – EXECUTION

3-1. PREPARATION.
   A. Clear, grub, and excavate/fill installation site to design grade. Remove topsoil, vegetation, and other unsuitable materials.
   B. Woven geotextiles shall be used in areas with soft to medium subgrade where SPT-N blow count is less than 8 (or CBR is less than or equal to 1.6) to provide both separation and stabilization where a minimum two feet of crushed rock shall be placed over the geotextile.
   C. Non-woven geotextiles shall be used in areas with medium to stiff subgrade where SPT-N blow count is between 8 and 15 (or CBR between 1.6 and 3.2) to provide both separation and stabilization where a minimum two feet of crushed rock shall be placed over the geotextile.

3-2. INSTALLATION.
   A. The geotextile shall be laid smooth without wrinkles or folds on the prepared subgrade in the direction of construction traffic.
   B. Adjacent geotextiles rolls shall be overlapped, sewn or joined as required below:

<table>
<thead>
<tr>
<th>Subgrade CBR</th>
<th>Minimum Overlap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 3</td>
<td>300 – 450 mm (12 – 18 in)</td>
</tr>
<tr>
<td>1 – 3</td>
<td>600 – 1000 mm (24 – 36 in)</td>
</tr>
<tr>
<td>0.5 – 1</td>
<td>1000 mm (36 in) or sewn</td>
</tr>
<tr>
<td>Less than 0.5</td>
<td>Sewn</td>
</tr>
<tr>
<td>All roll ends</td>
<td>1000 mm (36 in) or sewn</td>
</tr>
</tbody>
</table>
C. When sewn seams are required, the seam strength, as measured by ASTM D4632 shall be equal to or greater than 90 percent of the specified grab strength.

D. On curves, the geotextile may be folded or cut to conform to the curves. The fold or overlap shall be in the direction of construction and held in place by pins, staples, or piles of fill or rock.

E. Prior to covering, the geotextile shall be inspected by a certified inspector of the Engineer to ensure that it has not been damaged during installation.

F. Damaged areas, as identified by the Engineer, shall be repaired immediately by covering the damaged area with a geotextile patch that extends an amount equal to the required overlap beyond the damaged area.

G. The crushed rock shall be placed by end dumping onto the geotextile, or over previously placed materials such that at least the minimum specified lift thickness shall be between the construction equipment tires or tracks and the geotextile at all times.

H. Pretensioning Geotextile:
   1. Proof roll with rubber-tired vehicle. Wheel load of truck shall be equivalent to maximum expected for site. Vehicle to make at least four passes over first lift in each area of site.

I. If required, staple or pin geotextile at overlaps to maintain position during construction activities. Use 250 to 300 mm (10 to 12 in) long nails placed at minimum 15 m (50 ft) on center for parallel rolls and 1.5 m (5 ft) on center for roll ends.

J. Do not place overlaps along anticipated primary wheel path locations. Place overlaps at end of rolls in direction of backfill placement with previous roll on top.

K. Compaction of subsequent backfill materials shall meet specified requirements.

L. Fill ruts formed during construction to maintain adequate cover over geotextile. Do not blade ruts down.

3-3. PROTECTION.

A. Atmospheric exposure of the geotextile to the elements following laydown shall be limited to 14 days to prevent damage.
B. Equipment in operation:

1. For extremely soft soils, use lightweight construction vehicles for access on first lift.

2. Limit construction vehicles in size and weight to limit rutting in initial lift to 75 mm (3 in).

3. If rut depths exceed 75 mm (3 in), decrease construction vehicle size or weight or increase lift thickness.

C. Turning not permitted on first lift of backfill placement.

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PART 1 – GENERAL

1-1. THE REQUIREMENT.

A. The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work of preparation of subgrade requirements on OCSD property as indicated on the Drawings and specified herein.

B. The subgrade will be considered as those areas and surfaces, new or existing, upon which subbase or base material, pavement, curbs and gutters, driveways, or sidewalks are to be placed.

C. All underground work in the area of the subgrade shall be completed and properly backfilled and compacted in compliance with the OCSD Earthwork section, before subgrade work is started.

1-2. RELATED WORK SPECIFIED ELSEWHERE.

A. OCSD Earthwork section

B. Demolition section

C. Asphaltic Concrete Pavement section

1-3. REFERENCE SPECIFICATIONS, CODES AND STANDARDS.

A. Comply with the applicable reference specifications of the GENERAL REQUIREMENTS.

B. Comply with SSPWC Section 301-1 unless otherwise specified in this section.

1-4. CONTRACTOR SUBMITTALS.

A. Submittals shall be made in accordance with the General Requirements and other Contract Document requirements.

1-5. QUALITY ASSURANCE.

A. Quality assurance shall be as specified in the OCSD Earthwork section.
PART 2 – PRODUCTS

2-1. EXCAVATION AND EMBANKMENT.
A. The excavation shall include removal of materials which are encountered in excavating to the required grades as shown on the Contract Drawings, including existing pavement, sidewalks and curbs designated to be removed, or other deleterious materials as required to accomplish the construction.

B. Unsuitable material below the processing depth for subgrade shall be excavated and disposed of as specified in the OCSD Earthwork section or as directed by the Engineer.

PART 3 - EXECUTION

3-1. SUBGRADE.
A. Scarify and compact the top 30 (thirty) inches of subgrade to at least 95 percent of the maximum dry density attainable as determined by ASTM D 1557 except clay soils with a Liquid Limit greater than or equal to 50 percent and a plasticity index greater than or equal to 20 shall be prepared according to the recommendation of the Engineer. Remove all soft or otherwise unsuitable material and replace with suitable material as specified in the OCSD Earthwork section. In sandy soils the moisture content shall be kept at or slightly above the optimum moisture content. However, in Clayey and Silty soils, the moisture content shall be kept at about 2% above the optimum moisture content. The finished subgrade shall be firm, hard and unyielding. The subgrade shall be considered to extend over the full width of the base course. Compaction shall extend a minimum of 18 inches beyond the edge of paving, curb, or form.

B. Subgrade tolerances for roadway structures, sidewalk, curb and gutter and driveways shall be in conformance with SSPWC Section 301-1.4.

3-2. EXCAVATION BELOW SUBGRADE.
A. Where the Engineer determines the subgrade material to be unsuitable, excavation below subgrade will be required to such depths as necessary to remove the unsuitable material. Special equipment may be
required because of the presence of shallow utilities or other unforeseen conditions.

B. The over excavated unsuitable subgrade shall be replaced with suitable material per the OCSD Earthwork section.

3-3. PROTECTION OF SUBGRADE.

A. After preparing the subgrade as specified, all traffic on the subgrade shall be avoided prior to paving. Should it be necessary to haul over the prepared subgrade, the Contractor shall drag and roll the traveled way as frequently as may be necessary to remove ruts, cuts, and breaks in the surface. All cuts, ruts, and breaks in the surface of the subgrade that are not removed by the above operations shall be raked and hand tamped. All equipment used for transporting materials over the prepared subgrade shall be equipped with pneumatic tires.

B. Continued use of sections of prepared subgrade for hauling that cause it to be cut up or deform it from the true cross-section, will not be permitted. The Contractor shall protect the prepared subgrade from all traffic.

C. The Contractor will be required to plank the subgrade before hauling materials or equipment over it.

D. The subgrade shall be maintained in the finished condition as required by Subsection 3.1 A, until the first succeeding course is placed.

* * * * * * *
PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of labor, materials and equipment for the construction of asphaltic concrete base or binding course, bituminous tack coat, and asphaltic concrete surface or wearing course for the roadway, driveways and parking area as indicated on the Drawings.

Subgrade preparation shall be as indicated in the Excavation and Fill for Structures section, unless otherwise specified in the governing standards or herein.

Asphaltic concrete paving shall be constructed to the lines, grades, and cross sections indicated on the drawings. Type of construction shall be as indicated on the Drawings and as specified herein.

1-2. GENERAL.

1-2.01. Governing Standards. Work of this section shall be performed in accordance with the Standard Specifications for Public Works Construction (SSPWC), unless otherwise specified herein. All materials and procedures shall comply with the rules and regulations of the South Coast Air Quality Management District.

1-2.02. Coordination. Contractor shall coordinate the construction of asphaltic concrete paving with the excavation, the construction of concrete curb and gutters and other construction.

1-3. SUBMITTALS. All submittals of design mix reports including design mix test results and other data, shall be in accordance with the Submittals Procedures section.

A. Samples. Prior to the delivery of specified aggregate to the site, the Contractor shall submit samples of the material for the Engineer’s acceptance in accordance with SSPWC Section 4-1.4. Samples shall be typical of materials to be furnished from the proposed source and in conformance with the specified requirements.

B. The Contractor shall formulate a job-mix formula using the Hveem method with the optimum asphalt content determine by California Test 367 in accordance with SSPWC Section 203-6.2 and submit it to the Engineer for approval.
C. Certificates

1. Twenty days prior to the delivery of aggregates, asphalt materials, and paving mixes to the project site, the Contractor shall submit to the Engineer certificates and test results of compliance of such materials with these Specifications.

2. Where laboratory testing is specified herein, the Contractor shall employ an independent testing laboratory to conduct such tests and submit certificates of the test results.

PART 2 - PRODUCTS

2-1.

2-1. GENERAL

A. The Contractor shall make all tests necessary to locate a source of materials that meet the Specifications. Final approval of the aggregate material will be based on tests of material taken by the Contractor from the compacted base course.

2-2. AGGREGATE BASE

A. Aggregate base shall conform to the provisions of the latest edition of the Standard Specifications for Public Works Construction (SSPWC), Subsection 200-2.2, Crushed Aggregate Base, or Subsection 200-2.4, Crushed Miscellaneous Base. Crushed miscellaneous base shall have only the fine gradation. Aggregate shall be asbestos free.

2-3. ASPHALT CEMENT

A. Asphalt cement for binder shall be AR-4000 paving asphalt and shall conform to the requirements of SSPWC Section 203-1 PAVING ASPHALT.

2-4. PRIME COAT

A. Asphalt to be used for a prime coat shall be liquid asphalt SC-250 and shall conform to the requirements of SSPWC Section 203-2 LIQUID ASPHALT.

2-5. TACK COAT

A. Asphalt emulsion shall be CSS1 or CSS-1h and shall conform to the requirements of SSPWC Section 203-3 EMULSIFIED ASPHALT.
2-6. **EMULSION-AGGREGATE SLURRY**  
A. Materials for emulsion-aggregate slurry shall be as specified in SSPWC Subsection 203-5.

2-7. **ASPHALT CONCRETE**  
A. Asphalt concrete for paving the designated area shall be Class C2-AR-4000 hot-plant mix and shall conform to the requirements of SSPWC Section 203-6 ASPHALT CONCRETE.

B. Asphalt content in the pavement shall be 5.5 percent to 6.0 percent by weight. Asphalt concrete (AC) paving shall conform to III-C2-AR-4000 as defined in SSPWC, Subsection 400-4. Asphalt shall be viscosity grade AR-4000 or AR-8000.

C. Aggregate shall be in accordance with SSPWC Subsections 400-1.1. Aggregate shall be asbestos free.

D. Coarse aggregate shall consist of material of which at least 75 percent by weight shall be crushed particles in lieu of the requirements of SSPWC, Subsection 400-4.2.3.

2-8. **WEED KILLER**  
A. Weed killer shall be Karmex 80, as manufactured by Dupont Chemical Company, or Diuron 4L, as manufactured by Drexel Chemical Company, or equal.

2-9. **DESIGN MIXES**, A design mix for the asphalt base course and for the surface course, based upon the aggregates to be furnished, shall be determined by an independent testing laboratory at the expense of Contractor and shall be submitted to Engineer for review.

The design mixes shall be based on the Marshal Test Method, and upon acceptance by Engineer, shall be the basis for the mixes to be used in asphaltic concrete pavement construction. The proposed design mix data submitted for review shall include at least the following:

- Marshall stability, all mixtures
- Density
- Number of compaction blows
- Flow, all mixtures

**PART 3 - EXECUTION**
3-1. EQUIPMENT
A. Equipment and facilities for storage, measuring, mixing, heating, transporting, spreading, compacting, and other operations shall be in accordance with the applicable requirements of the governing standards. Improved or modernized equipment which will produce results equal in quality to those which would result from the specified equipment will be considered for use. All equipment and facilities shall be acceptable to the Engineer.

3-2. EXCAVATION AND BACKFILL
A. Excavation and backfill are specified in the Earthwork section.

3-3. PREPARATION OF SUBGRADE
A. Subgrade shall be shaped and compacted in accordance with SSPWC Subsections 300-4.7 to 95 percent relative density.
B. Use of the prepared subgrade for hauling will not be permitted. The Contractor shall protect the prepared subgrade from all traffic.
C. The subgrade shall be maintained in the finished condition until the first succeeding course is placed.
D. Unless specified otherwise on the Contract Documents, the upper 30 inches of subbase, the Street Zone, shall be compacted to not less than 95 percent relative density. Compaction operations shall be in conformance with the Earthwork section.

3-4. BASE COURSE
A. Place crushed aggregate base in a uniform layer over the entire area to receive base course, without segregation of size, to such loose depth that when compacted with the power roller, the course shall have the required thickness shown on the Drawings. Compact over the full width until a density of 95 percent as determined by AASHTO T 180 is obtained. Blade the base with a grader and roll, while damp, with the power roller specified above until the course is thoroughly and uniformly compacted and its surface is smooth and conforms to the grade requirements specified. Maintain the surface in its finished condition until the succeeding layer is placed.

3-5. WEED KILLER
A. After the subbase has been prepared, weed killer shall be applied to the entire base. The weed killer shall be applied according to the manufacturer's published instructions.

3-6. PRIME COAT
A. Prime coat is required in this Contract.
B. After treatment with weed killer, the aggregate base course shall be primed prior to application of the asphalt concrete in accordance with SSPWC, Subsection 302-5.3.

C. The prime coat shall be applied only when the base course surface is dry or slightly damp. For extremely dry areas, a light application of water may be required prior to application of the prime coat which will permit uniform distribution and the desired penetration. The prime coat shall not be applied when the ambient atmospheric temperature is below 60° F.

D. The prime coat shall be applied at a temperature of 175° F to 225° F, and at a rate of 0.3 to 0.4 gallons per square yard.

E. Following the application of the prime coat material, the surface shall be allowed to dry for at least 48 hours without being disturbed, or for an additional period of time as may be necessary to attain penetration of the prime material into the base course, and drying out or evaporation of the volatiles in the prime coat material. Traffic shall be kept off the prime coat until it has penetrated the base course and cured. No prime coat drying time limit is imposed on public streets where fast completion is important. The Contractor shall furnish and spread enough imported sand on all areas that show an excess of bituminous material to effectively blot up and cure excess prime coat material.

F. The primed surface shall be maintained by the Contractor until the succeeding layer of pavement has been placed. During this interval, the Contractor shall protect the primed surface against damage and shall repair all broken spots.

3-7. CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT

A. Lay asphalt concrete over the aggregate base in accordance with the SSPWC Section 302-5.5. The method of proportioning, mixing, transporting, laying, processing, rolling the material, and the standards of workmanship shall conform to the applicable requirements of SSPWC Section 302-5 ASPHALT CONCRETE PAVEMENT. At no time shall the coarse aggregate that has segregated from the mix be scattered across the paved mat.

B. A tack coat of emulsified asphalt shall be applied to the first lift of the pavement prior to placing the second lift. Application shall be in conformance with SSPWC Section 302-5.4.

