SAN JUAN WATER DISTRICT

WATER TREATMENT PLANT
RESIDUALS AREA STORMWATER LIFT STATION PROJECT

CONTRACT DOCUMENTS

CONFORMED FOR CONSTRUCTION
ISSUED FEBRUARY 2020

Prepared By:

SAN JUAN WATER DISTRICT
9935 Auburn Folsom Road,
Granite Bay, California, 95746
Phone • (916) 791-6939
Facsimile • (916) 791-6989
# PUBLIC WORKS BID AND CONTRACT DOCUMENTS

## TABLE OF CONTENTS

1. **BIDDING REQUIREMENTS**
   - **1.1 INVITATION TO BID**
   - **1.2 BID**
   - **1.3 BID SCHEDULE**
   - **1.4 DESIGNATION OF SUBCONTRACTORS**
   - **1.5 BID BOND**
   - **1.6 EXPERIENCE QUALIFICATIONS**
   - **1.7 NONCOLLUSION DECLARATION TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID (PUBLIC CONTRACT CODE SECTION 7106)**
   - **1.8 ACKNOWLEDGMENT OF INSURANCE REQUIREMENTS**
   - **1.9 IRAN CONTRACTING ACT CERTIFICATION**

2. **CONTRACT FORMS**
   - **2.1 CONTRACT**
   - **2.2 FAITHFUL PERFORMANCE BOND**
   - **2.3 PAYMENT BOND**
   - **2.4 CONTRACTOR'S WORKERS' COMPENSATION CERTIFICATE (LABOR CODE SECTION 1861)**

3. **ABBREVIATIONS AND DEFINITIONS**
   - **3.1 ABBREVIATIONS**
   - **3.2 DEFINITIONS**

4. **INSTRUCTIONS TO BIDDERS**
   - **4.1 INTRODUCTION**
   - **4.2 PLANS**
   - **4.3 LOCAL CONDITIONS**
   - **4.4 FORM OF BID AND SIGNATURE**
   - **4.5 SUBMISSION OF BIDS**
   - **4.6 PREPARATION OF THE BID**
   - **4.7 BID GUARANTEE**
   - **4.8 LIST OF SUBCONTRACTORS; SUBCONTRACTING LIMITS**
   - **4.9 INTERPRETATION OF CONTRACT DOCUMENTS**
4.10 MODIFICATION OF BIDS ................................................................. 4-5
4.11 WITHDRAWAL AND RETURN OF BIDS .................................... 4-5
4.12 DISCREPANCIES ........................................................................ 4-5
4.13 SERVICING AND MAINTENANCE ............................................. 4-6
4.14 DISQUALIFICATION OF BIDDERS ............................................. 4-6
4.15 AWARD OF CONTRACT ............................................................... 4-6
4.16 CONTRACT BONDS .................................................................... 4-6
4.17 EXECUTION OF CONTRACT ......................................................... 4-7
4.18 RETURN OF BID GUARANTEES ................................................ 4-8
4.19 POWER OF ATTORNEY .............................................................. 4-8
4.20 TIME OF COMPLETION ............................................................... 4-8
4.21 LICENSING REQUIREMENTS FOR CONTRACTORS ................. 4-8
4.22 PREVAILING WAGES ................................................................. 4-8
4.23 BID PROTEST ............................................................................ 4-8
4.24 INELIGIBLE CONTRACTORS AND SUBCONTRACTORS .......... 4-9
4.25 AUDIT OF BID DOCUMENTS ..................................................... 4-9
4.26 SUBSTITUTIONS DURING BIDDING ........................................ 4-9

5 GENERAL CONDITIONS ................................................................. 5-1
5.1 INTENT OF CONTRACT DOCUMENTS/MEANS AND METHODS .... 5-1
5.2 CONTRACTOR’S UNDERSTANDING ............................................. 5-1
5.3 CHANGES IN THE WORK ............................................................. 5-2
5.4 CLAIMS AND RESOLUTION OF DISPUTES ................................. 5-5
5.5 GUARANTEE ............................................................................... 5-11
5.6 AUTHORITY OF THE ENGINEER .................................................. 5-11
5.7 DRAWINGS .................................................................................. 5-12
5.8 CONSTRUCTION STAKING AND SURVEYS ................................. 5-13
5.9 PERMITS AND REGULATIONS .................................................... 5-14
5.10 CONFORMITY WITH CONTRACT DOCUMENTS ......................... 5-14
5.11 COORDINATION & INTERPRETATION OF CONTRACT DOCUMENTS 5-14
5.12 SUBCONTRACTS .................................................................... 5-15
5.13 COOPERATION OF CONTRACTORS ......................................... 5-15
5.14 SUPERINTENDENCE ................................................................ 5-16
5.15 INSPECTION OF WORK ................................................................. 5-16
5.16 TESTS ......................................................................................... 5-18
5.17 REMOVAL OF REJECTED/UNAUTHORIZED WORK AND MATERIALS .. 5-18
5.18 DEDUCTIONS FOR UNCORRECTED WORK ..................................... 5-19
5.19 EQUIPMENT AND PLANTS ......................................................... 5-19
5.20 CHARACTER OF WORKER .......................................................... 5-19
5.21 SEPARATE CONTRACTS ............................................................... 5-19
5.22 MATERIALS ................................................................................ 5-20
5.23 STORAGE OF MATERIALS; STORAGE AREAS ............................... 5-20
5.24 TRADE NAMES AND ALTERNATIVES ............................................ 5-20
5.25 CERTIFICATES OF COMPLIANCE .................................................. 5-21
5.26 ASSIGNMENT .............................................................................. 5-21
5.27 DISTRICT ENTRY ON WORK SITE; RIGHT TO OPERATE UNSATISFACTORY EQUIPMENT OR FACILITIES ................................. 5-22
5.28 LANDS FOR WORK; RIGHTS OF WAY; CONSTRUCTION ROADS; TEMPORARY UTILITY SERVICES .............................................. 5-22
5.29 PROGRESS SCHEDULE ................................................................ 5-23
5.30 COMMENCEMENT AND PROGRESS OF THE WORK AND TIME OF COMPLETION; CONSTRUCTION SEQUENCE; DELAYS .................. 5-23
5.31 SUSPENSION OF WORK ............................................................... 5-27
5.32 TERMINATION FOR DEFAULT; DAMAGES FOR DELAY; TIMELY EXTENSION ........................................................................... 5-28
5.33 RIGHTS OF DISTRICT UPON TERMINATION .................................... 5-30
5.34 FAILURE TO COMPLETE THE WORK IN THE TIME AGREED UPON; LIQUIDATED DAMAGES .............................................................. 5-31
5.35 CLEAN UP .................................................................................... 5-32
5.36 COMPLIANCE WITH LAWS; PERMITS; TAXES .............................. 5-32
5.37 PREVAILING WAGE PENALTIES; WAGE CLAIMS PROHIBITED ...... 5-33
5.38 LABOR DISCRIMINATION ................................................................ 5-33
5.39 EIGHT HOUR DAY LIMITATION; CERTIFIED PAYROLL REPORTS ................................. 5-34
5.40 EMPLOYMENT OF APPRENTICES .................................................. 5-35
5.41 WATER POLLUTION ...................................................................... 5-35
5.42 PATENTS ....................................................................................... 5-35
5.43 PUBLIC CONVENIENCE ................................................................. 5-35
5.44 UNDERGROUND UTILITIES ..................................................... 5-36
5.45 SAFETY AND TRENCHING ......................................................... 5-36
5.46 PROTECTION OF PERSON AND PROPERTY ............................. 5-39
5.47 HAZARDOUS MATERIALS; HAZARD COMMUNICATION .......... 5-40
5.48 RESPONSIBILITY FOR REPAIR OF FACILITIES ..................... 5-41
5.49 DISTRICT'S REPAIR ................................................................. 5-41
5.50 CONTRACTOR'S LICENSE NOTICE ......................................... 5-41
5.51 PUBLIC WORKS CONTRACTOR REGISTRATION .................... 5-41
5.52 INSURANCE ................................................................................. 5-42
5.53 INDEMNITY AND DEFENSE OBLIGATION ................................. 5-45
5.54 PROTECTION OF WORK ............................................................ 5-46
5.55 ACCIDENTS ................................................................................. 5-48
5.56 NO PERSONAL LIABILITY .......................................................... 5-48
5.57 MEASUREMENT OF QUANTITIES ............................................ 5-48
5.58 SCOPE OF PAYMENT ................................................................. 5-48
5.59 PROGRESS ESTIMATE ............................................................... 5-49
5.60 PROGRESS PAYMENTS .............................................................. 5-49
5.61 COMPLETION AND FINAL ACCEPTANCE ................................. 5-54
5.62 FINAL PAYMENT ....................................................................... 5-56
5.63 FINAL RELEASE ......................................................................... 5-56
5.64 RIGHT TO WITHHOLD PAYMENTS ........................................... 5-60
5.65 WAIVER OF INTEREST ............................................................... 5-60
5.66 SATISFACTION OF CLAIMS AND LIENS .................................. 5-60
5.67 ASSIGNMENT ............................................................................. 5-61
5.68 AVAILABILITY AND AUDIT OF INFORMATION ....................... 5-61
5.69 INTEGRATION ............................................................................. 5-62
5.70 WAIVER ....................................................................................... 5-62
5.71 REMEDIES NOT EXCLUSIVE .................................................... 5-62
5.72 SEVERABILITY ............................................................................. 5-62
5.73 GOVERNING LAW AND VENUE .............................................. 5-62
5.74 NOTICES .................................................................................... 5-62
# TABLE OF CONTENTS