C. The Engineer will examine the base before the paving has begun. The Contractor will correct any deficiencies before the paving is started. Roll each lift of the asphalt concrete and compact to 95 percent of the density obtained with the California Kneading Compactor per California Test 304. The grade, line, and cross section of the finished surface shall conform to the Drawings.
D. Asphalt concrete pavement shall consist of one or more courses of a mixture of paving asphalt and graded aggregate placed upon a roadbed or base, or over existing pavement, as indicated on the Contract Documents. The mixture shall be placed when it is at a temperature of not less than 250°F nor more than 320°F and shall not be placed onto a wet surface or when the ambient atmospheric temperature is less than 40°F. All paving or resurfacing shall match the appearance of the existing improvements. A 5-inch asphalt concrete course shall be placed over an 9-inch aggregate base course unless otherwise shown on the Contract Documents.

E. When asphalt is to be applied over existing pavement, and local irregularities in the existing surface would result in a course of more than the specified thickness, the surface of the existing pavement shall be brought to uniform contour by patching with asphalt concrete thoroughly tamped or rolled until it conforms with the surrounding surface, and a tack coat applied to the entire surface. Any existing base, surfacing or pavement shall be thoroughly cleaned immediately prior to receiving the plant-mixed surfacing material.

F. Finished pavement, when ready for acceptance, thoroughly compacted and true to cross section, shall not deviate from the designated grade by more than 1/8-inch in 10 feet and shall be free from ruts, depressions and irregularities. The pavement shall be brought to the final grade with a paving machine. The resulting edge of contact between the new and existing pavement shall be a straight, vertical and neat join line parallel to the trench on each side. New pavement shall not lap over the existing pavement.

G. The base asphalt course mixture shall be placed on the prepared subgrade by means of approved spreading devices in accordance with SSPWC, Subsection 302-5.5. Where the finished paving area exceeds 5000 square feet or 9 feet in width, the Contractor shall use only a Barber-Green type paving machine. For smaller areas, the motor grader method for placing the base course may be used.

H. The final asphalt concrete course surface shall be 1-inch thick with ½ inch maximum aggregate grading. Placing of the final asphalt concrete course shall be done with a Barber-Green type paving machine.

I. Rolling equipment shall conform to the provisions of SSPWC, Subsection 302-5.6.

3-8. PAVEMENT REMOVAL

A. Pavement removal shall be in accordance with SSPWC Subsection 300-1.3 unless otherwise specified herein.

B. Street pavement or pavement within the treatment plants shall be removed within the limits of all construction excavations prior to
excavation. Surplus material shall be removed as specified in the Earthwork section.

C. Prior to removing existing surfacing, pavement cuts shall be made as shown on the Contract Documents and as specified herein. All pavement cuts shall be neat and straight along both sides of the trench or excavation and parallel to its alignment. The strip of existing AC pavement between an excavation and a gutter face or edge of pavement shall be removed and replaced if less than 3 feet in width. Where large irregular surfaces are removed, such trimming or cutting shall be parallel to the roadway centerline or at right angles to the same.

D. After backfilling and compaction, final pavement cuts shall be made by saw cutting (unless permit requirements supersede) to a minimum depth of 2 inches at a point not less than 12 inches outside the limits of excavation.

E. Concrete curbs, cross gutters, sidewalks and driveways shall be saw cut to a minimum depth of 1½ inches and at a point not less than 12 inches outside the limits of the excavation.

3-9. TACK COAT
   A. All vertical or horizontal hard surfaces, which will be in contact with new pavement, shall be tack coated in accordance with SSPWC, Subsection 302-5.4, and at an approximate rate of 0.05 to 0.10 gallons per square yard.

3-10. SEAL COAT
   A. The entire asphalt concrete pavement shall be fog sealed with asphalt emulsion prior to final striping. The fog sealer shall be applied within 5 calendar days after final asphalt concrete course, at a temperature of 75° F to 130° F, and at a rate of 0.05 to 0.10 gallons per square yard.
   B. Seal coat shall extend over the full width of access road unless otherwise specified.

3-11. EMULSION-AGGREGATE SLURRY
   A. Emulsion-aggregate slurry shall be applied in accordance with SSPWC Subsection 302-4.

3-12. PAVING HEADERS
   A. All edges of paving adjacent to earth shall be bounded by 2- x 6-inch net, new rough-sawn redwood headers staked with 2- x 2- x 18-inch redwood stakes, 4 feet on centers. The top edge of headers shall be at the grade of the proposed asphalt surface. The top of stakes shall be 1-inch below the top of the header.
3-13. ASPHALT CURBS (NOT USED)

3-14. REPAIRS

   A. Areas of new or existing asphalt concrete requiring repair shall be
delineated by saw cutting and the asphalt concrete removed, then prime
or tack coated, and paved with hot asphalt as specified herein.

3-15. TEMPORARY PAVING

   A. On city streets and where otherwise indicated, pavement removed for
trenching operations shall be replaced with 2 inches of temporary asphalt
paving mix within one day after compaction is approved by the Engineer.
Cross streets are to be paved with temporary pavement on the same day
that excavation is made. Temporary pavement shall be maintained so
that a smooth traversable surface free from ruts, depressions, holes and
loose gravel is available at all times for vehicular traffic.

   B. The cost of temporary asphalt paving is considered to be included in
the Contract unit prices for the work and no extra compensation will be
made to the Contractor.

3-16. CLEANUP

   A. Clean all debris and unused materials from the paving operation.
Clean all surfaces that have been spattered or defaced as a result of the
paving operation. Asphalt or asphalt stains which are noticeable upon
surfaces of concrete or materials which will be exposed to view shall be
promptly and completely removed. Cleaning shall be done in a manner
that will not result in the discharge of contaminated materials into any
catch basin or storm drain system.

3-17. PROTECTION

   A. In addition to the requirements for protection stipulated in the
governing standards, Contractor shall protect all adjacent concrete and
masonry so that no damage will occur as the result of subsequent
construction operations. All damage or discoloration shall be repaired to
the satisfaction of Engineer before final acceptance by Owner.

   Special care shall be taken to prevent tack or other asphalt materials from
spraying or splashing. Adjacent construction shall be protected by
covering with suitable fabric or paper.

End of Section
PART 1 - GENERAL

1-1. SCOPE. This section covers the construction of concrete sidewalks, curb and gutter. This section also covers the reconstruction of concrete sidewalks, curb, and gutter.

Subgrade preparation shall be as indicated in the Excavation and Fill for Structures section, unless otherwise specified in the governing standards or herein.

1-2. GENERAL. All existing sidewalks, and curb and gutters disturbed or damaged during construction of new work, or indicated on the Drawings to be demolished and replaced shall be reconstructed to the lines, grades, and cross sections indicated on the Drawings. Damaged curbs, sidewalks and/or gutters shall be restored to their original locations, cross sections, and style unless indicated otherwise on the Drawings.

Contractor shall be responsible to remove, construct, reconstruct, and adjust as necessary all existing or new manhole tops, curb and gutter, and area drainage structures to match new grades as needed.

1-2.01. Governing Standards. Except as otherwise specified or indicated on the drawings, materials, equipment, details, and construction methods shall comply with the applicable standards of Standard Specifications for Public Works Construction (SSPWC), as required.

1-3. Contractor Submittals. Submittals shall be in accordance with the Submittals section.

PART 2 - PRODUCTS

2-1. MATERIALS. The sources of materials shall be acceptable to Engineer. Except as otherwise modified herein, materials shall conform to the requirements of the governing standards.

Concrete materials shall be as follows:

<table>
<thead>
<tr>
<th>Items</th>
<th>SSPWC Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forms</td>
<td>303-5.2</td>
</tr>
<tr>
<td>Drainage outlet through curb</td>
<td>303-5.1.2</td>
</tr>
</tbody>
</table>

Orange County Water District
Groundwater Replenishment System
Final Expansion
Sidewalks
Concrete designation. See Cast-In-Place Concrete section
Portland cement designation. See Cast-In-Place Concrete section
Aggregate designation. Coarse

Curbs and Gutters.
Concrete designation. See Cast-In-Place Concrete section
Portland cement designation. See Cast-In-Place Concrete section
Aggregate designation. Coarse
Reinforcing steel grade. See the Concrete Reinforcement section
Membrane curing compound. See the Concrete Finishing, Placing, and Curing section
Expansion joint filler 1/2-inch thick, preformed asphalt-impregnated, expansion joint material conforming to ASTM D 994

2-2. DESIGN MIXTURE DATA. The design mixture shall be as specified in the Cast-In-Place Concrete section.

PART 3 - EXECUTION

3-1. SUBGRADE PREPARATION. As a minimum, the top 6 inches of the subgrade shall be compacted to a 95 percent of standard proctor density at optimum moisture content as determined by governing standards. In addition, the stability of subgrades shall be such that when materials for construction are deposited on the subgrade no rutting or displacement of the subgrade by material hauling vehicles will occur. No materials shall be placed on subgrades which are muddy, frozen, or have frost, snow, or water thereon. Subgrades shall be thoroughly compacted and properly shaped before any surfacing, curb and gutter, or sidewalk materials are placed. All subgrade and surfacing shall be sloped as indicated on the Drawings, and as needed to achieve a uniform slope between new and existing surfaces. Sidewalks shall slope toward one edge.

3-2. CONCRETE SIDEWALKS. Concrete sidewalks damaged or removed by Contractor during performance of work shall be completely reconstructed at their original locations as indicated on the drawings. The width and thickness of reconstructed sidewalks are to be the same as the original sidewalks and shall be verified with Engineer prior to reconstruction.
New concrete sidewalks and handicap ramps shall be as indicated on the Drawings and as required.

Concrete shall be placed, vibrated, and finished as described in the governing standards.

One-half inch expansion joints shall be provided where sidewalks abut a curb, structure, existing sidewalk, at changes in directions, and at intervals of not more than 40 feet. Expansion joints shall be filled to within 3/4 inch of the surface with bituminous expansion joint material, and then filled flush to the surface with self-leveling caulking in accordance with the Joint sealant section. The joint sealing compound shall be finished slightly concave, and shall not be allowed to overflow the joint.

Concrete sidewalks shall be screeded to the proper elevation and contour. All aggregates shall be completely embedded in mortar. Screeded surfaces shall be given an initial float finish as soon as the concrete has stiffened sufficiently for proper working. Any piece of coarse aggregate which is disturbed by the float or which causes a surface irregularity shall be removed and replaced with mortar. Initial floating shall produce a surface of uniform texture and appearance, with no unnecessary working of the surface. A second floating at the time of initial set shall follow initial floating.

Floated surfaces shall be given a light broom finish, using a horsehair broom, to provide a nonslip surface. Brooming shall be at right angles to the length of the curb, walk, or gutter.

New sidewalks shall be edged to match existing sidewalks. Sidewalks shall be edged using a 3 to 4 inch wide edging tool with a 1/8 inch corner radius. Edger lap marks at corners of each slab shall be carefully removed. False joints shall be provided at right angles to the length of the walk, using a grooving tool with 1/8 inch radius and a depth of 1.2 inch. The finished edge on each side of the joint shall be the same width as the edging tool used. False joints shall divide each sidewalk into square sections.

The finished surface of all sidewalks shall be neat in appearance, shall be sloped to drain, and shall not pond water.

The finished concrete shall be cured and protected as stipulated in the governing standards.

3-3. CONCRETE CURB AND GUTTER. New concrete curb and gutter shall be as indicated on the Drawings and specified herein. Existing concrete curb and gutter damaged or removed by Contractor during performance of work shall be completely reconstructed at their original locations to the configuration and the existing lines and grades. Replacement concrete curb and gutter shall match the
existing curb and gutter. Unless otherwise authorized by Engineer, adjacent and enclosed curbs, drainage structures, and gutters shall be placed before placement of pavement sections.

3-3.01. Forms. Forms shall be in conformance with the governing standards. All forms shall be in good condition, with not more than 1/8 inch variation in horizontal and vertical alignment for each 10 feet in length. Side forms shall have a depth at least equal to the edge thickness of the concrete being formed. The forms shall be set true to line and grade and shall be adequately supported to stay in position while depositing and consolidating the concrete. Forms shall be designed and constructed so as to permit their removal without damage to the concrete. Setting forms shall be in conformance with SSPWC Section 303-5.2.1.

3-3.02. Joints. Expansion and contraction joints shall be formed at right angles to the alignment of the curb and gutter and to the depths as specified, as indicated on the Drawings, and in conformance with the governing standards.

a. Expansion Joints. One half inch wide expansion joints shall be placed full depth using a premolded expansion joint material, cut to the configuration of the full size of the Curb and Gutter section, being secured so that they are not moved by depositing and compacting the concrete at these joints. The edges of these joints shall be rounded by an edging tool of 1/8 inch radius.

Expansion joints shall be placed at the beginning and end of radii, where curbs and gutters abut structures, and at intervals of approximately 45 feet. Expansion joints shall be constructed in conformance with SSPWC Section 303-5.4.2.

b. Contraction Joints. Contraction joints shall be a minimum of 3 inches deep on all sides, shall be spaced at approximately 15 foot intervals, and shall be formed by a 1/8 inch thick steel template, cut to the configuration of the Curb section. These templates shall be secured so that they are not moved by depositing and compacting the concrete.

Unless otherwise indicated on the Drawings, and as soon as the concrete has hardened sufficiently, the templates shall be removed from all contraction joints. The edges of the joint shall be rounded with an edging tool having a maximum radius of 3/8 inch.

All expansion and contraction joints shall be filled flush to the surface with joint sealing compound. The joint sealing compound shall be finished slightly concave and shall not be allowed to overflow the joint. Weakened plane joints shall be placed in conformance with SSPWC Section 303-5.4.3.
3-3.03. Finishing. Curb and gutter shall be finished to the shape indicated on the drawings. After the forms have been removed, all exposed edges shall be rounded, using an edging tool with a 1/8 inch corner radius. Exposed surfaces shall be float finished and given a light broom finish applied at right angles to the curb at the time of initial set, using a horsehair broom. Mortar or dryer shall not be used to remove imperfections. In all cases, the resulting surface shall be smooth and of uniform color with all rough spots, projections, and form stakes removed. No plastering of the concrete will be allowed. The finished curb shall have a true surface, free from sags, twists, or warps; shall have a uniform appearance; and shall be true to the original lines, grades, and configurations indicated on the Drawings. The finished surface of the walk shall be in conformance with SSPWC Section 303-5.5.3. The stripping of front forms and finishing of curb shall be in conformance with SSPWC Section 303-5.5.2. Where the back of new curb is exposed, it shall likewise be finished in conformance with SSPWC Section 303-5.5.2.

3-4. PROTECTION. In addition to the requirements for protection set forth in the governing standards, Contractor shall protect all adjacent concrete and masonry so that no damage will occur as the result of subsequent construction operations. All damage or discoloration shall be repaired to the satisfaction of Engineer before final acceptance by Owner.

Special care shall be taken to prevent bituminous materials from spraying or splashing. Adjacent construction shall be protected by covering with suitable fabric or paper.

End of Section
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PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing and installation of 4 through 36 inch buried polyvinyl chloride (PVC) pressure pipe for potable water service. PVC pressure pipe shall be furnished complete with all fittings, jointing materials, anchors, blocking, encasement, and other necessary appurtenances.

Pressure and leakage tests, cleaning, and disinfection, are covered in other sections. Pipe trenching, bedding, and backfill are covered in the GWRS Trenching and Backfilling section for work on OCWD property and the Earthwork – OCSD section for work on OCSD property.