## DIVISION 1 - (01000) – GENERAL REQUIREMENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>00800</td>
<td>SUPPLEMENTARY PROVISIONS</td>
</tr>
<tr>
<td>01010</td>
<td>SUMMARY OF WORK</td>
</tr>
<tr>
<td>01025</td>
<td>MEASUREMENT AND PAYMENT</td>
</tr>
<tr>
<td>01050</td>
<td>SURVEY WORK</td>
</tr>
<tr>
<td>01060</td>
<td>REGULATORY REQUIREMENTS</td>
</tr>
<tr>
<td>01061</td>
<td>SAFETY &amp; HEALTH</td>
</tr>
<tr>
<td>01071</td>
<td>STANDARD REFERENCES</td>
</tr>
<tr>
<td>01201</td>
<td>PROJECT MEETINGS</td>
</tr>
<tr>
<td>01301</td>
<td>SCHEDULE OF VALUES</td>
</tr>
<tr>
<td>01310</td>
<td>SCHEDULE</td>
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<tr>
<td>01340</td>
<td>SUBMITTALS</td>
</tr>
<tr>
<td>01360</td>
<td>OPERATING AND MAINTENANCE INFORMATION</td>
</tr>
<tr>
<td>01500</td>
<td>CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS</td>
</tr>
<tr>
<td>01540</td>
<td>SECURITY</td>
</tr>
<tr>
<td>01600</td>
<td>MATERIAL &amp; EQUIPMENT SUBSTITUTION</td>
</tr>
<tr>
<td>01605</td>
<td>SHIPMENT, PROTECTION AND STORAGE</td>
</tr>
<tr>
<td>01660</td>
<td>TESTING</td>
</tr>
<tr>
<td>01700</td>
<td>RESTORATION OF IMPROVEMENTS</td>
</tr>
<tr>
<td>01710</td>
<td>FINAL CLEANUP</td>
</tr>
<tr>
<td>01760</td>
<td>SPARE PARTS &amp; MAINTENANCE MATERIALS</td>
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<tr>
<td>01950</td>
<td>CONTRACT &amp; RECORD DRAWINGS</td>
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## DIVISION 2 - (02000) – SITEWORK

<table>
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<th>SECTION</th>
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<tbody>
<tr>
<td>02055</td>
<td>DEMOLITION AND SITE PREPARATION</td>
</tr>
<tr>
<td>02140</td>
<td>DEWATERING</td>
</tr>
<tr>
<td>02200</td>
<td>EARTHWORK</td>
</tr>
<tr>
<td>02350</td>
<td>SHEETING, SHORING AND BRACING</td>
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</tbody>
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DIVISION 3 - (03000) – CONCRETE

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<tr>
<th>SECTION</th>
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<tr>
<td>03100</td>
<td>CONCRETE FORMWORK</td>
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<tr>
<td>03200</td>
<td>REINFORCEMENT STEEL</td>
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<tr>
<td>03280</td>
<td>JOINTS IN CONCRETE PAVEMENT</td>
</tr>
<tr>
<td>03290</td>
<td>JOINTS IN CONCRETE STRUCTURES</td>
</tr>
<tr>
<td>03300</td>
<td>CAST-IN-PLACE CONCRETE</td>
</tr>
<tr>
<td>03315</td>
<td>GROUT</td>
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<tr>
<td>03400</td>
<td>PRE-CAST CONCRETE</td>
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DIVISION 5 - (05000) – METALS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
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<tbody>
<tr>
<td>05500</td>
<td>MISCELLANEOUS METALWORK</td>
</tr>
<tr>
<td>05910</td>
<td>HOT-DIP ZINC COATING</td>
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</tbody>
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DIVISION 6 - (06000) – WOODS, PLASTICS, AND COMPOSITE PRODUCTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
</tr>
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<tbody>
<tr>
<td>06610</td>
<td>FIBERGLASS REINFORCED PLASTIC (FRP) GRATING</td>
</tr>
</tbody>
</table>

DIVISION 7 - (07000) – THERMAL AND MOISTURE PROTECTION

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
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<tbody>
<tr>
<td>07900</td>
<td>SEALANTS</td>
</tr>
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DIVISION 9 - (09000) – THERMAL AND MOISTURE PROTECTION

<table>
<thead>
<tr>
<th>SECTION</th>
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<tbody>
<tr>
<td>09900</td>
<td>PROTECTIVE COATING SYSTEMS</td>
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DIVISION 11 - (11000) – EQUIPMENT

<table>
<thead>
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<th>SECTION</th>
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<tbody>
<tr>
<td>11010</td>
<td>GENERAL REQUIREMENTS FOR EQUIPMENT</td>
</tr>
<tr>
<td>11050</td>
<td>EQUIPMENT MOUNTING</td>
</tr>
<tr>
<td>11530</td>
<td>SUBMERSIBLE PUMPS</td>
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DIVISION 15 - (15000) – MECHANICAL

<table>
<thead>
<tr>
<th>SECTION</th>
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<tbody>
<tr>
<td>15060</td>
<td>PIPING SYSTEMS</td>
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<tr>
<td>15061</td>
<td>STEEL PIPE</td>
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<tr>
<td>15064</td>
<td>PVC PIPE</td>
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<tr>
<td>15075</td>
<td>HDPE PIPE AND APPURtenances</td>
</tr>
<tr>
<td>15100</td>
<td>VALVES AND MISCELLANEOUS COMPONENTS</td>
</tr>
<tr>
<td>15150</td>
<td>VALVE AND PIPING ACCESSORIES</td>
</tr>
<tr>
<td>15190</td>
<td>MECHANICAL IDENTIFICATION</td>
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</table>

DIVISION 16 - (16000) – ELECTRICAL

<table>
<thead>
<tr>
<th>SECTION</th>
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<tbody>
<tr>
<td>16011</td>
<td>PROTECTIVE DEVICE COORDINATION STUDY AND ARC FLASH ANALYSIS</td>
</tr>
<tr>
<td>16020</td>
<td>ELECTRICAL PROVISIONS</td>
</tr>
<tr>
<td>16030</td>
<td>ELECTRICAL TESTS</td>
</tr>
</tbody>
</table>

DIVISION 17 - (17000) – INSTRUMENTATION

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>17010</td>
<td>GENERAL REQUIREMENTS, INSTRUMENTATION</td>
</tr>
</tbody>
</table>

**END OF SECTION**
1 BIDDING REQUIREMENTS

1.1 INVITATION TO BID

Sealed proposals will be received at the Boardroom of the San Juan Water District, located at 9935 Auburn Folsom Road, Granite Bay, CA 95746, until 1:00 P.M local time on March 31, 2020, or such later date as may be set by addendum, and then will be publicly opened and read for the construction of the following public works project:

WATER TREATMENT PLANT RESIDUAL AREA STORMWATER LIFT STATION PROJECT

The project includes civil grading of the solids drying area, building a rock lined v-ditch to collect solids drying area runoff, building a new lift station and piping to pump runoff water collection into the existing equalizations basin and all other work as described in Section 01010 – Summary of Work.

The contract documents for the Project, including the public works construction contract, instructions to bidders, bid forms, and plans and specifications, are available via download at the following address: https://www.sjwd.org/current-rfp-s. Hard copies will not be provided to the proposing contractors.

The District will hold a MANDATORY pre-bid conference in the Boardroom of San Juan Water District, 9935 Auburn Folsom Road, Granite Bay, CA 95746, on March 4, 2020 at 10:00 AM. It is suggested that each prospective bidder review the bid documents and project site prior to the pre-bid conference. Each prospective bidder shall be required to attend the pre-bid conference. Bids from any bidder not attending this conference will be rejected as non-responsive. Any questions regarding the type of work to be done may be addressed to Tony Barela, Operations Manager at TBarela@sjwd.org or (916) 791-6939. Responses will be provided to questions submitted up until March 18, 2020.