The following pipe may be permitted as an alternate to PVC pressure pipe:

   Ductile Iron Pipe
   Steel Pipe

Specifications for alternate pipe materials are covered in other sections.

Pipe shall be furnished where indicated in the pipeline schedule or where indicated on the Drawings.

1-2. GOVERNING STANDARDS. Except as modified or supplemented herein, all PVC pressure pipe shall conform to the applicable requirements of ANSI/AWWA C900 and C905.

The supplementary information required in the governing standards is as follows:

   Affidavit of Compliance  Required.
   Plant Inspection  Not required.
   Special Markings  Not required.
   Special Preparation for Shipment  Not required.
   Certification  Required.

1-3. SUBMITTALS. Drawings and data shall be submitted in accordance with the Submittals Procedures section. Drawings and data shall include, but shall not be limited to, the following:

   Gasket material.
   Pipe length.
Pipe Dimension Ratio.

Manufacturer’s hydrostatic proof test results for each length of pipe in each lot from which pipe shall be provided for the Project, and results from dimension measurements, flattening tests, and extrusion quality tests performed in accordance with the governing standard, for each lot from which pipe is provided for the Project. Test results shall be submitted in Microsoft Excel format on CD, and shall include a summary of the number of lengths in each lot that fail the tests and the total number of lengths in each lot. The submittal shall also include a listing of the number of lengths of pipe provided from each lot.

Affidavit of Compliance (ANSI/AWWA C900, Sec. 6.3).

Affidavit of Compliance (ANSI/AWWA C905, Sec. 6.3).

Certification (ANSI/AWWA C900, Sec. 4.2.4).

Certification (ANSI/AWWA C905, Sec. 4.2.4).

Certificate of Compliance with NSF Standard No. 61 (if applicable).


1-4. MATERIALS TESTING. The Owner shall have the option of performing testing on pipe delivered to the Site. Testing may be performed on a random sample from each lot or on a random selection of samples obtained from the lots of pipe delivered to the Site. Sample lengths are expected to be approximately 4 feet.

The Owner shall reimburse the Contractor for the Contractor’s cost of the sample material plus overhead and profit, for samples that meet expected testing results as defined by the independent testing laboratory. The Contractor shall pay for samples and reimburse the Owner’s cost for sample shipping and for testing laboratory fees, for samples that fail to meet expected testing results.

Tests the Owner may perform are:

- Axial Tensile Properties (ASTM D638)
- Dimension Measurements (ASTM D2122)
- Flattening (ASTM D2412)
- Acetone Immersion (ASTM D2152)

The lot of pipe from which a sample fails to meet expected testing results as defined by the independent testing laboratory, will be rejected by the Owner. Installation of pipe prior to test results being reported to the Owner, shall be at the Contractor’s risk.
The Contractor shall allow a testing period as required by Owner, which will commence from the time the sample(s) are provided to the Owner.

1-5. DELIVERY, STORAGE AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section.

Pipe, fittings, and accessories shall be handled in accordance with Chapter 6 of AWWA Manual M23, to ensure installation in sound, undamaged condition. Pipe shall not be stored uncovered in direct sunlight.

PART 2 - PRODUCTS

2-1. DIMENSIONS. The dimension ratios (DRs: outside diameter to wall thickness) of PVC pressure pipe shall be as indicated herein or in the Pipeline Schedule section.

2-2. MATERIALS.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe</td>
<td>ANSI/AWWA C900 or C905; cast iron pipe OD, dimension ratio as specified herein.</td>
</tr>
<tr>
<td>Fittings</td>
<td>Ductile iron; ANSI/AWWA C110/A21.10, 250 psi pressure rating, except shorter laying lengths will be acceptable. Tapping saddles/sleeves shall be sized for PVC pipe.</td>
</tr>
<tr>
<td>Joints</td>
<td>PVC to PVC ANSI/AWWA C900 or C905, stab type, with elastomeric synthetic rubber gaskets. Gaskets of natural rubber will not be acceptable.</td>
</tr>
<tr>
<td></td>
<td>PVC to Cast Iron ANSI/AWWA C111/A21.11, except gaskets shall be synthetic rubber. Natural rubber will not be acceptable.</td>
</tr>
<tr>
<td></td>
<td>Tapping Saddles Ductile iron, with galvanized steel straps and synthetic rubber sealing gasket, 250 psi pressure rating.</td>
</tr>
</tbody>
</table>
Restrained Joints: ASTM F1674, EBAA Iron 2000PV series (4 inch through 20 inch), Sigma “One Lok” SLCE series, or concrete thrust blocking.

Tapping Sleeves: Ductile iron, 250 psi pressure rating.

Polyethylene Encasement: Tube or sheet, ANSI/AWWA C105/A21.5.

Joint Tape: Self-sticking, PVC or polyethylene, 10 mils [250 µm] thick; Chase "Chasekote 750", Kendall "Polyken 900", or 3M "Scotchrap 50".

Coal Tar Epoxy: High-build coal tar epoxy; Ameron "Amercoat 78HB Coal Tar Epoxy", Carboline "Bitumastic 300 M", Tnemec "46H-413 Hi-Build Tneme-Tar", or Sherwin-Williams "Hi-Mil Sher-Tar Epoxy".

Manufacturing quality control shall be maintained by frequent, regularly scheduled sampling and testing. Testing shall comply with the governing standards.

2-3. SHOP COATING AND LINING. The exterior surfaces of ductile iron fittings shall be coated with a bituminous coating. The interior surfaces of ductile iron fittings shall be lined with cement mortar.

PART 3 – EXECUTION

3-1. INSPECTION. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation; spigot ends and bells shall be examined with particular care. All defective pipe and fittings shall be removed from the site of the work.

3-2. LAYING PIPE. Pipe shall be protected from lateral displacement by pipe embedment material installed as specified in the GWRS Trenching and Backfilling section for work on OCWD property and the Earthwork - OCSD section for work on OCSD property. Pipe shall not be laid in water or other unsuitable conditions.

Pipe shall be laid with bell ends facing the direction of laying, except when reverse laying is specifically permitted by Engineer.
Foreign matter shall be prevented from entering the pipe during installation.

Whenever pipe laying is stopped, the open end of the line shall be sealed with a watertight plug. All water shall be removed from the trench prior to removing the plug.

3-2.01. Cleaning. The interior of all pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted.

3-2.02. Alignment. Piping shall be laid to the lines and grades indicated on the Drawings. Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the maximum deflections specified by the manufacturer.

Unless otherwise specified or indicated on the Drawings, and subject to acceptance by Engineer, either shorter pipe sections or fittings shall be installed as required to maintain the indicated alignment or grade.

3-3. Cutting Pipe. Cutting shall comply with the pipe manufacturer's recommendations and with Chapter 7 of AWWA Manual M23. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the end of the pipe shall be dressed to remove all roughness and sharp corners and shall be beveled in accordance with the manufacturer's instructions.

3-4. Joints. Joints shall be gasketed push on type meeting the requirements of ASTM D3139 unless otherwise indicated on the Drawings.

3-4.01. Gasketed Push-on Type Joints. Jointing shall conform to the instructions and recommendations of the pipe manufacturer. All surfaces of the spigot end of the gasketed joints shall be lubricated immediately before the joint is completed. Gaskets and lubricants shall be supplied by the pipe manufacturer, shall be suitable for use in potable water, shall be compatible with the pipe materials, shall be stored in closed containers, and shall be kept clean. Each spigot shall be suitably beveled to facilitate assembly.

3-4.02. Mechanical Joints. Mechanical joints shall be carefully assembled in accordance with the manufacturer's recommendations. If effective sealing is not obtained, the joint shall be disassembled, thoroughly cleaned, and reassembled. Over-tightening of bolts to compensate for poor installation practice will not be permitted.

3-5. Polyethylene Encasement. All cast iron fittings, tapping saddles, tapping sleeves, valves, or other cast iron accessories shall be provided with polyethylene tube or sheet protection installed in accordance with ANSI/AWWA C105/A21.5, Method A or C.
3-6. **CONNECTIONS WITH EXISTING PIPING.** Connections with existing pipes shall be made using fittings suitable for the conditions encountered. Each connection with an existing pipe shall be made at a time and under conditions which will least interfere with service to customers, and as authorized by Owner. Facilities shall be provided for proper dewatering and for disposal of water removed from the dewatered lines and excavations without damage to adjacent property.

3-7. **SERVICE CONNECTIONS.** Tapping saddles or tapping sleeves shall be used for all service connections 2 inches and smaller. Direct tapping of PVC pipe will not be permitted. Fittings shall be used for service connections larger than 2 inches.

3-8. **CONCRETE ENCASEMENT.** Concrete encasement shall be installed as indicated on the Drawings. Concrete and reinforcing steel shall be as specified in the Cast-in-Place Concrete section. All pipe to be encased shall be suitably supported and blocked in proper position and shall be anchored against flotation.

3-9. **RESTRAINED JOINTS.** All bell-and-spigot or all-bell tees, Y-branches, bends deflecting 11-1/4 degrees or more, valves, and plugs which are installed in piping subjected to internal hydrostatic heads in excess of 30 feet shall be provided with suitable restraint.

Concrete blocking shall extend from the fitting to solid, undisturbed earth and shall be installed so that all joints are accessible for repair. The dimensions of concrete reaction blocking shall be as indicated on the Drawings or as directed by Engineer.

Reaction blocking, anchorages, or other supports for fittings installed in fills or other unstable ground shall be provided as indicated by the Drawings or as directed by Engineer.

All steel clamps, rods, bolts, and other metal accessories used in tapping saddles or reaction anchorages subject to submergence or in contact with earth or other fill material, and not encased in concrete, shall be protected from corrosion by two coats of medium consistency coal tar applied to clean, dry metal surfaces. The first coat shall be dry and hard before the second coat is applied.

3-10. **PRESSURE AND LEAKAGE TESTS.** After installation, PVC piping shall be hydrostatically tested for defective workmanship and materials as specified in the Pipeline Pressure and Leakage Testing section.

3-11. **LEAKAGE.** All PVC piping shall be watertight and free from leaks. Each leak which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor.
End of Section
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Section 02634

HIGH DENSITY POLYETHYLENE (HDPE) PRESSURE PIPE

PART 1 - GENERAL

1-1. SCOPE. This section covers furnishing and installation of 4 inch through 36 inch buried solid wall high density polyethylene (HDPE) pressure pipe. HDPE pressure pipe shall be furnished and installed complete with all fittings, jointing materials, anchors, blocking, encasement, and other necessary appurtenances.

Pressure and leakage tests, disinfection, and cleaning are covered in other sections. Pipe trenching, bedding, and backfill are covered in the GWRS Trenching and Backfilling section for work on OCWD property and the Earthwork – OCSD section for work on OCSD property.

1-2. GOVERNING STANDARDS. Except as modified or supplemented herein, all HDPE pressure pipe shall conform to the applicable requirements of ANSI/AWWA C906, latest edition.

The supplementary information required in the foreword of the governing standard is as follows:

- Affidavit of Compliance (Sec. 6.3) Required.
- Plant Inspection by Purchaser (Sec. 5.8) Not required.
- Markings (Sec. 6.1) Not required.
- Shipping (Sec. 6.2) Not required.
- Verification (Sec. 5) Required.

1-3. SUBMITTALS. Drawings and data shall be submitted in accordance with the Submittals Procedures section. Drawings and data shall include, but shall not be limited to, the following:

- Details of joints and connections.
- Pipe section length.
- Pipe Dimension Ratio.
- Certification of compliance with NSF Standard No. 61 (for potable water system pipe)
- Affidavit of Compliance (ANSI/AWWA C906, Sec. 6.3).
- Verification, including Quality Assurance Testing (ANSI/AWWA C906, Sec. 5).

1-4. QUALITY ASSURANCE.
1-4.01. **Qualifications.** The pipe manufacturer shall provide the services of an experienced, competent, and authorized representative to visit the site of the work to advise and consult with Contractor during joining and installation of the pipe. The manufacturer's representative shall not directly supervise Contractor's personnel, and Contractor shall remain responsible for the pipeline work.

1-4.02. **Fusion.** Fusion joints shall be made by qualified fusion technicians who shall demonstrate fusion experience on projects completed within a year of the Bid date which included similar or larger installation lengths, similar pipe sizes (+/- 2 pipe sizes) and similar DRs (+/- 2 DRs).

1-5. **STORAGE AND HANDLING.** Storage and handling shall meet the requirements of Product Storage and Handling Requirements section, and shall be in accordance with Chapter 7, Transportation, Handling and Storage of Pipe and Fittings of AWWA Manual M55, to ensure installation in sound, undamaged conditions. Pipe shall not be stored uncovered in direct sunlight.

**PART 2 - PRODUCTS**

2-1. **PERFORMANCE AND DESIGN REQUIREMENTS.**

2-1.01. **Dimensions.** Dimensions shall be as specified in the materials paragraph.

The dimension ratios (DRs) of HDPE pressure pipe shall be as indicated in the following table:

<table>
<thead>
<tr>
<th>Location</th>
<th>Nominal Size (inches)</th>
<th>DR</th>
</tr>
</thead>
<tbody>
<tr>
<td>PW</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>RW</td>
<td>4</td>
<td>17</td>
</tr>
</tbody>
</table>

2-2. **MATERIALS.**

Pipe

ANSI/ AWWA C906; material designation (ASTM D3350) PE3608 or PE4710, minimum cell classification 344464C, IPS (Iron Pipe Size).

Pressure class and wall thickness of DR 17. Thermal butt fusion joints, ASTM D3261.

Bluestriped.
Joints

Butt fusion joints, ASTM D3261; manufactured by injection molding; pressure class of the pipe or greater.

Fittings

Electrofusion Type
ASTM F1055 having pressure class equivalent to the pipe or greater as required.

Molded or Fabricated Type
Meet applicable AWWA C906 requirements; pressure class and cell class equivalent to the pipe or greater as required.

Other Types
Subject to review by the Engineer.

Tapping Saddles
Ductile iron, with galvanized steel straps and synthetic rubber sealing gasket, 250 psi pressure rating.

Tapping Sleeves
Ductile iron, 250 psi pressure rating.

Coal Tar Epoxy
High-build coal tar epoxy; Ameron "Amercoat 78HB Coal Tar Epoxy", Carboline "Bitumastic 300 M", Tnemec "46H-413 Hi-Build Tneme-Tar", or Sherwin-Williams "Hi-Mil Sher-Tar Epoxy".

PART 3 - EXECUTION

3-1. INSPECTION. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation, with special attention to pipe ends. All defective pipe and fittings shall be removed from the site of the work.

3-2. INSTALLATION.

3-2.01. Laying Pipe. Pipe shall be protected from lateral displacement by pipe embedment material installed as specified in the GWRS Trenching and Backfilling section for work on OCWD property and the Earthwork – OCSD section for work on OCSD property. Pipe shall not be laid in water or under unsuitable weather or trench conditions, and shall be protected against entry of foreign matter.

Whenever pipe laying is stopped, the open end of the line shall be closed with a tight-fitting end board to keep out sand and earth. The end board shall have...
several perforations near its center to admit water into the pipe, to prevent flotation in the event the trench is flooded. Any standing water shall be removed from the trench before the end board is removed.

Pipe shall be protected from extended exposure to sunlight, shall be kept as cool as possible during installation, and shall be covered with backfill immediately after installation only during the cooler morning hours of the day.

3-2.02. Cleaning. The interior of all pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted.

3-2.03. Alignment. Piping shall be laid to the lines and grades indicated on the drawings. Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the maximum deflection specified by the manufacturer. Unless otherwise specified or indicated on the drawings, and subject to acceptance of the Engineer, either shorter pipe sections or fittings shall be installed as required to maintain the indicated pipeline alignment or grade.

3-2.04. Cutting Pipe. Cutting shall be in accordance with the pipe manufacturer's recommendations. Cuts shall be smooth, straight, and at right angle to the pipe axis. After cutting, the end of the pipe shall be dressed to remove all roughness and sharp corners and shall be beveled in accordance with the manufacturer's instructions.

3-2.05. Jointing. Jointing of pipe and fittings shall be performed in accordance with the instructions and recommendations of the pipe manufacturer and in accordance with ASTM F2620 and PPI TR 33. Sections of HDPE pipe shall be joined above ground into continuous lengths by the thermal butt fusion method.

Saddle fusion shall be performed in accordance with ASTM F2620 or PPI TR 41 and the fitting manufacturer's recommendations.

Where required, electrofusion shall be performed in accordance with ASTM F1290, PPI TN 34, and the manufacturer recommended procedure.

Socket fusion and extrusion welding or hot gas welding will not be acceptable.

All joining procedures shall be acceptable to Engineer.

3-2.06. Connections with Existing Piping. Connections between new work and existing piping shall be made using suitable fittings. Each connection with an existing pipe shall be made at a time and under conditions which will least interfere with service to customers, and as authorized by Owner. Facilities shall be provided for proper dewatering and for disposal of all water removed from the dewatered lines and excavations without damage to adjacent property.
Special care shall be taken to prevent contamination of potable water lines when
dewatering, cutting into, and making connections with existing pipe. Trench
water, mud, and other contaminating substances shall be kept out of the lines.
The interior of all pipe, fittings, and valves installed in connections to existing
piping shall be thoroughly cleaned and then swabbed in accordance with the
requirements of AWWA C651.

3-2.07. **Service Connections.** Not used.

3-2.08. **Concrete Encasement.** Not used.

3-2.09. **Reaction Anchorage and Blocking.** All tees and plugs installed in piping
subject to internal hydrostatic head in excess of 30 feet [9.1 m] shall be provided
with suitable reaction blocking, anchors, joint harnesses, or other acceptable
means of preventing movement of the pipe caused by internal pressure.

Concrete blocking shall extend from the fitting to solid undisturbed earth and
shall be installed so that all joints are accessible for repair. The dimensions of
concrete reaction blocking shall be as indicated on the drawings or as directed by
Engineer.

Reaction blocking, anchorages, or other supports for fittings installed in fill or in
other unstable ground shall be provided as indicated on the drawings or as
directed by Engineer.

3-2.10. **Protective Coating.** All steel clamps, rods, bolts, and other metal
components of tapping saddles or reaction anchorages subject to submergence
or in contact with earth or other fill material, and not encased in concrete, shall be
protected from corrosion by two coats of coal tar paint applied to clean, dry
surfaces. The first coat shall be dry and hard before the second coat is applied.

3-3. **FIELD QUALITY CONTROL.**

3-3.01. **Hydrostatic Tests.** After installation, HDPE piping shall be
hydrostatically tested for defective workmanship and materials as specified in the
Pipeline Pressure and Leakage Testing section.

3-3.02. **Leakage.** All HDPE piping shall be watertight and free from leaks. Each
leak that is discovered within the correction period stipulated in the General
Conditions shall be repaired by and at the expense of Contractor.

3-4. **CLEANING.** After installation, HDPE piping shall be cleaned as specified in
the Cleaning and Disinfection of Water Pipelines section. 

End of Section
PART 1 – GENERAL

1-1. **SCOPE.** This section covers field hydrostatic pressure and leakage testing of piping. The term "piping" shall be used in this section to refer to piping systems, pipelines, or sections thereof.

Testing of other piping is covered in the Miscellaneous Piping and Accessories Installation section. Cleaning and disinfection of piping is covered in the Cleaning and Disinfection of Water Pipelines section.

1-2. **GENERAL.** Contractor shall coordinate pressure and leakage testing with adjacent work as necessary to preclude work interferences or duplication of effort and to expedite the overall progress of the work.

Contractor shall provide all necessary piping, piping connections, temporary valves, backflow preventers, and all other items of equipment or facilities necessary to complete the pressure and leakage testing.

In all cases where it is necessary to interrupt service, permission of Owner shall be obtained at least two days before the service will be interrupted. In all cases where it is necessary to interrupt service to water customers, permission of the Owner shall be obtained and each customer affected shall be notified of the proposed service interruption and its possible duration in accordance with the Project Requirements section.

Contractor shall notify federal, state, and local regulatory agencies to determine if any special procedures or permits are required for disposal of water used for pressure and leakage testing and to identify acceptable locations for disposal of the water. All requirements and costs associated with notifications and obtaining any discharge permit or approvals shall be responsibility of Contractor.

Engineer or Engineer's representative shall be present during testing and shall be notified of the time and place of testing at least 3 days prior to commencement of testing. All testing shall be performed to the satisfaction of Engineer, and in accordance with all governing standards and regulations.

1-2.01. **Testing Schedule and Procedure.** A testing schedule and procedure shall be submitted to Engineer for review and acceptance not less than 21 days prior to commencement of testing. The schedule and procedure shall include, but not be limited to the following information for each pipe section to be tested:

- limits of each pipe test section;
1-2.02. Special Testing Requirements. Special testing requirements include the following:

Water for filling the pipeline from the Owner's existing facilities may not be available during the Owner's periods indicated in the Work Restrictions specification.

Unless otherwise acceptable to Engineer, the general sequence of work for each pipeline, or valved or bulkheaded section thereof, shall be as follows:

- Initial cleaning and flushing of pipeline.
- Filling pipeline.
- Hydrostatic pressure and leakage testing.
- Disinfection.
- Final flushing and neutralization of heavily chlorinated water.
- Bacteriological tests.

Unless otherwise acceptable, during testing of the pipeline, all valves, except for auxiliary hydrant valve(s), shall be in the open position.

Unless otherwise acceptable, temporary bulkheads shall be provided during testing so that the test pressure is not applied to existing or new valves and hydrants, or to existing water lines, or to any portion of water lines installed under this Contract that have already been put into service.

Unless otherwise acceptable, a temporary pressure gauge shall be installed at each end of the limits of the pipeline to be tested.

Unless otherwise acceptable, tests shall be conducted before connections are made to existing water lines, or to any portion of water lines installed under this Contract that have already been put into service.

Unless otherwise acceptable, upon completion of testing and disinfection, connections made to existing water lines or to any portion of water lines installed under this Contract that have already been put into service, and any other portion of the pipeline not subject to the pressure test, shall be visually inspected for
leakage after placing the water line into service and before backfilling the connection.

If testing is permitted against a valve, the maximum differential test pressure across the valve seat (gate) in the closed position shall not exceed the drip-tight rated pressure of the valve.

1-2.03. Water. Water for testing shall be furnished as stipulated in the Temporary Facilities section. Unless otherwise permitted, the water shall be kept out of the remainder of the piping. Following completion of testing, the water shall be disposed of in accordance with the requirements of regulatory agencies and in a manner acceptable to Engineer.

PART 2 - PRODUCTS

2-1. TEST EQUIPMENT. All necessary connections between the piping to be tested and the water source, together with pumping equipment, water meter, pressure gauges, backflow prevention, and all other equipment, materials, and facilities required to perform the specified tests, shall be provided. All required blind flanges, valves, bulkheads, bracing, blocking, and other sectionalizing devices shall also be provided. All temporary sectionalizing devices shall be removed upon completion of testing. Vents shall be provided in test bulkheads where necessary to expel air from the piping to be tested.

Test pressure shall be applied by means of a force pump sized to produce and maintain the required pressure without interruption during the test.

Water meters and pressure gauges shall be accurately calibrated and shall be subject to review and acceptance by Engineer.

Permanent or temporary gauge connections shall be installed at each location where test gauges are connected to the piping during the required test. Drilling and tapping of pipe walls will not be permitted. Upon successful completion of testing, each permanent gauge connection shall be fitted with an isolation valve and a permanent gauge, and each temporary gauge connection, if used, shall be fitted with a permanent sealed plug or cap acceptable to the Engineer.

Permanent or temporary fill and vent connections shall be installed as needed for the required test. Drilling and tapping of pipe walls will not be permitted. Upon successful completion of testing, each permanent fill and vent connection shall be fitted with the permanent fill or vent piping, and each temporary fill and vent connection, if used, shall be fitted with a permanent sealed plug or cap acceptable to the Engineer.
PART 3 - EXECUTION

3-1. **FILLING AND VENTING.** Before filling the piping with water, care shall be taken to ensure that all air release valves and other venting devices are properly installed and operating properly. Hand-operated vent valves shall not be closed until an uninterrupted stream of water is flowing from each valve. The rate of filling the piping with water must not exceed the venting capacity of the installed air vent valves and devices.

3-2. **BLOCKING AND BACKFILLING.** Piping shall be adequately blocked, anchored, and supported before the test pressure is applied. Underground piping identified in the Pipeline Schedule shall be tested before the joints are covered.

3-3. **PRESSURE TESTING.** After the piping to be tested has been filled with water, the test pressure shall be applied and maintained without interruption within plus or minus 5 psi [35 kPa] of test pressure for 2 hours plus any additional time required for Engineer to examine all piping being tested and for Contractor to locate any defective joints and pipe materials. The test pressure shall be in accordance with the requirements specified for pipeline or plant piping.

3-3.01. **Pipeline Test Pressure.** Piping shall be subjected to a hydrostatic test pressure as indicated in the Pipeline Test Pressure Schedule.

The test pressure, expressed in feet of water, to be applied at any point in the piping shall be equivalent to the arithmetic difference between the specified test pressure plane elevation and the elevation of the horizontal center line of the piping at the selected location. The value obtained shall be multiplied by 0.433 to obtain psi.

3-3.02. **Plant Piping Test Pressure.** Piping shall be subjected to the test pressure as indicated in the Plant Piping Test Pressure Schedule.

3-3.03. **Pressure Testing of Above Ground or Exposed Piping.** Maintain the test pressure for a minimum of 24 hours. Examine joints, fittings, valves, and connections for leaks. The piping system shall show zero leakage or weeping. Repair leaks and retest until zero leakage is obtained. Air and vacuum valves shall be in place and operational in case of pipe failure during testing.

3-3.04. **Pressure Testing of Buried Piping.** Where any section of the piping contains concrete thrust blocks or encasement, do not pressure test until at least 10 days after the concrete has been poured. When testing cement mortar lined piping, fill the pipe to be tested with water and allow to soak for at least 48 hours to absorb water before conducting the pressure test. Contractor shall apply and maintain the test pressure by means of a hydraulic force pump. The test
pressure shall be maintained for the following durations by restoring it whenever it falls an amount of 5 psi:

<table>
<thead>
<tr>
<th>Pipe Diameter (inches)</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 and less</td>
<td>4</td>
</tr>
<tr>
<td>29 to 36</td>
<td>8</td>
</tr>
<tr>
<td>Greater than 36</td>
<td>24</td>
</tr>
</tbody>
</table>

3-4. **PLANT PIPING LEAKAGE TESTING.** All plant piping shall be watertight and free from leaks. Each leak which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor.

3-5. **PIPELINE LEAKAGE TESTING.** The pipeline piping shall be subjected to a leakage test. Leakage testing may be conducted concurrently with pressure testing. The duration of the leakage test shall be 2 hours plus the additional time required for Engineer to make an accurate determination of leakage.

3-5.01 **Above Ground and Exposed Piping Leakage.** All above ground and exposed piping shall be watertight and free from leaks. Each leak which is discovered within the correction period stipulated in the General Provisions shall be repaired by and at the expense of the Contractor.

3-5.02 **Zero Leakage Piping.** In addition to the above ground and exposed piping zero leakage allowance, the allowable leakage for welded steel pipe and flanged joints shall be zero gallons. The allowable leakage for buried piping having threaded, braded, or welded (including solvent welded) joints shall be zero gallons.

3-5.03. **Leakage Test Pressure.** The hydrostatic pressure maintained during the leakage test shall be equal to the pressure specified for pressure testing of the piping and shall be maintained within plus or minus 5 psi during the entire time that leakage measurements are being performed.

3-5.02. **Leakage Measurement.** Measurement of leakage shall not be attempted until all trapped air has been vented, absorption of water by the pipe wall or lining has stabilized, and a constant test pressure has been established. After the pressure has stabilized, piping leakage shall be measured with a suitable water meter installed in the pressure piping on the discharge side of the force pump.

3-5.03. **Allowable Leakage.** The term "leakage", as used herein, refers to the total amount of makeup water which must be added into the piping during the test to maintain the test pressure.
No piping will be accepted if and while it exhibits a leakage rate in excess of that determined by the indicated formulas:

\[ Q = 0.0075 \text{ DLN} \text{ (using inch-pound units)} \]

Where

\[
\begin{align*}
Q &= \text{allowable leakage in gallons per hour} \\
D &= \text{nominal diameter of pipe in inches} \\
L &= \text{length of section tested in thousand feet} \\
N &= \text{square root of average test pressure in pounds per square inch}
\end{align*}
\]

Whenever the piping to be tested contains pipe of different diameters, the allowable leakage shall be calculated separately for each diameter and the corresponding length of piping. The resulting allowable leakage rates shall be added to obtain the total allowable leakage for the entire piping.

All joints in piping shall be free from visible leaks during the leakage test. Each leak which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor regardless of the amount that the total leakage may have been below the specified allowable leakage rate during the leakage test.

If the leakage test indicates a higher than allowable leakage rate, Contractor shall locate and repair leaking joints and other defective work and repeat the test until leakage rate is less than the allowable rate.

End of Section
DIVISION 3 – Concrete
DIVISION 5 – Metals
DIVISION 6 – Wood and Plastics
DIVISION 7 – Thermal and Moisture Protection
DIVISION 8 – Doors and Windows
DIVISION 9 – Finishes
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PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing and installing of elastomeric high-solids urethane lining systems as indicated on the Drawings. This section covers surface preparation, furnishing and application of a urethane lining system suitable for each set of specified service conditions, the engineering field services from the Material Manufacturer and Applicator that are required, and any other appurtenances that are required to provide a completed corrosion protection system.

1-2. QUALITY ASSURANCE.

1-2.01. Manufacturer's Field Services. The field services provided by the material manufacturer shall include review of the project before surface preparation; certification of the manufacturer’s product for the application; approval of the applicator, the materials, and the procedure to be used; approval of the surface preparation; and approval of the application.

A representative of the corrosion protection system material manufacturer shall submit, through Contractor, written approvals/certification of the proposed protection system materials, application procedures, applicator, and surface preparation requirements. The representative shall be an employee of the material manufacturer.

Contractor shall notify the material manufacturer and Engineer at least 10 days prior to anticipated date of the commencement of corrosion protection system work.

1-2.02. Applicator Field Services. Contractor shall employ the services of a qualified corrosion protection system application contractor (Applicator). The Applicator of the corrosion protection system shall contact the corrosion protection system material manufacturer during the bidding phase of the project and shall include in the cost of this work and the estimated cost of the manufacturers engineering field services as specified.
The corrosion protection system Applicator shall submit a satisfactory experience record including references for previous application of the specified corrosion protection systems to concrete structures of similar design and complexity. The material manufacturer shall approve the applicator in writing. After the application is complete, the applicator of the corrosion protection system shall certify that the corrosion protection system is free of pinholes and holidays.