Each Bid must be submitted on the prescribed forms and accompanied by cash, a cashier's check, certified check or bid bond executed on the prescribed form payable to the District in an amount not less than 10 percent of the amount bid.

The successful bidder will be required to furnish a payment bond and faithful performance bond each in the full amount of the Contract price, and insurance with certificates and endorsements of insurance, as provided in the Contract Documents. The required bonds must be provided only by a surety insurer who is admitted to do business by and in good standing with the California Department of Insurance.

Bidders are hereby notified that in accordance with Public Contract Code section 22300, securities may be substituted for any monies that the District may withhold pursuant to the terms of this Contract to ensure performance.

The successful bidder must possess the following classification or type of contractor's license issued by the Contractors State License Board: Class A, California.
To be qualified to bid on this Project, bidders must be registered and qualified to perform public work with the Department of Industrial Relations pursuant section 1725.5 of the Labor Code. All subcontractors listed in a qualified bidder’s bid as performing any portion of the work also must be registered and qualified with the Department of Industrial Relations.

Bids that equal or exceed $1,000,000 must be accompanied by an Iran Contracting Act certification in the form provided in section 1.9.

The attention of bidders is directed to the requirements and conditions of employment to be observed and prevailing wage rates to be paid to all workers employed under the Contract in accordance with Labor Code sections 1770 and following. Copies of the prevailing rate of per diem wages are on file at the District's office, and will be made available to any interested party on request. In accordance with Labor Code section 1771.4(a)(1), this project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

The District reserves the right to reject all bids. Any bid not conforming to the intent and purpose of the Contract Documents may be rejected. The District may extend the time to award the Contract.

Dated: 02/14/2020

San Juan Water District

By: Tony Barela, PE
Operations Manager
1.2   BID

TO:   San Juan Water District, 9935 Auburn Folsom Road, Granite Bay, CA 95746

The undersigned states and declares as follows:

That the Bidder has carefully examined the location of the proposed work; that the Bidder has examined the Contract Documents entitled: WATER TREATMENT PLANT RESIDUAL AREA STORMWATER LIFT STATION PROJECT; the Addenda Numbers ___ to ___, if any; that the Bidder has read the accompanying Instructions to Bidders; that the Bidder hereby proposes to begin work and complete the project in accordance with the schedule and deadlines in the Contract Documents; that the Bidder hereby proposes to furnish all labor, materials, tools, and equipment, and to perform all work required, complete in place, in compliance with all terms and condition and requirements of the Contract Documents; and that the Bidder will take in full payment for the work the prices set forth in the accompanying bid schedule.

The Bidder acknowledges that the following quantities are approximate only, being given as a basis for the comparison of proposals, that the District does not expressly or by implication agree that the actual amount of the work will correspond therewith, and that the District reserves the right to increase or decrease the amount of any class or portion of the work, as may be deemed necessary or advisable by the Engineer.

The following surety or sureties have agreed to furnish payment and faithful performance bonds to the Bidder if it is awarded the contract:

Name of Performance Bond Surety: ________________________________

Name of Payment Bond Surety: ________________________________

BIDDER INFORMATION

Bidder Name: ________________________________

Type of Business Entity and State of Incorporation (e.g., corporation, limited liability company, partnership):

________________________________________________

Contractor’s License No.: ________________________________

DIR Public Works Contractor Registration No.: ________________________________

Expiration Date: ________________________________

Type of license: ________________________________
Name under which license is held: ________________________________

Status of license: ________________________________

The Bidder's authorized officer identified below hereby declares that the representations in this Bid are true and correct and of my own personal knowledge, and that these representations are made under penalty of perjury under the laws of the State of California.

Authorized Signature: ________________________________

Printed Name: ________________________________

Title: ________________________________

Date: ________________________________

Address: ________________________________

Phone: ________________________________

Fax: ________________________________

Email: ________________________________
### 1.3 BID SCHEDULE

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Total Bid Price (In Figures) $ 

Total Bid Price (in words): ______________________________________________________________

**Acknowledge Addenda**

Addendum #: ______ Signed: ____________________________________________________________

Addendum #: ______ Signed: ____________________________________________________________

Addendum #: ______ Signed: ____________________________________________________________

Addendum #: ______ Signed: ____________________________________________________________
1.4 DESIGNATION OF SUBCONTRACTORS

In compliance with Public Contract Code section 4100 et seq. each bidder shall set forth below the: (a) name, location of the mill, shop, or office, and California contractor’s license number of each subcontractor who will perform work or labor or render service to the Contractor in or about the construction of the work or improvement to be performed under these specifications in excess of one-half of 1% of the Contractor's total bid, (b) description of the type of work to be performed by each such subcontractor, and (c) portion of the work (expressed in dollar amount) that will be performed by each such subcontractor.

If the Contractor fails to specify a subcontractor for any portion of the work to be performed under the Contract, it shall be deemed to have agreed to perform such portion itself, and it shall not be permitted to subcontract that portion of the work except under the conditions hereinafter set forth.

Subletting or subcontracting of any portion of the work in excess of one-half of 1% of the Contractor's total bid as to which no subcontractor was designated in the original bid shall only be permitted in cases of public emergency or necessity, and then only after a making a written finding as a public record of the District setting forth the facts constituting the emergency or necessity.

<table>
<thead>
<tr>
<th>Subcontractor (name, address, Subcontractor’s CSLB License Number, Subcontractor’s DIR Public Works Contractor Registration Number)</th>
<th>Description of Subcontractor Work</th>
<th>Portion of Work ($)</th>
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</thead>
<tbody>
<tr>
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Additional pages attached: ____________________________
1.5  BID BOND

KNOW ALL MEN BY THESE PRESENTS, THAT WE, THE UNDERSIGNED _____________________________________________________________, Contractor as Principal; and _____________________________________________________________, as Surety, are hereby held and bound unto San Juan Water District, hereinafter called the District, in the sum of $_________________________, which sum is equal to at least ten percent of the total amount of the Bid, payment of which sum, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

The condition of the above obligation is such that whereas the Principal has submitted to the District a certain Bid, attached hereto and hereby made a part hereof, to enter into a Contract in writing, for the construction of the following public works project:

Water Treatment Plant Residual Area Stormwater Lift Station Project includes furnishing all labor, materials, equipment, and services for the project, including a new lift station with local panel, all piping and valves, all site work including civil grading of the solids drying area, v-ditch and culverts, all concrete work including a new concrete pad and installation of the pre-cast wet well, all electrical supply, control and instrumentation work, all instrumentation and control work, and all miscellaneous work as shown, specified or required for a complete, operating installation.

NOW, THEREFORE,

(a) If the Bid is rejected, or in the alternate,

(b) If the Bid is accepted and the Principal shall sign and deliver a Contract, in the form of the Contract attached hereto and shall execute and deliver Performance and Payment Bonds in the forms attached hereto and shall deliver proof of insurance (all completed in accordance with the Contract Documents), and shall in all other respects perform the agreement created by the acceptance of the Bid;

Then, this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all default of the Principal hereunder shall be the amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the District may accept such Bid, and said Surety does hereby waive notice of any such extension.

IN WITNESS THEREOF, the above bounded parties have executed this instrument under their several seals this __________ day of ___________________________, the name and corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative, pursuant to authority of its governing body.

For Contractor as Principal:
For Surety:

Name: ___________________________
Title: ___________________________

(Seal)
1.6 EXPERIENCE QUALIFICATIONS

The Bidder has been engaged in the contracting business, under the present business name for ___ years. Experience in work of a nature similar to that covered in the Bid extends over a period of ____ years.

The Bidder, as a contractor, has never failed to satisfactorily complete a contract awarded to it, except as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Owner</th>
<th>Contact Information: Contact Name and Phone Number</th>
<th>Type of Work</th>
<th>Contract Amount</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>
The following is a list of plant and equipment owned by the Bidder, which is definitely available for use on the proposed work as required.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Name, Type, and Capacity</th>
<th>Condition</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

Executed on ________________, at ________________, ________________

BIDDER

Company Name: ____________________________________________

Authorized Signature: ______________________________________

Printed Name: ____________________________________________

Title: __________________________________________________
1.7 NONCOLLUSION DECLARATION TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID (PUBLIC CONTRACT CODE SECTION 7106)

The undersigned declares:

I am the __________________________ (Title) of __________________________ (Bidder), the party making the foregoing bid.

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder. All statements contained in the bid are true. The bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on __________________________, at __________________________, __________________________.