The Applicator shall also perform and provide the adhesion testing and results to determine compliance with the specified minimum pull-off adhesion strength.

Following the application, the Applicator shall certify that the corrosion protection system is free of pinholes and holidays.

1-3. **SUBMITTALS.** In accordance with the Submittals section, complete specifications and data on the protection system, application instructions for the protection system, and material manufacturer's approvals for the protection system furnished under this section shall be submitted for Engineer review. The lining manufacturer shall submit acceptable lining termination details and metal accessories encapsulation details.

The corrosion protection system manufacturer shall provide a certification statement for each component of the corrosion protection system that it will provide corrosion resistance for the specified service conditions.

Submittals shall include instructions on the treatment of bolted connections of equipment to concrete when applied before and/or after surface is coated.

1-4. **DELIVERY, STORAGE, AND HANDLING.** The material shall be delivered to the jobsite in original unopened containers with labels intact. Protection system components shall be stored indoors in an appropriate location and environment in accordance with the manufacturer's recommendations and shall be protected against freezing.

Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Delivery, Handling, and Storage section.

1-5. **WARRANTY.** Material manufacturer shall warrant the chemical resistance of each corrosion protection system (products and labor) for a period one year from the date of installation when exposed to the customer's normal operating conditions as stated in the specification. This warranty shall not cover wear and tear such as abrasion resistance or mechanical abuse.

**PART 2 - PRODUCTS**
2-1. **SERVICE CONDITIONS.** The lining system shall protect the concrete and metal accessories from damage when exposed to the service indicated. The lining system shall withstand exposure to sunlight and outdoor atmospheric conditions for unlimited duration.

Lining systems required to be compliant with ANSI/NSF 61 shall be certified as compliant in writing by the lining material manufacturer.

2-2. **MATERIALS.** Each corrosion protection system specified herein is a product of the indicated manufacturer. Equivalent protection systems of other manufacturers regularly producing high quality concrete corrosion protection systems and materials including providing the required material manufacturer's engineering field services may be furnished subject to review and acceptance by Engineer.

2-2.01. **RO Permeate Surfaces.** All surfaces in contact with RO Permeate shall be coated with a polyurethane elastomeric coating. The surfaces include the RO Flush Tank Interior (Area 710), RO Building Sump, RO Waste Sump, RO Building Drainage Trenches (Area 510), and the UV containment area (Area 610). The coating system shall be one the following systems, or equivalent:

<table>
<thead>
<tr>
<th>Elastomeric Modified Urethane Lining Systems</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primer</strong></td>
<td>High-solids, two component, epoxy coating, Ameron &quot;Amerlock 400&quot; or Tnemec &quot;Series 20-1255 Pota-Pox&quot;,</td>
</tr>
<tr>
<td><strong>Topcoat (NSF certified)</strong></td>
<td>Two component, conventional spray applied, high solids, high-build elastomeric modified urethane high-build protective and waterproof lining, certified as compliant with ANSI/NSF 61; CIM Industries Inc. &quot;CIM 1061&quot; or Tnemec &quot;Series 264 Elasto-Shield&quot;.</td>
</tr>
<tr>
<td><strong>Joint Cover Sheet</strong></td>
<td>Used when recommended and approved by the membrane material manufacturer; polyester fabric with a minimum weight of 3 ounces per square yard and a sheet width of 6 to 12 inches.</td>
</tr>
<tr>
<td><strong>Epoxy Concrete Filler</strong></td>
<td>Epoxy filler compound for concrete surfaces shall be a two-component, 100</td>
</tr>
</tbody>
</table>
percent solids epoxy filler or as recommended by the corrosion protection system material manufacturer.

Fiberglass Reinforcing Screen Woven 16 by 18 fiberglass mesh fabric with 0.011 inch yarn diameter; Phifer Wire Products.

2-2.02. **Coatings for MF Membrane Basins.** The interior surface of the MF Membrane Basins and floor sumps (2) located at Train C shall receive a corrosion protection system as specified below. The total system will consist of three coats of an epoxy coating system, applied in accordance with the manufacturer’s latest written data. The coating system shall be:

Two coats of Sherwin Williams Duraplate UHS ultra high solids epoxy (minimum DFT 10 to 12 mils per coat) and one primer coat of Sherwin Williams Corobond 100 epoxy primer/sealer (minimum DFT of 4 to 6 mils).

One finish coat of Tnemec H.S. Epoxy Series 104 (minimum DFT 6 to 10 mils), one intermediate coat of Tnemec H.S. Epoxy Series 104 (minimum DFT 6 to 10 mils), and one primer coat of Tnemec H.S. Epoxy Series 104 (minimum DFT 4 to 6 mils).

**PART 3 - EXECUTION**

3-1. **GENERAL.** All details, methods, and procedures of mixing, surface preparation, bonding, application, finishing, curing, and protection of the lining shall be in strict accordance with the recommendations of the material manufacturer. The applicator shall comply with the recommendations of the material manufacturer’s engineering field representative.

3-1.01. **Coordination.** The Contractor shall be responsible for providing dewatering, ventilation and humidity control, confined space entry, cleaning, inspection, supervision, dust control and equipment protection as specified herein and related sections, and as stipulated and recommended by the lining manufacturer.

3-1.02. **Manufacturer’s Field Services.** Manufacturer shall be present at all times for the accelerated schedule related to the FPW Channel application including the concrete placement.

3-2. **SURFACE PREPARATION.** All surfaces shall be free of objectionable substances and shall meet the recommendations of the coating manufacturer for surface preparation. Any other surface preparation recommended by the lining
material manufacturer shall be brought to Engineer’s attention and may be incorporated into the work if acceptable to Engineer.

All surfaces shall be dry when coated or lined, and shall be free from dirt, dust, sand, mud, oil, grease, rust, mill scale, and other objectionable substances. Oil and grease shall be completely removed as recommended by the material manufacturer before mechanical cleaning is started.

3-2.01. Concrete Surfaces. Concrete surfaces shall be prepared in accordance with SSPC-SP13/NACE 6 and the lining material manufacturer’s recommendation. Surfaces shall be free of cracks, pits, projections, or other imperfections that would interfere with the formation of a smooth, unbroken coating film.

New concrete shall be cured for at least 28 days before lining is applied and shall be ready to receive the lining as determined by the Applicator and material manufacturer. Concrete surfaces shall be tested for capillary moisture in the concrete in accordance with ASTM D4263. There shall be no capillary moisture migration after 24 hours as determined by the test method. If moisture is observed, the corrosion protection system shall include a vapor barrier that is recommended by the protection system manufacturer.

All concrete surfaces to be lined shall be cleaned in accordance with ASTM D4258 and abrasive blasted in accordance with ASTM D4259. Before the lining is applied, the surfaces shall be thoroughly washed or cleaned by air blasting to remove all dust and residue. The Contractor shall repair all concrete surfaces that have spalls, voids, and cracks and shall remove all fins and other surface projections to produce a flush surface for application of the protection system.

Surface profile shall be at least 4 mils [100 μm] for a coating protection system and at least 22 mils [550 μm] for a lining protection system, but shall not be less than 25 percent of the dry film thickness specified for the corrosion protection system or 40-60 grit sandpaper unless recommended otherwise by the material manufacturer.

Concrete surfaces shall be pinhole free as using an epoxy concrete filler or as recommended by the material manufacturer and acceptable to Engineer.

3-2.01.01. Existing Concrete. Existing concrete shall have all existing lining products completely removed before the application of a new corrosion protection system. For existing concrete, unless it can be verified that existing concrete has a vapor retarder, applied beneath it, the application shall include a surface-applied vapor barrier product before the lining system is applied.
If any repairs to existing concrete are required, they shall be made as part of the surface preparation in accordance with the Concrete Surface Repair section prior to the application of lining products.

3-2.01.02. Adhesion Testing. Adhesion testing shall be conducted, by the Applicator, at each application area, after the concrete surfaces has been prepared and approved by the Applicator and lining material manufacturer. Adhesion strength test results shall exceed 400 psi [2.7 MPa] or a higher value if recommended by material manufacturer. Adhesion test results shall be presented to and approved by Owner/Engineer, Applicator, and lining material manufacturer.

The test area shall be at least 2 square feet [0.19 sq. m] to allow a minimum of three tests to be conducted. Pull-off strength adhesion tests shall be conducted by the Applicator in accordance with ASTM D7234 for concrete surfaces using an Elcometer tensile adhesion tester. At least three adhesion tests shall be conducted and the results averaged. Adhesion strength shall equal or exceed the minimum adhesion strength specified herein and by the material manufacturer.

3-2.02. Metal Surfaces. Metal surfaces shall be prepared in accordance with the following: All sharp edges, and corners are to be ground smooth, Welds are to be ground smooth, in accordance with NACE standard RP0 178, Appendix C, Designation C, shall have all weld slag and splatter removed and be free of all defects. The surfaces shall be abrasive blasted in conformance with SSPC SP-10 and shall be at least a 3 mil [75 µm] surface profile.

3-3. MIXING AND THINNING. Liner material shall be thoroughly mixed each time any is withdrawn from the container. Liner material containers shall be kept tightly closed except while the material is being withdrawn.

Liner components shall be mixed to proper consistency and viscosity in accordance with the manufacturer's recommendations. Thinning will not be permitted. No adulterant, unauthorized thinner, or other material not included in the formulation, shall be added to the protection system components for any purpose.

In no case shall the wet film thickness of applied lining be reduced below the thickness recommended by the liner manufacturer.

3-4. APPLICATION. Coating shall be spray-applied in accordance with the material manufacturer’s recommendations. Coating shall be applied in a neat manner, with finished surfaces free of runs, sags, ridges, laps, and brush marks as recommended by the material manufacturer.
Each coat shall be applied over the previous coat in accordance with the recommendations of the material manufacturer. Each coat shall be applied in a manner that will produce an even film of uniform and proper thickness. In no case shall coating be applied at a rate of coverage which is greater than the maximum rate recommended by the material manufacturer.

Recoating shall be in accordance with the material manufacturer’s recommendations.

Alternate coats shall be of contrasting colors to assist in obtaining complete coverage. The first coat on concrete surfaces shall be a dark color.

Lining showing checks, blisters, excessive sags, teardrops, or fat edges will not be accepted and shall be entirely removed and the surface recoated. The lining shall be free of pinholes and holidays.

Lining shall be applied when surface temperature is at least 50°F and at least 5°F above dew point, and relative humidity is 85 percent or lower. Coatings shall not be applied in direct sunlight or when the temperature of the concrete is rising. Preferably the coating shall be applied when the temperature of the concrete is dropping.

When applying high build coatings with a roller or brush and where a dry film thickness of at least 4 mils [100 µm] per coat is required, two or more coats shall be applied to achieve the recommended dry film thickness equal to a spray applied coating.

For conventional spray equipment, each coat shall be applied over the previous coat only when acceptable to the material manufacturer.

For plural spray equipment, the topcoat shall be applied in multiple passes to achieve the required DFT.

3-4.01. **Elastomeric Modified Urethane Lining Systems.** The concrete surface lining shall be applied in four coats, not including concrete filler when used. The lining shall consist of one prime coat and three finish coats. Prime coat thickness shall be 5 mils. The dry film thickness of each final coat shall be 25 mils.

3-4.02. **High Solids Epoxy Systems.** The concrete surface lining shall be applied in three coats as specified herein. Minimum thickness of the prime coat shall be 4 to 6 mils. The dry film thickness of the system shall be no less than 25 mils.

3-5. **FIELD QUALITY CONTROL.** The surfaces shall be cleaned and prepared as needed to properly conduct the visual inspection, spark testing, and adhesion
testing. All inspection and testing shall be witnessed by the Applicator and Material Manufacturer. Repairs shall be acceptable to Engineer.

3-5.01. Visual Inspection. The surface of the liner shall be visually inspected for areas defects, air inclusion, pinholes, or other imperfections in the system that may prevent a complete seal of the surfaces.

3-5.02. Spark Testing. All detected holidays and pinholes shall be marked and repaired as recommended by the material manufacturer.

3-5.02.01. Concrete Surfaces. After liners are installed, the material manufacturer shall spark-test all concrete surfaces covered with lining using an acceptable high-voltage electrical spark tester in accordance with ASTM D4787 and set at the recommended voltage, or as a minimum at 100 volts per mil of liner thickness. The material manufacturer shall verify the testing equipment is working properly before beginning the spark testing of the lining. The electrode movement shall be continuous and shall proceed in a systematic manner that will cover 100 percent of the lining surface. A carbon fiber brush shall be used on the sensor electrode.

3-5.03. Adhesion Testing. The Owner/Engineer reserves the right to require adhesion testing of any finished corrosion protection system application specified herein. Adhesion testing shall be conducted as specified in Paragraph 3-2.01.01 above by the Applicator. Adhesion strength test results shall exceed 300 psi or a higher value. Finished system adhesion test results shall be presented to and approved by Owner/Engineer, Applicator, and lining material manufacturer. Following adhesion testing, the area(s) tested shall be repaired by the Applicator with the specified products and methods specified herein.

If the finished system fails an adhesion test, the cause of the failure shall be determined and corrected before the test is repeated on a new test area. If the adhesion test fails a second time, the Owner/Engineer reserves the right to require the entire surface to be completely removed and reapplied at no cost to the Owner/Engineer.

3-5.04. Film Thickness. Coating film thickness shall be verified by measuring the wet film thickness of each coat as it is applied and the dry film thickness of the entire system. Wet film thickness shall be measured with a gauge that will measure the wet film thickness within an accuracy of ±0.5 mil. Dry film thickness for concrete shall be measured using a Defelsko Positector 200 series or equal, in accordance with SSPC-PA9 (concrete) and PA2 (steel). At the discretion of the Owner/Engineer, core samples could be obtained for measuring dry film thickness.
3-6. **STORAGE AND SAFETY.** Store all materials only in area or areas designated by the District solely for this purpose. Confine mixing, thinning, clean-up and associated operations, and storage of coating materials related debris before authorized disposal, to these areas. All materials are to be stored on pallets or similar storage handling skids off the ground.

All pertinent governmental, industry, and in-house regulations and standards, including, but not limited to those concerning painting, flammable/combustible liquids, eye protection, head protection, skin protection, respiratory protection, scaffolding, lighting, ventilation, working in enclosed or confined spaces, air and water quality, VOC emissions, dust, blasting residues and paint particulate, as well as the containment, handling and disposal of hazardous or toxic substances or waste, shall be carefully observed and shall supersede any guidelines herein. Material Safety Data Sheets (MSDS) shall be made available at job-site to all workers who may come in contact with the products used.

3-7. **PROTECTION.** Care shall be taken to prevent the lining material from being dropped or spilled on adjacent surfaces, buildings, structures, or facilities. All surfaces so damaged shall be cleaned, repaired, replaced, or painted as acceptable to Engineer.

End of Section
PART 1 - GENERAL

1-1. **SCOPE.** This section covers field applied protective coatings, including surface preparation, protection of surfaces, inspection, and other appurtenant work for equipment and surfaces designated to be coated with heavy-duty maintenance coatings. Regardless of the number of coats previously applied, at least two field coats in addition to any shop coats or field prime coats shall be applied to all surfaces unless otherwise specified.

1-2. **GENERAL.** Cleaning, surface preparation, coating application, and thickness shall be as specified herein and shall meet or exceed the coating manufacturer’s recommendations. When the manufacturer's minimum recommendations exceed the specified requirements, Contractor shall comply with the manufacturer's minimum recommendations. When equivalent products are acceptable to Engineer, Contractor shall comply with this Specification and the coating manufacturer’s recommendations.

1-2.01. **Governing Standards.** All cleaning, surface preparation, coating application, thickness, testing, and coating materials (where available) shall be in accordance with the referenced standards of the following AWWA, ANSI, NACE, SSPC, NSF, and ASTM.

1-2.02. **Delivery and Storage.** All coating products shall be received and stored in accordance with the coating manufacturer’s recommendations.

1-2.03. **Coatings, Painting, and Linings Covered in Other Sections.**

   Architectural painting.
   Elastomeric high solids urethane lining systems for corrosion protection and waterproofing.
   Steel tank lining.

1-3. **SUBMITTALS.** Contractor shall submit color cards for all coatings proposed for use, together with complete descriptive specifications, manufacturer’s product data sheet and the completed Coating System Data Sheets, to Engineer for review and color selection. Each product data sheet shall include application temperature limits including recoat time requirements for the ambient conditions at the site, including temperatures up to 130°F [54°C]. Requests for review submitted directly to Engineer by coating suppliers will not be considered.
When the proposed products will be in contact with treated or raw water in potable water treatment facilities, Contractor shall submit certifications that the proposed systems are in compliance with ANSI/NSF 61.

Contractor shall submit a Coating System Data Sheet for each separately identified surface in the Metal Surfaces Coating Schedule, Concrete and Masonry Surfaces Coating Schedule, and the Miscellaneous Surfaces Coating Schedule that will be used in the Project, using the appropriate Coating System Data Sheet forms (Figures 1-09940 and 2-09940) at the end of this section. Each field coating system shall be acceptable to the coating material manufacturer.

Coating System Data Sheets shall be assigned a unique number with a prefix letter based on the following:

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Surfaces</th>
<th>Fig. 09940</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Iron and steel (coated entirely in field)</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>Iron and steel (shop primed)</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>Concrete and concrete block</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>Equipment - submerged</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>Equipment – nonsubmerged</td>
<td>2</td>
</tr>
<tr>
<td>F</td>
<td>Nonferrous metal</td>
<td>1</td>
</tr>
<tr>
<td>G</td>
<td>Galvanized</td>
<td>1</td>
</tr>
<tr>
<td>H</td>
<td>High temperature</td>
<td>1</td>
</tr>
<tr>
<td>P</td>
<td>PVC and FRP</td>
<td>1</td>
</tr>
</tbody>
</table>

Each coating system that will be applied entirely in the field shall be assigned only a prefix letter and no suffix letter. Fig. 1-09940 shall be submitted for each surface coated entirely in the field.

Each shop-applied coating system that includes one or more field applied coats shall be assigned both a prefix letter and suffix letter “F”. Fig. 2-09940 shall be submitted for each surface having a shop applied coating and one or more field applied finish coats.

A separate Coating System Data Sheet shall be developed and submitted for each surface scheduled to be coated or variation or change in a coating system. The number identifying the surface and coating system shall be of the form A1.
or A1₂-F. The subscript number shall be assigned by the Contractor so that each surface and coating system combination is uniquely identified. For example:

A1₁-F may be assigned to “Epoxy – one coat to metal curbs for skylights and power roof ventilators that have been shop primed.”

A2₁ may be assigned to “Epoxy – two coats to non-galvanized structural and miscellaneous steel exposed to view inside buildings.”

C2₁ may be assigned to “Epoxy – two coats to all concrete and concrete block in corrosive area (Except floors and surfaces scheduled to receive other coatings) which are exposed to view.”

C2₂ may be assigned to “Epoxy – two coats to walls, floors, and curbed areas, adjacent to corrosive chemical storage and feed equipment as indicated on the Drawings.”

The manufacturer’s standard colors will be acceptable for all coatings.

1-4. QUALITY ASSURANCE.

1-4.01. Coating System Data Sheet Certifications. The coating applicator and coating manufacturer shall review and approve in writing the coating manufacturer’s written recommendations for the coating system and the intended service. Any variations from the Specifications or the coating manufacturers published recommendations shall be submitted in writing and approved by the coating manufacturer.

1-4.02. Special Interior Coating Systems. Specialty coatings in the Microfiltration Area shall be in accordance with the Elastomeric High Solids Urethane and Epoxy Lining Systems Section.

In addition to the requirements for all coating systems, the coating applicator and coating manufacturer shall develop and submit, in writing, the proposed detailed procedures for handling, storing, surface preparation, mixing, and application to verify compliance with this Specification and the coating manufacturer's written recommendations. The procedures shall include copies of the coating manufacturer’s published recommendations and the proposed method for complying with these recommendations and these Specifications. Contractor, coating applicator, and coating manufacturer shall review and approve, in writing, the proposed detail procedures before they are submitted for review.

Contractor and coating manufacturer shall inspect coating application of the appropriate application methods.
PART 2 - PRODUCTS

2-1. ACCEPTABLE MANUFACTURERS.

2-1.01. Alternative Manufacturers. In addition to the coatings listed herein, equivalent products of other manufacturers that distribute globally will also be acceptable.

Sigma Rust-Oleum

2-1.02. Equivalent Coatings. Whenever a coating is specified by the name of a proprietary product or of a particular manufacturer or vendor, it shall be understood as establishing the desired type and quality of coating. Other manufacturers' coatings will be accepted, provided that sufficient information is submitted to enable Engineer to determine that the proposed coatings are equivalent to those named. Information on proposed coatings shall be submitted for review in accordance with the Submittals Procedures section. Requests for review of equivalency will be accepted only from Contractor, and will be considered only after the contract has been awarded.

2-2. MATERIALS. All coatings shall be delivered to the job in original, unopened containers, with labels intact. Coatings shall be stored indoors and shall be protected against freezing. No adulterant, unauthorized thinner, or other material not included in the coating formulation shall be added to the coating for any purpose.

All coatings shall conform to the air quality regulations applicable at the location of use. Coating materials that cannot be guaranteed by the manufacturer to conform, whether or not specified by product designation, shall not be used.

With the exception of heat resistant coatings, the coatings specified have been selected on the basis of the manufacturer's statement that the VOC content of the product is 0.8 lbs per gallon or less; however, it shall be the Contractor's responsibility to use only coating materials that are in compliance with the requirements of all regulatory agencies. Local regulations may require some coatings to have a lower VOC content than specified herein. The coatings specified may meet the VOC limits in the unthinned (as shipped) condition, but may exceed the limits if thinned according to the manufacturer's recommendations. In such case, the coatings shall not be thinned beyond the 0.8 lbs per gallon limit, and if the product cannot be thinned to suit the application method or temperature limits, another manufacturer's coating shall be used, subject to acceptance by Engineer.
Contractor shall be responsible for ensuring the compatibility of field coatings with each other or with any previously applied coatings. Coatings used in successive field coats shall be produced by the same manufacturer. The first field coat over shop coated or previously coated surfaces shall cause no wrinkling, lifting, or other damage to underlying coats.

All coatings used on surfaces that will be in contact with potable or treated water shall be certified as being in compliance with ANSI/NSF 61. Coatings that cannot be so certified, whether or not specified by manufacturer and by product designation, shall not be used.

All intermediate and finish coating materials that will be in contact with wastewater atmosphere shall be guaranteed by the manufacturer to be fumeproof and suitable for wastewater plant atmosphere that contains hydrogen sulfide. Coatings that cannot be so guaranteed shall not be used. Lead-free, chromium-free, and mercury-free coatings shall be used.

2-2.01 Primers.

<table>
<thead>
<tr>
<th>Universal Primer</th>
<th>PPG Amerlock 2/400VOC Tnemec “Series 27 F.C Typoxy”, Carboline &quot;Rustbond&quot;, ICI Devoe &quot;Devran 224HS&quot; International Paint Interseal 1100, or Sherwin-Williams &quot;Macropoxy 646&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc Primer</td>
<td>PPG Dimetcote 21-5 (Inorganic) PPG Amercote 68HSVOC (Epoxy), Carboline &quot;859 VOC Zinc Primer&quot;, ICI Devoe &quot;Catha-Coat 302V&quot;, or Sherwin-Williams &quot;Zinc Clad II Series&quot;</td>
</tr>
<tr>
<td>Epoxy Concrete Block Filler</td>
<td>PPG Amercoat 114A, Carboline &quot;Sanitile 100&quot; or « Carboguard 954HB », ICI Devoe &quot;Tru glaze 4015&quot;, Tnemec &quot;Series 130 Envirofill&quot;, or Sherwin-Williams &quot;Heavy Duty Block Filler B42W46&quot;</td>
</tr>
<tr>
<td>Epoxy Concrete Filler and Surfacer</td>
<td>Tnemec &quot;Series 218 MortarClad&quot;, PPG Amercoat 114A, Carboline &quot;Carboguard 510&quot;, Devoe « Trueglaze 4015 », or Sherwin-Williams &quot;Heavy Duty Block Filler B42W46&quot;</td>
</tr>
</tbody>
</table>
2-2.02. **Intermediate and Finish Coatings.**

**Epoxy (NSF Certified systems)**

<table>
<thead>
<tr>
<th>Surface Type</th>
<th>Coatings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrous Metal Surfaces and Concrete Surfaces in Contact with Treated or Raw Water in Potable Water Facilities</td>
<td>PPG Amercoat &quot;Amerlock 2/400VOC&quot;, Carboline &quot;Phenoline 341 100% Solids Epoxy&quot;, ICI Devoe &quot;233H3502 Low VOC Enviroline 230 NSF&quot; Tnemec &quot;Series L140F Pota-Pox Plus&quot;, or Sherwin-Williams &quot;Macropoxy 646NSF&quot;; immersion service.</td>
</tr>
</tbody>
</table>

**Epoxy Enamel**

<table>
<thead>
<tr>
<th>Surface Type</th>
<th>Coatings</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Surface Type</th>
<th>Coatings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrous Metal Surfaces and Masonry or Concrete Surfaces Other Than Floors</td>
<td>PPG Amercoat &quot;Amercoat 2/400VOC&quot;, Carboline &quot;Carboguard 890VOC&quot;, ICI Devoe International Paint Interseal 2100 Devoe 235V, Tnemec &quot;Series L69 Hi-Build Epoxoline II&quot;, or Sherwin-Williams &quot;Macropoxy 646&quot;.</td>
</tr>
</tbody>
</table>

**Flake-Filled Epoxy**

<table>
<thead>
<tr>
<th>Coatings</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICI Devoe “International Interline 984/985Carboline &quot;Plasite 4500&quot;, Sherwin-Williams &quot;Sher-Glass FF&quot;.</td>
</tr>
</tbody>
</table>

**Aliphatic Polyurethane**

<table>
<thead>
<tr>
<th>Coatings</th>
</tr>
</thead>
</table>

**Coal Tar Epoxy**

<table>
<thead>
<tr>
<th>Coatings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sherwin-Williams &quot; Targuard Coal Tar Epoxy B69&quot;.</td>
</tr>
</tbody>
</table>

**Vinyl Ester**

<table>
<thead>
<tr>
<th>Coatings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tnemec &quot;Series 120 Vinester&quot; Carboline &quot;Plasite 4110&quot; or Sherwin-Williams &quot;Magnaplate Vinyl Ester&quot;, or Ceilcote 232.</td>
</tr>
</tbody>
</table>
Heat-Resistant  Suitable for temperatures up to 400°F;  
PPG Amercoat "Amerlock 2/400VOC",  
International Intertherm 228 Carboline 
"Thermaline 450", or Sherwin-Williams 
"Kem Hi-Temp Heatflexll 450 »".

High Heat-Resistant  Suitable for temperatures up to 1000°F;  
Carboline "Thermaline 4700 VOC", or Sherwin-Williams "Flame Control".

PART 3 - EXECUTION

3-1. SURFACE PREPARATION. All surfaces to be coated shall be clean and dry and shall meet the recommendations of the coating manufacturer for surface preparation. Freshly coated surfaces shall be protected from dust and other contaminants. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss on previously coated surfaces shall be dulled if necessary for proper adhesion of topcoats.

Surfaces shall be free of cracks, pits, projections, or other imperfections that would interfere with the formation of a smooth, unbroken coating film, except for concrete block construction where a rough surface is an inherent characteristic.

When applying touchup coating or repairing previously coated surfaces, the surfaces to be coated shall be cleaned as recommended by the coating manufacturer, and the edges of the repaired area shall be feathered by sanding or wire brushing to produce a smooth transition that will not be noticeable after the coating is applied. All coatings made brittle or otherwise damaged by heat of welding shall be completely removed.

3-1.01. Galvanized Surfaces. Galvanized surfaces shall be prepared for coating according to the instructions of the manufacturer of the epoxy. Any chemical treatment of galvanized surfaces shall be followed by thorough rinsing with clean water.

3-1.02. Ferrous Metal Surfaces. Ungalvanized ferrous metal surfaces shall be prepared for coating by using one or more of the following cleaning procedures specified here-in: solvents (SSPC-SP1); abrasive blasting (SSPC-SP5, -SP10, -SP6, or -SP7) power tools (SSPC-SP3 or -SP11); or hand tools (SSPC-SP2). Oil and grease shall be completely removed in accordance with SSPC-SP1 before beginning any other cleaning method. Surfaces of welds shall be scraped and ground as necessary to remove all slag and weld spatter. Tools which produce excessive roughness shall not be used.
All components of equipment that can be properly prepared and coated after installation shall be installed prior to surface preparation. Components that will be inaccessible after installation shall have the surfaces prepared and coated before installation. Motors, drive trains, and bearings shall be protected during surface preparation in accordance with the equipment manufacturer's recommendations.

All cut or sheared edges shall be ground smooth to a 1/8 inch [3 mm] minimum radius for all material 1/4 inch [6 mm] thickness and larger. For material thickness less than 1/4 inch [6 mm] all cut or sheared edges shall be ground smooth to a radius equal to 1/2 the material thickness. Grinding of rolled edges on standard shapes with a minimum radius of the 1/16 inch [1.5 mm] will not be required.

All ferrous metal surfaces shall have all welds ground smooth and free of all defects in accordance with NACE Standard SP0178, Appendix C, Designation C and sharp edges ground smooth, if not previously prepared in the shop. Instead of blending of the weld with the base metal as required by the NACE standard, it will be acceptable to furnish a welded joint that has a smooth transition of the weld to the base metal. All welds shall be ground smooth to ensure satisfactory adhesion of paint.

The cleaning methods and surface profiles specified herein are minimums, and if the requirements printed in the coating manufacturer's data sheets exceed the limits specified, the value printed on the data sheets shall become the minimum requirement.

3-1.02.01. **Ferrous Metal Surfaces – Non-immersion Service.** Ferrous metal surfaces, including fabricated equipment, in non-immersion service shall be cleaned to the degree recommended by the coating manufacturer for surfaces to be coated with coal tar epoxy, epoxy, and heat-resistant coatings, except galvanized surfaces. Surface preparation of ferrous metal surfaces in non-immersion service shall consist of abrasive blast cleaning to SSPC-SP6, and the first application of coating shall be performed on the same day. If more surface area is prepared than can be coated in one day, the uncoated area shall be blast cleaned again to the satisfaction of Engineer. Surface profile shall be as recommended by coating manufacturer, but not less than 2.0 mils [50 µm].