Authorized Signature: __________________________

Printed Name: __________________________
1.8 ACKNOWLEDGMENT OF INSURANCE REQUIREMENTS

By signing below Bidder acknowledges the insurance requirements as listed in the General Conditions, section 5.52 “Insurance”. By this acknowledgment, the Bidder and its insurance provider(s) and surety(ies) certify that they have read and understand the insurance and bonding requirements in their entirety, including limits of coverage, additional insureds and endorsements, and bonding requirements, and that the Bidder can provide the insurance coverage and bonds as required in the Contract documents without exception.

Bidder understands that if the insurance coverage provided in section 5.52 of the General Conditions and the Contract Bonds cannot be provided, its bid is subject to rejection by the District as non-responsive.

BIDDER

Company Name: ________________________________

Authorized Signature: __________________________

Printed Name: _________________________________

Title: _________________________________________

Date: _________________________________________

INSURANCE PROVIDER/SURETY REPRESENTATIVE

Insurer/Surety Name: ______________________________

Authorized Signature: __________________________

Printed Name: _________________________________

Title: _________________________________________

Date: _________________________________________

Bidder Must Provide This Acknowledgment for Each Insurer or Surety Providing Insurance Coverage or a Bond under this Contract
1.9 **IRAN CONTRACTING ACT CERTIFICATION**

Pursuant to Public Contract Code (PCC) section 2204, the following Iran Contracting Act certification is required if your bid totals $1,000,000 or more.

If your bid totals $1,000,000 or more, you must complete only one of the following two paragraphs. To complete paragraph 1, check the corresponding box and complete the certification. To complete paragraph 2, simply check the corresponding box.

□ 1. We are not on the current list of persons engaged in investment activities in Iran created by the California Department of General Services (DGS) pursuant to PCC 2203(b), and we are not a financial institution extending twenty million dollars ($20,000,000) or more in credit to another person, for 45 days or more, if that other person will use the credit to provide goods or services in the energy sector in Iran and is identified on the current list of persons engaged in investment activities in Iran created by DGS.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on

______________________________________ (date),

at ________________________________ (city), ______________________ (state).

______________________________________ (signature)

______________________________________ (printed name)

OR

□ 2. We have received written permission from the District to submit a bid pursuant to PCC 2203(c) or (d). A copy of the written permission from the District is included with our bid.
2 CONTRACT FORMS

2.1 CONTRACT

THIS CONTRACT is made as of __________, in Granite Bay, California, by and between San Juan Water District, a public agency, ("District") and ________________, a ________________ ______ ("Contractor"), who agree as follows:

2.1.1 The Contractor agrees to furnish all labor, materials, supplies, tools and equipment and to perform all the work required to construct and complete in a good and workmanlike manner, and in strict accordance with the Contract Documents, those certain improvements entitled:

Water Treatment Plant Residual Area Stormwater Lift Station Project includes furnishing all labor, materials, equipment, and services for the project, including a new lift station with local panel, all piping and valves, all site work including civil grading of the solids drying area, v-ditch and culverts, all concrete work including a new concrete pad and installation of the pre-cast wet well, all electrical supply, control and instrumentation work, all instrumentation and control work, and all miscellaneous work as shown, specified or required for a complete, operating installation.

2.1.2 Contract Documents for this project have been prepared by the District's Engineer, Hydrosience Engineering, Inc., hereinafter called the Engineer. All Contract Documents, and each and every provision thereof, relating to this Contract are hereby made a part of and incorporated by reference into this Contract. The following are the applicable Contract Documents: Invitation to Bid, Bid, Bid Bond, Designation of Subcontractors, Experience Qualifications, Noncollusion Declaration, Acknowledgment of Insurance Requirements, Instructions to Bidders, Contract, Faithful Performance Bond, Payment Bond, Contractor's Certificate Regarding Workers' Compensation, the Insurance Certificates and Endorsements, Abbreviations and Definitions, General Conditions, Technical Specifications and Plans (Drawings), applicable to this work, and all Addenda and Change Orders, as well as all written modifications of the Contract Documents agreed to by the parties. Any work called for in one Contract Document and not mentioned in others is to be performed and executed as if mentioned in all Contract Documents.

2.1.3 The District agrees to pay the Contractor for the performance of the Contract, subject to additions and deductions provided therein, the following prices, and the Contractor agrees to receive and accept the following prices as full compensation for furnishing all materials, labor, supplies, tools and equipment, and for doing all the work contemplated and embraced in this Contract, and for all risks of every description connected with the work and for all expenses incurred by or in consequence of the suspension or discontinuance of the work, and for well and faithfully completing the work and the whole thereof in the manner and according to the Contract Documents and the requirements of the Engineer under them, namely:

2.1.4 The District shall make payments on the account of the Contract as specified in the General Conditions of the Contract.
2.1.5 The Contractor shall diligently prosecute the work to completion in accordance with the following schedule: 150 Calendar Days from the Notice to Proceed.

2.1.6 The Contractor acknowledges that it has examined the prevailing rate of per diem wages as established and published by the California Director of Industrial Relations, copies of which are available for inspection at the office of the District. The Contractor agrees to pay all workers employed on the work not less than the applicable prevailing rate of per diem wages, as the same may be amended from time to time. The Contractor shall post at each job site a copy of the determination of the Director of Industrial Relations of the prevailing rate of per diem wages. The Contractor also shall ensure that all subcontractors on the work are notified of and comply with their obligations in regard to the payment of prevailing wages to all of their workers employed on the Project.

IN WITNESS WHEREOF, the parties execute this Contract as follows:

For District:

____________________________________________________________________

Name: ________________________________

Title: President, Board of Directors

Attest:

____________________________________________________________________

Name: ________________________________

Title: Secretary, Board of Directors

For Contractor:

____________________________________________________________________

Name: ________________________________

Title: ________________________________
2.2 FAITHFUL PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS,

THAT, WHEREAS, San Juan Water District, hereinafter designated as the “District,” entered into a Contract with _____________________________, hereinafter designated as the “Contractor” for the work described as follows:

Water Treatment Plant Residual Area Stormwater Lift Station Project includes furnishing all labor, materials, equipment, and services for the project, including a new lift station with local panel, all piping and valves, all site work including civil grading of the solids drying area, v-ditch and culverts, all concrete work including a new concrete pad and installation of the pre-cast wet well, all electrical supply, control and instrumentation work, all instrumentation and control work, and all miscellaneous work as shown, specified or required for a complete, operating installation.

WHEREAS, the Contractor is required under terms of the Contract to furnish a bond for the faithful performance of the Contract;

WHEREAS, the Contract is by reference made a part hereof;

NOW, THEREFORE, we, the undersigned Contractor, as Principal, and _____________________________, a corporation organized and existing under the laws of the State of __________, and duly authorized and in good standing to transact business under the laws of the State of California, as an admitted Surety, are held and firmly bound unto the District in the penal sum of $______________, the sum being not less than one hundred percent (100%) of the total Contract amount, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, THAT, if the above bounden Contractor, its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions, and agreements in the Contract and any alterations thereof made as therein provided, on its part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless the District, its directors, officers, employees and agents, as therein stipulated, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

As a condition precedent to the satisfactory completion of the said Contract, the above obligation in above-stated amount shall hold good for a period of one (1) year after the recording of the notice of completion, during which time if the Contractor, its heirs, executors, administrators, successors or assigns shall fail to make full, complete, and satisfactory repair and replacements or totally protect the District from loss or damage made evident during the period of one (1) year from the date of recording of the notice of completion, and resulting from or caused by defective materials or faulty workmanship in the prosecution of the work done, the above obligation in the above-stated amount shall remain in full force and effect. However, anything in
this paragraph to the contrary notwithstanding, the obligation of the Surety hereunder shall continue so long as any obligation of the Contractor remains.

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

In the event suit is brought upon this bond by the District and judgment is recovered, the Surety shall pay all costs incurred by the District in such suit, including, but not limited to, administrative and consultant costs, and reasonable attorneys' fees to be fixed by the Court.

The address or addresses at which the principal and surety(ies) may be served with notices, papers and other documents under the California Bond and Undertaking Law (Code of Civil Procedure section 995.010 et seq.) is the following:

__________________________________________________________________________________________________________________________

IN WITNESS THEREOF, the above bounded parties have executed this instrument under their several seals this ______ day of ________________, the name and corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative, pursuant to authority of its governing body.