3-1.02.02. **Ferrous Metal Surfaces - Immersion Service.** Surface preparation of ferrous metal surfaces in immersion service shall consist of abrasive blast cleaning to at least SSPC-SP10 and the first application of coating shall be performed on the same day. If more surface area is prepared than can be coated in one day, the uncoated area shall be blast cleaned again to the satisfaction of Engineer. Surface profile shall be as recommended by coating manufacturer, but not less than 3.5 mils [88 µm].
3-1.03. **Concrete Surfaces.** All concrete surfaces shall be free of objectionable substances and shall meet the coating manufacturer’s recommendations for surface preparation. Concrete surfaces shall be prepared in accordance with SSPC-SP13/NACE 6. Any other surface preparation recommended by the coating material manufacturer shall be brought to Engineer’s attention and may be incorporated into the work if acceptable to Engineer.

All concrete surfaces shall be dry when coated and free from dirt, dust, sand, mud, oil, grease, and other objectionable substances. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started.

New concrete shall have cured for at least 4 weeks before coating is applied as recommended by the material manufacturer. Concrete surfaces shall be tested for capillary moisture in accordance with ASTM D4263. There shall be no capillary moisture when coatings are applied on concrete.

All surfaces to be coated shall be cleaned in accordance with ASTM D4258 and abraded in accordance with ASTM D4259. Surface profile shall be at least 25 percent of the dry film thickness specified for the coating system. Prior to application of the coating, the surfaces shall be thoroughly washed or cleaned by air blasting to remove all dust and residue. Spalled areas, voids, and cracks shall be repaired in accordance with the Concrete section and as acceptable to the Engineer. Fins and other surface projections shall be removed to provide a flush surface before application of coating.

Except where epoxy is applied as damp-proofing, the concrete surfaces, including those with bug holes less than 1 inch [25 mm] in any dimension, shall be prepared as recommended by the manufacturer, using an epoxy concrete filler and surfacer. Where coating with a vinyl ester the concrete filler and surfacer shall be as recommended by the manufacturer to be compatible with vinyl ester.

3-1.04. **Concrete Block Surfaces.** Voids and openings in concrete block surfaces shall be pointed. All exposed exterior surfaces and surfaces to be coated with epoxy, including the joints, shall be filled so that a continuous unbroken coating film is obtained.

3-1.05. **Copper Tubing.** All flux residue shall be removed from joints in copper tubing. Immediately before coating is started, tubing shall be wiped with a clean rag soaked in xylol.

3-1.06. **Plastic Surfaces.** All wax and oil shall be removed from plastic surfaces that are to be coated, including PVC and FRP, by wiping with a solvent compatible with the specified coating.
3-1.07. **Hardware.** Hardware items such as bolts, screws, washers, springs, and grease fittings need not be cleaned prior to coating if there is no evidence of dirt, corrosion, or foreign material.

3-1.08. **Aluminum.** When a coating system is required, remove all oil or deleterious substance with neutral detergent or emulsion cleaner or blast lightly with fine abrasive.

3-1.09. **Stainless Steel.** When a coating system is required, surface preparation shall conform to the coating manufacturer’s recommendations.

3-2. **MIXING AND THINNING.** Coating shall be thoroughly mixed each time any is withdrawn from the container. Coating containers shall be kept tightly closed except while coating is being withdrawn.

Coating shall be factory mixed to proper consistency and viscosity for hot weather application without thinning. Thinning will be permitted only as necessary to obtain recommended coverage at lower application temperatures. In no case shall the wet film thickness of applied coating be reduced, by addition of coating thinner or otherwise, below the thickness recommended by the coating manufacturer. Thinning shall be done in compliance with all applicable air quality regulations.

3-3. **APPLICATION.** Coating shall be applied in a neat manner that will produce an even film of uniform and proper thickness, with finished surfaces free of runs, sags, ridges, laps, and brush marks. Each coat shall be thoroughly dry and hard before the next coat is applied. Each coat shall be a different color, if available. In no case shall coating be applied at a rate of coverage greater than the maximum rate recommended by the coating manufacturer.

Coating failures will not be accepted and shall be entirely removed down to the substrate and the surface recoated. Failures include but are not limited to sags, checking, cracking, teardrops, fat edges, fisheyes, or delamination.

3-3.01. **Priming.** Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) of primer before application of the primer coat. The stripe coat shall be applied by a brush and worked in both directions. Special attention shall be given to filling all crevices with coating. When using zinc primers the stripe coat shall follow the initial prime coat.

Abraded and otherwise damaged portions of shop-applied coating shall be cleaned and recoated as recommended by the manufacturer of the finish coating. Welded seams and other uncoated surfaces, heads and nuts of field-installed bolts, and surfaces where coating has been damaged by heat shall be given a brush coat of the specified primer. Before the specified spot or touchup coating of metal surfaces, edges, corners, crevices, welds, and bolts in the area of the
spot or touchup coating shall be given a brush coat of primer. This patch, spot, or touchup coating shall be completed, and the paint film shall be dry and hard, before additional coating is applied.

3-3.02. **Epoxy.** When used, epoxy shall be applied in accordance with the coating manufacturer's recommendations, including temperature limitations and protection from sunlight until top-coated.

When concrete is to be coated, coatings shall not be applied to concrete surfaces in direct sunlight or when the temperature of the concrete is rising. Preferably the coating shall be applied when the temperature of the concrete is dropping.

When applying high build epoxy coatings with a roller or brush and where a dry film thickness of at least 4-6 mils [100-150 µm] per coat is required, two or more coats shall be applied to achieve the recommended dry film thickness equal to a spray applied coating.

3-3.03. **Coal Tar Epoxy.** When used, the application of coal tar epoxy, including time limits for recoating, shall conform to the recommendations of the coating manufacturer.

When concrete is to be coated, coatings shall not be applied to concrete surfaces in direct sunlight or when the temperature of the concrete is rising. Preferably the coating shall be applied when the temperature of the concrete is dropping.

3-3.04. **Vinyl Ester.** When used, the application of vinyl ester coating system, including time limits for recoating and temperature requirements of the materials, shall conform to the recommendations of the coating manufacturer.

3-3.05. **Film Thickness.** The total coating film thickness including intermediate coats and finish coat, shall be not less than the following:

<table>
<thead>
<tr>
<th>Type of Coating</th>
<th>Minimum Dry Film Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium consistency coal tar</td>
<td>20 mils [500 µm].</td>
</tr>
<tr>
<td>Coal tar epoxy (two coats)</td>
<td>20 mils [500 µm].</td>
</tr>
<tr>
<td>Epoxy</td>
<td></td>
</tr>
<tr>
<td>Floors (two coats)</td>
<td>10 mils [250 µm].</td>
</tr>
<tr>
<td>Surfaces with first coat of epoxy and final coat of aliphatic polyurethane</td>
<td>7 mils [175 µm] (5 mils [125 µm] DFT for epoxy plus 2 mils [50 µm] DFT for aliphatic polyurethane).</td>
</tr>
<tr>
<td>Surfaces with first and second coat of epoxy and final coat of aliphatic polyurethane</td>
<td>12 mils [300 µm] (10 mils [250 µm] DFT for epoxy plus 2 mils [50 µm] DFT for aliphatic polyurethane).</td>
</tr>
<tr>
<td>Other surfaces (two coats)</td>
<td>10 mils [250 µm].</td>
</tr>
<tr>
<td>Immersion service (three coats)</td>
<td>15 mils [375 µm].</td>
</tr>
</tbody>
</table>
### Type of Coating
<table>
<thead>
<tr>
<th></th>
<th>Minimum Dry Film Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flake-filled epoxy (two coats)</td>
<td>30 mils [750 µm].</td>
</tr>
<tr>
<td>Vinyl ester</td>
<td>30 mils [750 µm].</td>
</tr>
<tr>
<td>Zinc, epoxy, polyurethane</td>
<td></td>
</tr>
<tr>
<td>Surfaces with first coat of zinc,</td>
<td>10 mils [250 µm].</td>
</tr>
<tr>
<td>intermediate coat of epoxy, and</td>
<td>3 mils [75 µm] zinc</td>
</tr>
<tr>
<td>final coat of aliphatic</td>
<td>5 mils [125 µm] epoxy,</td>
</tr>
<tr>
<td>polyurethane</td>
<td>plus 2 mils [50 µm]</td>
</tr>
<tr>
<td>Heat-resistant (silicone)</td>
<td>3 mils [75 µm].</td>
</tr>
<tr>
<td>High heat-resistant (silicone)</td>
<td>3 mils [75 µm].</td>
</tr>
<tr>
<td>Other (one coat)</td>
<td>5 mils [125 µm].</td>
</tr>
<tr>
<td>Other (two coats)</td>
<td>10 mils [250 µm].</td>
</tr>
</tbody>
</table>

3-3.06. **Weather Conditions.** Coatings shall not be applied, except under shelter, during wet, damp, or foggy weather, or when windblown dust, dirt, debris, or insects will collect on freshly applied coating.

Coatings shall not be applied at temperatures lower than the minimum temperature recommended by the coating manufacturer, or to metal surfaces such as tanks or pipe containing cold water, regardless of the air temperature, when metal conditions are likely to cause condensation. When necessary for proper application, a temporary enclosure shall be erected and kept heated until the coating has fully cured.

Coatings shall not be applied at temperatures higher than the maximum temperature recommended by the coating manufacturer. Where coatings are applied during periods of elevated ambient temperatures, Contractor and the coatings manufacturer shall be jointly responsible to ensure that proper application is performed including adherence to all re-coat window requirements. Precautions shall be taken to reduce the temperature of the surface application, especially for metal, at elevated temperatures above 100°F including shading application area from direct sunlight, applying coating in the evening or at night, and ventilating the area to reduce the humidity and temperature,

Vinyl ester coating materials, when required, shall be maintained during transportation, storage, mixing, and application at the temperature required by the coating manufacturer, 35°F to 90°F.

3-4. **REPAIRING FACTORY FINISHED SURFACES.** Factory finished surfaces damaged prior to acceptance by Owner shall be spot primed and recoated with materials equivalent to the original coatings. If, in the opinion of Engineer, spot repair of the damaged area is not satisfactory, the entire surface or item shall be recoated.

3-5. **PROTECTION OF SURFACES.** Throughout the work Contractor shall use drop cloths, masking tape, and other suitable measures to protect adjacent...
surfaces. Contractor shall be responsible for correcting and repairing any damage resulting from its or its subcontractors’ operations. Coatings spilled or spattered on adjacent surfaces which are not being coated at the time shall be immediately removed. Exposed concrete or masonry not specified to be coated which is damaged by coatings shall be either removed and rebuilt or, where authorized by Owner, coated with two coats of masonry coating.

3-6. FIELD QUALITY CONTROL. The following inspection and testing shall be performed: surface profile, visual inspection, and wet and dry film thickness testing. All inspection and testing shall be witnessed by Engineer.

3-6.01. Surface Profile Testing. The surface profile for ferrous metal surfaces shall be measured for compliance with the specified minimum profile. The surface profile for concrete shall comply with SSPC 13/NACE 6 Table 1 for severe service.

3-6.02. Visual Inspection. The surface of the protective coatings shall be visually inspected.

3.6.03. Film Thickness. Coating film thickness shall be verified by measuring the film thickness of each coat as it is applied and the dry film thickness of the entire system. Wet film thickness shall be measured with a gauge that will measure the wet film thickness within an accuracy of ±0.5 mil [12.5 µm]. Dry film thickness shall be measured in accordance with SSPC-PA 2.


3-6.05. Adhesion Testing. Not required.

3-7. FIELD PRIMING SCHEDULE. In general, steel and cast iron surfaces of equipment are specified to be shop primed. Any such surfaces which have not been shop primed shall be field primed. Damaged or failed shop coatings which have been determined unsuitable by Engineer shall be removed and the surfaces shall be field coated, including prime coat (if any). Galvanized, aluminum, stainless steel, and insulated surfaces shall be field primed. Primers used for field priming, unless otherwise required for repair of shop primers, shall be:

<table>
<thead>
<tr>
<th>Surface To Be Primed</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Universal primer.</td>
</tr>
<tr>
<td>Equipment, surfaces</td>
<td>Same as finish coats.</td>
</tr>
<tr>
<td>to be coated with</td>
<td>Same as finish coats.</td>
</tr>
<tr>
<td>Aliphatic polyurethane</td>
<td></td>
</tr>
<tr>
<td>Epoxy</td>
<td></td>
</tr>
<tr>
<td>Coal tar coating</td>
<td></td>
</tr>
</tbody>
</table>

Orange County Water District
Groundwater Replenishment System
Final Expansion
09940 PROTECTIVE COATINGS
-13- August 2018
DS2 Submittal
Surface To Be Primed | Material
--- | ---
Vinyl ester | Same as finish coats.
Steel and cast iron, surfaces to be coated with | Same as finish coats or inorganic zinc.
Epoxy | Same as finish coats.
Coal tar coating | Epoxy.
Aluminum | Epoxy.
Galvanized | Epoxy.
Copper | Epoxy.
Stainless steel | Epoxy.
Plastic surfaces, including PVC and FRP | As recommended by manufacturer of finish coats.
Insulated piping | Concrete, surfaces to be coated with epoxy
For damp-proofing | Epoxy.
For all other surfaces | Epoxy concrete filler and surfacer.
Concrete block exposed in exterior locations | Epoxy concrete block filler.
Concrete block to be coated with epoxy | Epoxy concrete block filler.

Unless otherwise recommended by the coating manufacturer or specified herein, priming will not be required on concrete, or concrete block, nor on metal surfaces specified to be coated with coal tar epoxy, and heat-resistant coatings. Concrete surfaces to be coated with epoxy shall be filled with epoxy concrete filler and surfacer so that a continuous film is obtained, except where concrete is damp-proofed with epoxy.

3-8. **FINISH COATING SYSTEMS.** The following schedule lists coatings systems and coating surface designations. See Article 1-3 for a definition of the surface designations.

<table>
<thead>
<tr>
<th>No.</th>
<th>Finish Coating Systems</th>
<th>Coating Surface Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>1.</td>
<td>Epoxy – One coat</td>
<td>x</td>
</tr>
<tr>
<td>2.</td>
<td>Epoxy – Two coats</td>
<td>x</td>
</tr>
<tr>
<td>3.</td>
<td>Epoxy / NSF – Two coats</td>
<td>x</td>
</tr>
<tr>
<td>No.</td>
<td>Finish Coating Systems</td>
<td>Coating Surface Designation</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>4.</td>
<td>Epoxy – Three coats</td>
<td>x</td>
</tr>
<tr>
<td>5.</td>
<td>Epoxy / NSF – Three coats</td>
<td>x</td>
</tr>
<tr>
<td>6.</td>
<td>Epoxy – First coat</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Aliphatic polyurethane – Finish coat</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Epoxy – First and second coat</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Aliphatic polyurethane – Finish coat</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Universal primer – First coat</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Aliphatic polyurethane – Finish coat</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Medium consistency coal tar – Two coats</td>
<td>x</td>
</tr>
<tr>
<td>10.</td>
<td>Coal tar epoxy – Two coats</td>
<td>x</td>
</tr>
<tr>
<td>11.</td>
<td>Vinyl ester – Two coats</td>
<td>x</td>
</tr>
<tr>
<td>12.</td>
<td>Heat resistant – Two coats</td>
<td>x</td>
</tr>
<tr>
<td>13.</td>
<td>High heat resistant – Two coats</td>
<td>x</td>
</tr>
<tr>
<td>14.</td>
<td>Zinc primer – First coat</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Epoxy – Intermediate coat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aliphatic polyurethane – Final coat</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Flake-filled epoxy</td>
<td>x</td>
</tr>
</tbody>
</table>

3-8.01. **Surfaces Not To Be Coated.** Unless otherwise specified, the following surfaces shall be left uncoated:

- Exposed aluminum, except ductwork.
- Polished or finished stainless steel. Unfinished stainless steel, except flashings and counter flashings, shall be coated.
- Nickel or chromium.
- Galvanized surfaces, except piping, conduit, ductwork, and other items specifically noted.
- Rubber and plastics, except as specified.
- Exterior concrete.
- FRP wastewater troughs.
- Surfaces specified to be factory finished.
3-8.02. **Shop Finishing.** Items to be shop finished include the following. Shop finishing shall be in accordance with the coating manufacturer’s recommendations.

   a. All slide gates.
   b. All conveyors.
   c. Other surfaces where blast cleaning cannot be or is not recommended to be performed in the field.
   d. Other items as otherwise specified.