For Contractor as Principal:

__________________________________________________________________________________________________________________________

Name: ___________________________
Title: ___________________________

For Surety:

__________________________________________________________________________________________________________________________

Name: ___________________________
Title: ___________________________

(Seal)
(NOTE: The date of this bond must not be prior to date of Contract. If Contractor is a partnership, all partners should execute bond.)
2.3 PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS,

THAT, WHEREAS, the San Juan Water District, hereinafter designated as the “District,” has awarded to __________________________ hereinafter designated as the “Contractor” a Contract for the work described as follows:

Water Treatment Plant Residual Area Stormwater Lift Station Project includes furnishing all labor, materials, equipment, and services for the project, including a new lift station with local panel, all piping and valves, all site work including civil grading of the solids drying area, v-ditch and culverts, all concrete work including a new concrete pad and installation of the pre-cast wet well, all electrical supply, control and instrumentation work, all instrumentation and control work, and all miscellaneous work as shown, specified or required for a complete, operating installation.

WHEREAS, the Contractor is required by the Contract and by the provisions of Division 4, Part 6 of the Civil Code to furnish a bond in connection with the Contract, as hereinafter set forth.

WHEREAS, the Contract by this reference is made a part hereof;

NOW, THEREFORE, we, the undersigned Contractor, as Principal, and __________________________, as Surety, a corporation organized and existing under the laws of the State of __________________________, duly authorized and in good standing to transact business under the laws of the State of California, as an admitted Surety, are held and firmly bound unto the District in the sum of $ __________________________, the sum being not less than one hundred percent (100%) of the total Contract amount payable by the District, under the terms of the Contract, for which payment well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, THAT, if the Contractor, its heirs, executors, administrators, successors, assigns or subcontractors shall fail to pay for any materials, provisions, provender or other supplies or teams, implements or machinery used in, upon, for or about the performance of the work contracted to be done, or shall fail to pay for any work or labor thereon of any kind, or shall fail to pay any of the persons named in Civil Code Section 9100, or shall fail to pay for amounts due under the Unemployment Insurance Code with respect to such work or labor as required by the provisions of Division 4, Part 6 of the Civil Code, or shall fail to pay for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the Contractor and subcontractors pursuant to Section 13020 of the Unemployment Insurance Code with respect to such work or labor, and provided that the claimant shall have complied with the provisions of that Code, the Surety or Sureties hereon will pay for the same in amount not exceeding the sum specified in the Contract, otherwise the above obligation shall be void. In case suit is brought upon this bond, the Surety will pay a reasonable attorney's fee to the prevailing party to be fixed by the court. This bond shall inure to the benefit of any and all persons, companies and corporations entitled to file
claims under Section 9100 of the Civil Code, so as to give a right of action to them or to their assigns in any suit brought upon this bond. And the Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the specifications.

The address or addresses at which the principal and surety(ies) may be served with notices, papers and other documents under the California Bond and Undertaking Law (Code of Civil Procedure section 995.010 et seq.) is the following:

____________________________________________________________________

____________________________________________________________________

IN WITNESS THEREOF, the above bounded parties have executed this instrument under their several seals this _____________ day of _________________, the name and corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative, pursuant to authority of its governing body.

For Contractor as Principal:

____________________________________________________________________

Name: ______________________________

Title: ______________________________

For Surety:

____________________________________________________________________

Name: ______________________________

Title: ______________________________

(Seal)

(NOTE: The date of this bond must not be prior to date of Contract. If Contractor is a partnership, all partners should execute bond.)
2.4 CONTRACTOR'S WORKERS’ COMPENSATION CERTIFICATE (LABOR CODE SECTION 1861)

To: San Juan Water District

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

BIDDER

Company Name: ___________________________________________________________

Authorized Signature: ______________________________________________________

Printed Name: _____________________________________________________________

Title: _____________________________________________________________________

Date: _____________________________________________________________________
# 3 ABBREVIATIONS AND DEFINITIONS

## 3.1 ABBREVIATIONS

The following abbreviations may be used in the Contract Documents:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Aluminum Association</td>
</tr>
<tr>
<td>AASHO</td>
<td>American Association of State Highway Officials</td>
</tr>
<tr>
<td>ABMA</td>
<td>American Boiler Manufacturer's Association</td>
</tr>
<tr>
<td>ACI</td>
<td>The American Concrete Institute</td>
</tr>
<tr>
<td>AGA</td>
<td>American Gas Association</td>
</tr>
<tr>
<td>AGC</td>
<td>Associated General Contractors</td>
</tr>
<tr>
<td>AGMA</td>
<td>American Gear Manufacturer's Association</td>
</tr>
<tr>
<td>AI</td>
<td>The Asphalt Institute</td>
</tr>
<tr>
<td>AIA</td>
<td>American Institute of Architects</td>
</tr>
<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>ANSI</td>
<td>American National Standards Institute, Inc.</td>
</tr>
<tr>
<td>API</td>
<td>American Petroleum Institute</td>
</tr>
<tr>
<td>APWA</td>
<td>American Public Works Association</td>
</tr>
<tr>
<td>AREA</td>
<td>American Railway Engineering Association</td>
</tr>
<tr>
<td>ASCE</td>
<td>American Society of Civil Engineers</td>
</tr>
<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>AWPA</td>
<td>American Wood Preservers' Association</td>
</tr>
<tr>
<td>AWS</td>
<td>American Welding Society</td>
</tr>
<tr>
<td>AWWA</td>
<td>American Water Works Association</td>
</tr>
<tr>
<td>BGHMA</td>
<td>Builders Hardware Manufacturers Association</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>CCMTC</td>
<td>California Concrete Masonry Technical Committee</td>
</tr>
<tr>
<td>CRSI</td>
<td>Concrete Reinforcement Steel Institute</td>
</tr>
<tr>
<td>DFPA</td>
<td>Douglas Fir Plywood Association</td>
</tr>
<tr>
<td>ETL</td>
<td>Electrical Testing Laboratory</td>
</tr>
<tr>
<td>FS</td>
<td>Federal Specification</td>
</tr>
<tr>
<td>ICBO</td>
<td>International Conference of Building Officials</td>
</tr>
<tr>
<td>IEEE</td>
<td>The Institute of Electrical and Electronics Engineers</td>
</tr>
<tr>
<td>IES</td>
<td>Illuminating Engineering Society</td>
</tr>
<tr>
<td>IPCEA</td>
<td>Insulated Power Cable Engineers Association</td>
</tr>
<tr>
<td>MBMA</td>
<td>Metal Building Manufacturer's Association</td>
</tr>
<tr>
<td>MSS</td>
<td>Manufacturers Standardization Society of Valve and Fitting Industry Standards</td>
</tr>
<tr>
<td>NBFU</td>
<td>National Board of Fire Underwriters</td>
</tr>
<tr>
<td>NBS</td>
<td>National Building Standards</td>
</tr>
<tr>
<td>NEC</td>
<td>National Electrical Code</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Electrical Manufacturers Association</td>
</tr>
<tr>
<td>NFPA</td>
<td>National Fire Protection Association</td>
</tr>
<tr>
<td>OSHA</td>
<td>Occupational Safety and Health Act of 1970</td>
</tr>
<tr>
<td>PCA</td>
<td>Portland Cement Association</td>
</tr>
<tr>
<td>SMACNA</td>
<td>Sheet Metal and Air Conditioning Contractor's National Association</td>
</tr>
<tr>
<td>SSPC</td>
<td>Steel Structures Painting Council</td>
</tr>
<tr>
<td>SSPWC</td>
<td>Standard Specifications for Public Works Construction</td>
</tr>
<tr>
<td>UBC</td>
<td>Uniform Building Code</td>
</tr>
<tr>
<td>UPHS</td>
<td>United States Public Health Service</td>
</tr>
<tr>
<td>UL</td>
<td>Underwriter's Laboratory</td>
</tr>
</tbody>
</table>
3.2 DEFINITIONS

For purposes of the Contract Documents, these words and phrases shall be defined as follows:

3.2.1 District means the San Juan Water District, also referred to as the Owner.

3.2.2 As Approved shall be understood to be followed by the words "by the Engineer," unless otherwise qualified.

3.2.3 As Shown and As Indicated shall be understood to be followed by the words "on the Plans."

3.2.4 Bid means the offer of the bidder for the work when made out and submitted on the prescribed bid form, properly completed, signed and guaranteed.

3.2.5 Bid Bond means the cash, cashier's check, certified check, or bidder's bond accompanying the bid submitted by the bidder, as a guarantee that the bidder will enter into a Contract with the District for the performance of work herein described.

3.2.6 Bidder means any individual, firm, partnership or corporation submitting a bid for the work contemplated, and acting directly or through a duly authorized representative.

3.2.7 Board of Directors or Board means the Board of Directors of the District.

3.2.8 Contract means the written agreement covering the performance of the work and the furnishing of labor, materials, tools and equipment in the construction of the work. The Contract shall include all Contract Documents and supplemental agreements amending or extending the work contemplated which may be required to complete the work in a substantial and acceptable manner. Supplemental agreements are written agreements covering alterations, amendments or extensions to the Contract, and include Addenda and Contract Change Orders.
3.2.9 **Contract Documents** means any or all of the documents listed in section 2.1.2 of the Contract.

3.2.10 **Contractor** means the person or persons, firm, partnership or corporation or other entity who has entered into the Contract with the District to perform the work.

3.2.11 **County** means County of Placer, California.

3.2.12 **Date of the Contract** means the date on which the Contract is signed by the District's authorized representative.

3.2.13 **Days** mean calendar days unless otherwise designated.

3.2.14 **Engineer** means the architect or engineer retained by the District, or the person or persons designated by the District as its engineering representative during the course of construction, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties delegated to them.

3.2.15 **He** shall include "she" and "it" and **his** shall include "her" and "its."

3.2.16 **Or Equal** means the term "or equal" shall be understood to indicate that the "equal" product be the same or better than the product named in function, performance, reliability, quality, and general configuration. Determination of equality in reference to the project design requirements will be made by the Engineer.

3.2.17 **Plans or Drawings** mean the term "Plans" or "Drawings" refers to the official plans, drawings, profiles, cross sections, elevations, details, and other working drawings and supplementary drawings, or reproductions thereof, signed by the Engineer, which show the location, character, dimensions, and details of the work to be performed, and identified at section 2.1.2. Plans may either be bound in the same book as the balance of the Contract Documents or bound in separate sets, and are a part of the Contract Documents, regardless of the method of binding.

3.2.18 **Specifications** mean the terms, provisions, and requirements contained in the Contract Documents and identified in section 2.1.2 and is synonymous with "Technical Specifications." Where standard specifications, such as those of "ASTM", "AASHO", etc. have been referred to, the applicable portions of such standard specifications shall become a part of these Contract Documents.

3.2.19 **State** means State of California.

3.2.20 **State Standard Specifications** mean the edition in effect as of the Date of Execution of the Contract of the Standard Specifications issued by the State of California Business and Transportation Agency, Department of Transportation, unless a specific edition is referenced.
3.2.21 **Subcontractor** means only those persons, firms or entities having a direct contract with the Contractor, and it includes one who furnishes material worked to a special design according to the Plans or Specifications of this work, but does not include one who merely furnishes material not so worked and would be considered a supplier only.

3.2.22 **Time Limits** mean all time limits stated in the Contract Documents are of the essence of the Contract.

3.2.23 **Work** means all the work specified, indicated, shown or contemplated in the Contract Documents to construct the improvements, including all alterations, amendments or extensions thereto made by Contract Change Order or other written orders of the Engineer.

3.2.24 Whenever in the Contract Documents or upon the Drawings the words DIRECTED, REQUIRED, PERMITTED, ORDERED, DESIGNATED, PRESCRIBED, or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation or prescription of the Engineer is intended, and similarly the words APPROVED, ACCEPTABLE, SATISFACTORY, or words of like import, shall mean approved or acceptable to, or satisfactory to the Engineer, unless otherwise expressly stated.
4 INSTRUCTIONS TO BIDDERS

4.1 INTRODUCTION

Each bid shall be in accordance with these Instructions to Bidders and other applicable provisions of the Contract Documents. The Invitation to Bid will specify whether Contract Documents are available on a purchase or deposit basis. Where payment for such sets is specified, no refund will be made.

4.2 PLANS

Additional copies of full scale plans or individual plan sheets may be obtained at the office of the Engineer for the cost of reproduction.

4.3 LOCAL CONDITIONS

4.3.1 The quantities of work or material stated in the unit price items of the Bid Schedule are given only as a basis for the comparison of Bids, and the District does not represent or warrant that the actual amount of work or material will correspond therewith, but reserves the right to increase or decrease the quantity of any unit price item of the work as may be deemed necessary or expedient by the Engineer.

4.3.2 The Bidder shall examine carefully the site of the work contemplated and the Contract Documents. The submission of a Bid shall be conclusive evidence that the Bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality and quantities of work to be performed and the materials to be furnished, and as to the requirements of the Contract Documents. Bidders shall thoroughly examine and be familiar with the Plans and Specifications. The failure of any bidder to receive or examine any form, instrument, addendum or other document, or to visit the site and acquaint himself with conditions there existing shall in no way relieve the Bidder from any obligation with respect to its proposal or to the Contract. The Plans for the work show conditions as they are supposed or believed by the District, the Engineer or their representatives to exist; but it is neither intended nor to be inferred that the conditions as shown thereon constitute a representation by the District, the Engineer, or their representatives that such conditions are actually existent, nor shall the District, the Engineer or their representatives be liable for any loss sustained by the Contractor as a result of any inference or extrapolation drawn by the Bidder between conditions as shown on the Plans and the actual conditions revealed during the progress of work, or otherwise. The Bidder's attention is directed to the possible existence of obstructions and public or private improvements which may be within the limits of the work or adjacent thereto, which may or may not be shown on the Plans.

4.3.3 Where the Engineer has made investigations of surface and subsurface conditions in areas where work is to be performed under the Contract, or in other areas, some of which may constitute possible local material sources, such investigations were made only for the purpose of study and design. Where such investigations have been made, bidders or Contractor may, upon written request, inspect the records of the Engineer as to such
investigations subject to and upon the conditions hereinafter set forth. Such inspection of 
records may be made at the office of the Engineer.

4.3.4 The records of such investigations are not a part of the 
Contract and are made available for inspection solely for the convenience of the bidder or 
Contractor. It is expressly understood and agreed by bidder or Contractor that neither the 
District nor the Engineer assumes any responsibility whatsoever with respect to the sufficiency 
or accuracy of the investigations thus made, the records thereof, or of the interpretation set 
forth therein or made by the Engineer in his use thereof and there is no representation, warranty 
or guarantee, either express or implied, that the conditions indicated by such investigations or 
records thereof are correct or representative of those existing throughout such areas or any part 
thereof, or that unanticipated developments may not occur or that materials other than, or in 
proportions different from, those indicated may not be encountered.

4.3.5 Where a log of test borings or other investigations of 
subsurface conditions have been made by the District in respect to foundation or other 
structural design, and that information is shown in the plans, said information represents only 
the statement by the District as to the character of material which has been actually encountered 
by it in its investigation, and is only included for the convenience of bidders. Water levels that 
may be shown on a log of test borings are valid only for the stated date of observation. The 
water level may change from season to season and from year to year. Investigations of 
subsurface conditions are made for the purpose of design, and the District assumes no 
responsibility whatever in respect to the sufficiency or accuracy of borings or of the log of test 
borings or other preliminary investigations, or of the interpretation thereof, and there is no guaranty, either expressed or implied, that the conditions indicated are representative of those 
existing throughout the work, or any part of it, or that unobserved or unanticipated 
developments may not occur. Making such information available to bidders is not to be 
construed in any way as waiver of the provisions of this section and bidders must satisfy 
themselves through their own investigations as to conditions to be encountered.

4.3.6 The availability or use of information described in these 
Instructions to Bidders and other bid documents shall not be construed in any way as a waiver 
of the provisions of the Instructions of Bidders and a Bidder or Contractor is cautioned to make 
such an investigation and examination as it deems necessary to satisfy itself as to conditions to 
be encountered in the performance of the work and, with respect to possible local material 
sources, the quality and quantity of material available from such property and the type and 
extent of processing that may be required in order to produce material conforming to the 
requirements of the Specifications.

4.3.7 No information derived from such inspection of records of 
investigations or compilations thereof made by the Engineer, will in any way relieve the bidder 
or Contractor from any risk or from properly fulfilling the terms of the Contract.

4.3.8 Information derived from inspection of topographic maps, or 
from Plans showing location of utilities and structures will not in any way relieve the 
Contractor from any risk, or from properly examining the site and making such additional 
investigations as it may elect, or from properly fulfilling all the terms of the Contract.
4.4 FORM OF BID AND SIGNATURE

Bids shall be submitted only on the forms attached hereto or copies thereof and shall be enclosed in a sealed envelope and marked and addressed as hereinafter directed. The Bidder shall state in figures the unit prices or the specific sums as the case may be, for which he proposes to supply the labor, materials, supplies tools or equipment, and perform the work required by the Contract Documents. If the Bid is made by an individual, it shall be signed by its full name and address shall be given; if it is made by a partnership, it shall be signed with the partnership name by a member of the partnership, who shall also sign his own name, and the name and address of each member of such partnership shall be given; and, if it is made by a corporation the name of the corporation shall be given and it shall be signed by its duly authorized officer or officers, the name(s) and title(s) of all signing officers, of the corporation shall be given, and the address of the corporation and the state in which incorporated shall be stated. Bids will be considered only from persons licensed as required under applicable provisions of the Contractors’ State License Law (California Business and Professions Code section 7000, et seq.) and rules and regulations adopted pursuant thereto; and each bidder shall insert its type of contractor's license, license number, and other requested information in the place provided in the bid. No oral, telephonic, e-mail, facsimile or telegraphic Bid or modification of a Bid will be considered.