3-8.03. **Field Coating.** Items to be field coated include the following. Field coating shall be in accordance with the field priming schedule, the coating schedule, and the manufacturer’s recommendations.

   a. Surfaces not indicated to be shop finished and surfaces where blast cleaning can be performed in the field.
   b. Other items as otherwise specified.

3-9. **METAL SURFACES COATING SCHEDULE.**

<table>
<thead>
<tr>
<th>Surface To Be Coated</th>
<th>Finish Coating System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-galvanized structural and miscellaneous steel exposed to view or to the elements in exterior locations.</td>
<td>A6</td>
</tr>
<tr>
<td>Non-galvanized structural and miscellaneous steel exposed to view inside buildings.</td>
<td>A2</td>
</tr>
<tr>
<td>Unless otherwise specified, pumps, motors, speed reducers, and other machines and equipment exposed to view.</td>
<td>E8</td>
</tr>
<tr>
<td>Actuator surfaces for sluice gates, slide gates, control weirs, unless factory finished.</td>
<td>Outdoor – E8</td>
</tr>
<tr>
<td></td>
<td>Indoor – E8</td>
</tr>
<tr>
<td>Exterior of elevator car, car frame, and enclosure.</td>
<td>A1</td>
</tr>
<tr>
<td>Interior of elevator car, car gates, and hoistway doors and frames.</td>
<td>A1</td>
</tr>
<tr>
<td>Elevator guiderails and structural steel in hoistway.</td>
<td>A2</td>
</tr>
</tbody>
</table>
Surface To Be Coated

Heating and air conditioning units, convector covers, electrical equipment cabinets, and similar Items and equipment (unless factory finished) exposed to view.

Surfaces of cranes and hoists exposed to view indoors.

Surfaces of cranes and hoists exposed to the elements outdoors.

Steel yard lighting poles exposed to view or to the elements.

Cast Iron and steel piping inside buildings, including piping to be insulated, valves, fittings, flanges, bolts, supports, and accessories, and galvanized surfaces after proper priming.

Cast Iron and steel piping in immersion service including inside buildings, including valves, fittings, flanges, bolts, supports, and accessories, and galvanized surfaces after proper priming.

Cast Iron and steel piping above grade exposed to the elements and to view outdoors, including piping to be insulated, valves, fittings, flanges, bolts, supports, and accessories, and galvanized surfaces after proper priming.

Copper pipe and tubing, including fittings and valves.

Copper pipe and tubing, including fittings and valves exposed to view in exterior locations.

Enclosed type screw pumping equipment, all iron and steel exterior surfaces exposed to UV except stainless steel, motors, and speed reducers.

Finish Coating System

E8

E2

E6

A8

A2

A4

A6

F2

F6

E7
Surface To Be Coated

Finish Coating System

Open type screw pumping equipment, all iron and steel exterior surfaces exposed to UV except stainless steel, motors, and speed reducers.

Open type screw pumping equipment, all iron and steel interior surfaces including the screw surfaces except stainless steel, motors, and speed reducers.

Basin launders, troughs, weir plates, and accessories.

Rapid mix equipment, all iron and steel surfaces except stainless steel, motors, and speed reducers.

Surface aeration equipment, all iron and steel surfaces except stainless steel, motors, and speed reducers.

All metal surfaces, unless otherwise specified, which will be submerged or buried, all or in part, including valves, and scum baffles, and cast iron slide gates, but excluding piping laid in the ground.

All fully or partially submerged surfaces of screening, grit removal, aeration mixing, and sludge mixing equipment.

Miscellaneous castings, including manhole rings and covers, and manhole steps. (One coat, if not shop coated.)

Cast iron and steel piping in manholes, wetwells, grit basin, aeration basin, and similar locations, including valves fittings, flanges, bolts, supports, and accessories.

All metal harness anchorage for buried piping.

Exterior surfaces of extension hoppers and accessories for chemical feeders.

Exterior surfaces of carbon steel chemical tanks.
Surface To Be Coated | Finish Coating System
---|---
Supports and miscellaneous metal for equipment handling corrosive chemicals. | Outdoor – A6, Indoor – A2
Aluminum in contact with concrete. | F1
Boiler breeching and other surfaces which will be hot during operation. | H13
Pneumatic conveyor piping. | H12
Aluminum and galvanized ductwork and conduit indoors. | F1 or G1
Aluminum and galvanized ductwork and conduit exposed to elements outdoors. | F6 or G6
Aluminum materials exposed to the elements outdoors. | F6

3-10. CONCRETE AND MASONRY SURFACES COATING SCHEDULE.

Surface To Be Coated | Finish Coating System
---|---
All concrete and concrete block in corrosive area (Except floors and surfaces scheduled to receive other coatings) which are exposed to view. | Indoor – C2
Outdoor – C7
Where indicated on the Drawings, walls, floors, and curbed areas, adjacent to corrosive chemical storage and feed equipment. | C2

3-11. MISCELLANEOUS SURFACES COATING SCHEDULE.

Plastic Surfaces, including PVC and FRP. | Outdoor – P6
Indoor – P2
Piping Insulation | Outdoor – P6
Indoor – P2

3-12. PIPING IDENTIFICATION SCHEDULE. Exposed piping and piping in accessible chases shall be identified with lettering or tags designating the service of each piping system, marked with flow directional arrows, and color coded.

Piping scheduled to be color coded shall be completely coated with the indicated colors, except surfaces specified to remain uncoated shall include sufficiently
long segments of the specified color to accommodate the lettering and arrows. All other piping shall be coated to match adjacent surfaces, unless otherwise directed by Engineer.

3-12.01. Location. Lettering and flow direction arrows shall be provided on pipe near the equipment served, adjacent to valves, on both sides of wall and floor penetrations, at each branch or tee, and at least every 50 feet [15 m] in straight runs of pipe. If, in the opinion of Engineer, this requirement will result in an excessive number of labels or arrows, the number required shall be reduced as directed.

3-12.02. Metal Tags. Where the outside diameter of pipe or pipe covering is 5/8 inch [15 mm] or smaller, aluminum or stainless steel tags shall be provided instead of lettering. Tags shall be stamped as specified and shall be fastened to the pipe with suitable chains. Pipe identified with tags shall be color coded as specified.

3-12.03. Lettering. Lettering shall be painted or stenciled on piping or shall be applied as snap-on markers. Snap-on markers shall be plastic sleeves, Brady "Bradysnap-On B-915", Seton "Setmark", or equal. Letter size shall be as follows:

<table>
<thead>
<tr>
<th>Outside Diameter of Pipe or Covering</th>
<th>Minimum Height of Letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8 inch [15 mm] and smaller</td>
<td>Metal tags -1/4 inch [6 mm]</td>
</tr>
<tr>
<td>3/4 to 4 inches [20 to 100 mm]</td>
<td>3/4 inch [20 mm]</td>
</tr>
<tr>
<td>5 inches [125 mm] and larger</td>
<td>2 inches [50 mm]</td>
</tr>
</tbody>
</table>

3-12.04. Color Coding and Lettering. All piping for the following services shall be color coded. Bands shall be 6 inches [150 mm] wide spaced along the pipe at 5 foot [1.5 m] intervals. For services not listed, the color coding and lettering shall be as directed by the Engineer.

<table>
<thead>
<tr>
<th>Piping Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service</td>
</tr>
<tr>
<td>Ammonia</td>
</tr>
<tr>
<td>Chilled Water (supply or return)</td>
</tr>
<tr>
<td>Compressed Air</td>
</tr>
</tbody>
</table>

Orange County Water District
Groundwater Replenishment System
Final Expansion
<table>
<thead>
<tr>
<th>Service</th>
<th>Color of Pipe</th>
<th>Color of Letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distilled Water</td>
<td>Light Blue with white bands</td>
<td>Red</td>
</tr>
<tr>
<td>Drain</td>
<td>Dark gray</td>
<td>White</td>
</tr>
<tr>
<td>Filtrate</td>
<td>Dark gray with red bands</td>
<td>White</td>
</tr>
<tr>
<td>Fire Protection Water</td>
<td>Red</td>
<td>White</td>
</tr>
<tr>
<td>Fuel Oil</td>
<td>Black</td>
<td>White</td>
</tr>
<tr>
<td>Gasoline</td>
<td>Black with red bands</td>
<td>White</td>
</tr>
<tr>
<td>Grease</td>
<td>Black with yellow bands</td>
<td>White</td>
</tr>
<tr>
<td>Grey Water</td>
<td>Purple</td>
<td>Black(^1)</td>
</tr>
<tr>
<td>Heated Sludge</td>
<td>Light brown with yellow bands</td>
<td>White</td>
</tr>
<tr>
<td>Heating Water (supply or return)</td>
<td>Light gray with black bands</td>
<td>Black</td>
</tr>
<tr>
<td>Instrument Air</td>
<td>Light green with dark green bands</td>
<td>Black</td>
</tr>
<tr>
<td>Laboratory Special Gases</td>
<td>Match adjacent surface</td>
<td>Black</td>
</tr>
<tr>
<td>Laboratory Vacuum</td>
<td>Dark green with light green bands</td>
<td>Red</td>
</tr>
<tr>
<td>Low Pressure Air (aeration supply)</td>
<td>Light green</td>
<td>Black</td>
</tr>
<tr>
<td>Natural Gas Or Propane Gas</td>
<td>Yellow with red bands</td>
<td>Black</td>
</tr>
<tr>
<td>Nonpotable Water (downstream of backflow preventer)</td>
<td>Light blue with white bands</td>
<td>Black(^2)</td>
</tr>
<tr>
<td>Odor Control – Indoors</td>
<td>Dark green with light brown bands</td>
<td>White</td>
</tr>
<tr>
<td>Odor Control – Outdoors</td>
<td>White</td>
<td>Black</td>
</tr>
<tr>
<td>Oil – Hydraulic</td>
<td>Black with white bands</td>
<td>White</td>
</tr>
<tr>
<td>Plumbing Vents</td>
<td>Dark gray</td>
<td>White</td>
</tr>
<tr>
<td>Polyaluminum Chloride</td>
<td>Light brown with red bands</td>
<td>White</td>
</tr>
<tr>
<td>Polymer</td>
<td>Light brown with gray bands</td>
<td>Black</td>
</tr>
<tr>
<td>Potable Water (hot or cold)</td>
<td>Light blue</td>
<td>Black</td>
</tr>
</tbody>
</table>
## Piping Identification

<table>
<thead>
<tr>
<th>Service</th>
<th>Color of Pipe</th>
<th>Color of Letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium Permanganate</td>
<td>Orange with white bands</td>
<td>Black</td>
</tr>
<tr>
<td>Sample</td>
<td>Light gray with green bands</td>
<td>Black</td>
</tr>
<tr>
<td>Service Water</td>
<td>Dark blue with red bands</td>
<td>White</td>
</tr>
<tr>
<td>Settled Sewage Service Water</td>
<td>Dark blue with orange bands</td>
<td>White</td>
</tr>
<tr>
<td>Sludge</td>
<td>Light brown</td>
<td>White</td>
</tr>
<tr>
<td>Sodium Bisulfite</td>
<td>Light brown with orange bands</td>
<td>White</td>
</tr>
<tr>
<td>Sodium Hydroxide (caustic)</td>
<td>Yellow with green bands</td>
<td>Black</td>
</tr>
<tr>
<td>Sulfuric Acid</td>
<td>Yellow with red bands</td>
<td>Black</td>
</tr>
<tr>
<td>Vacuum Pump Discharge</td>
<td>Aluminum</td>
<td>Black</td>
</tr>
<tr>
<td>Zinc Orthophosphate</td>
<td>Light Brown with Blue bands</td>
<td>Black</td>
</tr>
</tbody>
</table>

### Notes:

1. Lettering shall read, “CAUTION: NONPOTABLE WATER, DO NOT DRINK.”.
2. Lettering shall be on a yellow background and shall read, “CAUTION: NONPOTABLE WATER, DO NOT DRINK.”. Each outlet on the nonpotable water line shall be similarly labeled.
3. Lettering shall read, “CAUTION: RECLAIMED WATER, DO NOT DRINK”.
4. Lettering shall be on a light green background.

Electrical conduit shall be coated to match adjacent ceiling or wall surfaces as directed by Engineer. Vent lines shall be coated to match surfaces they adjoin.

In addition, special coating of the following items will be required:

<table>
<thead>
<tr>
<th>Item</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve handwheels and levers</td>
<td>Red</td>
</tr>
<tr>
<td>Hoist hooks and blocks</td>
<td>Yellow and black stripes</td>
</tr>
</tbody>
</table>

Numerals at least 2 inches high shall be painted on or adjacent to all accessible valves, pumps, flowmeters, and other items of equipment which are identified on the Drawings or in the Specifications by number.

End of Section
<table>
<thead>
<tr>
<th>SURFACE DESCRIPTION</th>
<th>SYSTEM NO. -</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>SURFACE PREPARATION DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Solvent SSPC-SP1</td>
</tr>
<tr>
<td>□ Ferrous Metal Nonimmersion SSPC-SP6</td>
</tr>
<tr>
<td>□ Ferrous Metal Immersion</td>
</tr>
<tr>
<td>□ SSPC-SP10</td>
</tr>
<tr>
<td>□ SSPC-SP-5</td>
</tr>
<tr>
<td>□ Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COATING</th>
<th>DFT mils</th>
<th>MANUFACTURER AND PRODUCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Coat (Primer)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second Coat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third Coat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total System</td>
<td>Not less than minimum thickness specified.</td>
<td></td>
</tr>
</tbody>
</table>

Notes: (Attached if needed.)

Project:
Coatings Manufacturer: Initials ______
Painting Applicator: Initials ______

BLACK & VEATCH COATING SYSTEM DATA SHEET Fig 1-09940
THIS PAGE LEFT BLANK INTENTIONALLY
<table>
<thead>
<tr>
<th>SHOP PRIMED SURFACE DESCRIPTION</th>
<th>SYSTEM NO.</th>
<th>-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURFACE PREPARATION DESCRIPTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Solvent SSPC-SP1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COATING</th>
<th>DFT mils</th>
<th>MANUFACTURER AND PRODUCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shop (Primer)</td>
<td></td>
<td>(Identify Product/Type)</td>
</tr>
<tr>
<td>Touchup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate Coat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finish Coat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total System</td>
<td></td>
<td>Not less than minimum thickness specified.</td>
</tr>
</tbody>
</table>

Notes: (Attached if needed.)

Project:
Coatings Manufacturer: __________
Painting Applicator: __________

BLACK & VEATCH
COATING SYSTEM DATA SHEET
Fig 2-09940
DIVISION 10 – Specialties