4.5 SUBMISSION OF BIDS

4.5.1 All Bids must be submitted not later than the time prescribed, at the place and in the manner set forth in the Invitation to Bid. The District shall not consider any Bid received after the time fixed or received at any place other than the place stated in the Invitation to Bid. Bids must be made on the prescribed Bid forms. A complete Bid requires submission of fully completed and executed: Bid, Designation of Subcontractors (if applicable), Bid Bond (or other bid guarantee), Experience Qualifications and Noncollusion Declaration. Each Bid must be submitted in a sealed envelope, so marked as to indicate its contents without being opened, and addressed in conformance with the instructions in the Invitation to Bid. The bidder is wholly responsible to see that its Bid is submitted at the time and place named for the opening of bids.

4.5.2 Bids shall acknowledge receipt of all addenda (identified by addendum no.) issued during the bidding period. Failure to acknowledge an addendum or clarification may result in the Bid being rejected as not responsive.

4.5.3 Bids shall be open at the time and place specified in the Invitation to Bid, unless changed by addendum. All Bids will be opened and read publicly. Bidders, their representatives and other interested parties, are invited to be present at the opening.

4.6 PREPARATION OF THE BID

4.6.1 Blank spaces in the Bid shall be properly completed. The phraseology of the Bid must not be changed and no additions shall be made to the items mentioned therein. Unauthorized conditions, limitations or provisions attached to a Bid may render it nonresponsive and may cause its rejection. If erasures, interlineations or other
4.6.2 Section 5.36 of the Contract General Conditions provides that the successful Contractor shall pay all federal, state and local taxes, including manufacturers' taxes, sales taxes, use taxes, processing taxes, and payroll, wage, insurance, social security, and unemployment taxes on wages, salaries or any remuneration paid to Contractor's employees. A bidder’s bid prices shall be deemed to include all applicable taxes, and there shall be no separate bid item or billing for taxes.

4.7 BID GUARANTEE

4.7.1 All Bids shall be accompanied by a Bid Bond, as defined, made payable to the District. The Bid Bond must be enclosed in the same envelope with the Bid. The amount of the Bid Bond shall be not less than 10 percent of the total amount of the Bid.

4.7.2 If a bond is utilized, the Attorney in Fact (resident agent) who executes the Bid Bond on behalf of the surety company must attach a copy of his Power of Attorney as evidence of his authority. A notary shall acknowledge the power as of the date of execution of the surety bond which it covers. A bond will be accepted only if it is made out on either the Bid Bond form enclosed in these documents or on a form which substantially conforms to it.

4.8 LIST OF SUBCONTRACTORS; SUBCONTRACTING LIMITS

4.8.1 Each Bidder shall set forth in its Bid on the form provided the following information in accordance with the provisions of California Public Contract Code section 4100, et seq.: (a) The name, location of the place of business, and California contractor’s license number of each subcontractor who will perform work or labor or render service to the Contractor in or about the construction of the work or improvement, and of each subcontractor who, under subcontract to the Contractor, is to specifically fabricate and install or provide a portion of the work or improvement according to the Contract Documents, in any amount in excess of 1/2 of 1 percent of the Contractor's total Bid; and (b) The portion of the work that will be done by each such subcontractor. Only one subcontractor shall be listed for each such portion of the work as defined in the Bid. If the Bidder fails to specify a subcontractor for any portion of the work to be performed under the Contract, the Bidder agrees to perform that portion of the work itself.

4.8.2 The Contractor shall perform with its own organization work amounting to not less than 50 percent of the original total contract price, except that any designated “Specialty Items” may be performed by subcontract and the amount of any such “Specialty Items” so performed may be deducted from the original total contract price before computing the amount of work required to be performed by the Contractor with its own organization. When items of work in the Bid schedule are preceded by the letter (S), such
items shall be deemed designated “Specialty Items.” Where an entire item is subcontracted, the value of work subcontracted will be based on the contract item bid price. When a portion of an item is subcontracted, the value of work subcontracted will be based on the estimated percentage of the contract item bid price, determined from information submitted by the Contractor, subject to approval by the Engineer.

4.9 INTERPRETATION OF CONTRACT DOCUMENTS

4.9.1 Any explanation desired by the bidders regarding the meaning or interpretation of any of the Contract Documents must be requested in writing, with sufficient allowance of time for receipt of reply before the time set for opening of Bids. Any such explanations or interpretations will be made only in the form of addenda to the documents and will be furnished to all bidders who shall submit all addenda with their Bids. Neither the Engineer nor any representative of the District is authorized to give oral explanations or interpretations of Contract Documents, and a submission of a Bid constitutes agreement by the bidder that he has placed no reliance on any such oral explanation or interpretation. However, the Engineer may, upon inquiry by bidder, orally direct the bidder's attention to specific provisions of the Contract Documents which cover the subject of the inquiry.

4.9.2 The Bidder shall review the Plans and Specifications prior to submission of his bid and shall report any errors and omissions noted by the Bidder to the District prior to such submission.

4.10 MODIFICATION OF BIDS

A Bidder may modify its Bid by written communication provided such communication is received by the District prior to the closing time for receipt of Bids. The written communication should not reveal the Bid price but should state the addition or subtraction or other modification so that the final prices or terms will not be known by the District until the sealed bid is opened.

4.11 WITHDRAWAL AND RETURN OF BIDS

Bids may be withdrawn without prejudice by written, e-mail, facsimile or telegraphic requests received from the Bidder prior to the time for opening of Bids, and Bids so withdrawn will be returned to bidders unopened. No Bid may be withdrawn after the hour affixed for opening Bids without rendering the accompanying Bid Bond subject to retention as liquidated damages in like manner as in the case of failure to execute the Contract after award, as provided in the Contract Documents. Negligence on the part of the Bidder preparing its Bid shall not constitute a right to withdraw the Bid subsequent to the opening of Bids. Any Bid received after the bid submission deadline shall be returned to the bidder unopened.

4.12 DISCREPANCIES

In the case of discrepancy between unit prices and totals, unit prices will prevail. In case of discrepancy between words and figures, words will prevail.
4.13 SERVICING AND MAINTENANCE

Each Bidder must, if requested, furnish evidence that there is an efficient service organization which regularly carries a stock of repair parts for the proposed equipment to be furnished and installed in the work and that the organization is conveniently located for prompt service.

4.14 DISQUALIFICATION OF BIDDERS

4.14.1 More than one Bid from an individual, firm, partnership or corporation under the same or different names will not be considered. Reasonable grounds for believing that any individual, firm, partnership or corporation is interested in more than one Bid for the work contemplated may cause the rejection of all Bids in which the individual, firm, partnership or corporation is interested. If there is reason for believing that collusion exists among the bidders, any or all Bids may be rejected. Bids in which the price is obviously unbalanced may be rejected.

4.14.2 All bidders are put on notice that any collusive agreement fixing the prices to be bid so as to control or affect the awarding of this Contract is in violation of the competitive bidding requirements applicable to the District, including Public Contract Code section 7106, and may render void any contract let under such circumstances.

4.15 AWARD OF CONTRACT

4.15.1 The District reserves the right to accept or reject any and all Bids during the time for awarding the Contract, and to waive any informality or irregularity in any Bid. No Bid can be withdrawn during the time for awarding the Contract. The time for awarding the Contract is provided in section 4.17.

4.15.2 Before a Bid is considered for award, the District may, in addition to the Experience Qualifications form, require a Bidder to submit a statement of facts and detail as to his business, technical organization and financial resources and equipment available and to be used in performing the work. Additionally, the District may require evidence that the Bidder has performed other work of comparable magnitude and type. The District expressly reserves the right to reject any Bid if it determines that the business and technical organization, equipment, financial and other resources or other experience of the Bidder (including the Bidder's subcontractors) is not sufficiently qualified for the work bid upon and, therefore, justifies such rejection.

4.15.2 The award of the Contract, if it is awarded, will be to the lowest responsible and responsive Bidder whose Bid complies with the requirements of the Contract Documents.

4.16 CONTRACT BONDS

4.16.1 The successful Bidder shall furnish both a Performance Bond and a Payment Bond in the type, form and amount specified in the forms included with the Contract Documents. These bonds shall be furnished on such forms or on substantially
similar forms acceptable to the District. The Payment Bond shall comply with California Civil Code sections 9550 and 9554 and applicable provisions of the California Bond and Undertaking Law (California Code of Civil Procedure section 995.010 et seq.). The bonds shall be obtained from a responsible corporate surety (or sureties) acceptable to the District, who is (or are) in good standing with and duly admitted by the Insurance Commissioner of the State of California to act as surety upon bonds and undertakings. The surety (or sureties) shall furnish reports as to its financial condition from time to time as requested by the District. The premiums for the bonds shall be paid by the successful Bidder.

4.16.2 If any surety becomes unacceptable to the District, is deemed insolvent, is no longer an admitted surety in California, or fails to furnish reports as to its financial condition as requested by the District, the Contractor shall promptly furnish such additional security as may be required from time to time to protect the interests of the District and of persons supplying labor or materials in the prosecution of the work contemplated by this Contract.

4.16.3 In the event of any conflict between the terms of the Contract and the terms of the bonds, the terms of the Contract shall control and the bonds shall be deemed to be amended thereby. Without limiting the foregoing, the District shall be entitled to exercise all rights granted to it by the Contract in the event of default, without control thereof by the surety, provided that the District gives the surety notice of such default at the time or before the exercise of any such right by the District, and, regardless of the terms of the bonds, the exercise of any such right by the District shall in no manner affect the liability of the surety under the bonds.

4.17 EXECUTION OF CONTRACT

The successful Bidder will be notified in writing by the District of the award of the Contract within thirty (30) days after opening of Bids, unless the time period is extended as provided in the Invitation to Bid. Accompanying the District's notice of award will be the Contract, which the District may require to be executed in duplicate or triplicate. Within ten (10) days following receipt of such notice of award, the successful bidder will be required to execute and return the original contract(s), together with the performance and payment bonds, and the required certificates and proof of insurance documents (see sections 2.4 and 5.52), to the District. Failure to do so shall be just cause for annulment of the award and for forfeiture of the Bid Bond which shall be retained as liquidated damages, and it is agreed that the Bid Bond sum is a fair estimate of the amount of damages that the District will sustain by reason of such failure. The District will promptly determine whether such Contract, bonds and insurance are as required by the Contract Documents, and upon such determination will forward a fully executed copy of the Contract and a Notice to Proceed with the work to the successful bidder. Signature by both parties constitutes execution of the Contract. In the event of failure of the lowest responsible responsive Bidder to sign and return the Contract with acceptable bonds and insurance as prescribed herein, the District may award the Contract to the next lowest responsible responsive Bidder, and, in the event that Bidder fails to sign and return the Contract with acceptable bonds and insurance, the District may award the Contract to the then next lowest responsible responsive Bidder, etc.
4.18  RETURN OF BID GUARANTEES

All Bid Bonds will be held until the Contract has been finally executed, after which all Bid Bonds, other than any Bid Bonds which have been forfeited, will be returned to the respective bidders whose Bids they accompanied, but in no event shall non-forfeited bonds be held by the District beyond 60 days from the date that the District awards the Contract.

4.19  POWER OF ATTORNEY

The Attorney in Fact (resident agent) who executes the Performance Bond and Payment Bond on behalf of the surety company must attach a copy of his Power of Attorney as evidence of his authority. A notary public shall acknowledge the power as of the date of the execution of the bond which it covers.

4.20  TIME OF COMPLETION

The time of completion of the work to be performed under this Contract is the essence of the Contract. Delays and extensions of time may be allowed in accordance with the provisions of the General Conditions. The time allowed for the completion of the work is stated in the Contract.

4.21  LICENSING REQUIREMENTS FOR CONTRACTORS

The Contractor shall hold such licenses as may be required by the laws of the State of California for the performance of the work specified in the Contract Documents, and shall have the following classification or type of license for the work issued by the California Contractors State License Board: CLASS A.

4.22  PREVAILING WAGES

Copies of the prevailing rate of per diem wages are on file at the District's office, and will be made available to any interested party on request. The Contractor shall post at each job site a copy of the determination of the Director of Industrial Relations of the prevailing rate of per diem wages. Furthermore, Contractor must post job site notices, as required by Section 1771.4(a)(2) of the Labor Code and prescribed by regulation.

4.23  BID PROTEST

Any bid protest must be submitted in writing to the District before 5:00 p.m. of the seventh day following the bid award. The party filing the protest must have actually submitted a bid for the work. A subcontractor of a bidder may not submit a bid protest.

4.23.1  The bid protest shall be in the form of a letter or memorandum and it shall include the following: a complete statement of the basis or bases for the protest, including any supporting documents; a reference to the specific portion(s) of the Contract Documents which form(s) the basis for the protest; and, the name, address and telephone number of the person representing the protesting bidder.
4.23.2 The bidder filing the protest shall concurrently transmit a copy of the protest document and any attached documentation to all other bidders with a direct financial interest who may be adversely affected by the outcome of the protest, including all other bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.

4.23.3 The District will issue a prompt decision on the protest. If the District determines that a protest is frivolous, the party originating the protest may be determined to be irresponsible and that party may be determined to be ineligible for future contract awards.

4.23.4 The procedure and time limits set forth in this section are mandatory and are the bidder’s sole and exclusive remedy in the event of a bid protest. Failure to comply with these procedures shall constitute a waiver of any right to further pursue the bid protest, including filing a Government Code claim, lawsuit or other legal proceeding.

4.23.5 For purposes of this section, a “bid protest” means any protest, objection, complaint or challenge to, concerning or against (a) a rejection of a bidder for any reason, (b) a contract award to the apparent low bidder, (c) another bidder’s bid, or (d) the legality or enforceability of the bid documents.

4.24 INELIGIBLE CONTRACTORS AND SUBCONTRACTORS

The District shall not accept a bid from a bidder who is ineligible to bid or work on, or be awarded, a public works project pursuant to California Labor Code section 1777.1 or 1777.7. Bidders and the Contractor who is awarded the project contract shall not utilize, or allow work by, any subcontractor who is ineligible to bid or work on, or be awarded, a public works project pursuant to California Labor Code section 1777.1 or 1777.7. (See California Public Contract Code section 6109.) The California Division of Labor Standards Enforcement publishes a list of debarred contractors and subcontractors on the Internet at http://www.dir.ca.gov/DLSE/debar.html

4.25 AUDIT OF BID DOCUMENTS

The District shall have the right to audit all (including review, obtain and copy upon reasonable notice) documents that comprise or relate to a bidder’s bid in connection with any request, claim or contention raised by any bidder, including, but not limited to, Public Contract Code Sections 4000, et seq., or 5000, et seq., or any bid protest. The term “records” and the term “documents” as used herein shall include, but not be limited to, original estimates, subcontracts, bids, proposals, purchase orders, books, documents, accounting records, papers, correspondence, project files and scheduling information, including the original Bid and all documents related thereto and to its preparation, the as-planned construction schedule and any related documents.

4.26 SUBSTITUTIONS DURING BIDDING

Manufacturers or suppliers of materials and equipment may offer an alternative product to the Contractor, except where alternatives or substitutes are specifically excluded, and request that alternatives to specified products be considered equal. Inclusion of such alternatives in the bid is
the responsibility of the Contractor. Inclusion should only be considered if the Contractor believes the offered alternative is equal in quality and performance to the specified product. After award of the Contract, such offers of alternative products will be reviewed and processed as a substitution as provided under General Conditions section 5.24 (Trade Names and Alternatives). Inclusion or offers of alternative products will not be reviewed or processed during the bidding period.
5 GENERAL CONDITIONS

5.1 INTENT OF CONTRACT DOCUMENTS/MEANS AND METHODS

5.1.1 The intent of the Contract Documents is to prescribe the details for the construction and completion of the work which the Contractor undertakes to perform in accordance with the terms of the Contract. Where the Specifications and Plans describe portions of the work in general terms, but not in complete detail, it is understood that only the best general practice is to prevail and that only materials and workmanship of the first quality are to be used. Unless otherwise specified, the Contractor shall furnish all labor, materials, tools, equipment and incidentals and do all the work involved in performing the Contract in a satisfactory and workmanlike manner.

5.1.2 The technical specifications are presented in sections for convenience. However, this presentation does not necessarily delineate trades or limits of responsibility. All sections of the Specifications and Plans are interdependent and applicable to the project as a whole.

5.1.3 The Contract Documents are complementary, and what is called for in any one shall be as binding as if called for in all.

5.1.4 It is expressly stipulated that the drawings, specifications and other Contract Documents set forth the requirements as to the nature of the completed work and do not purport to control the method of performing work except in those instances where the nature of the completed work is dependent on the method of performance.

5.1.5 Except as provided elsewhere in the Contract Documents, neither the District nor the Engineer will be responsible for or have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the work. Except as provided elsewhere in the Contract Documents, neither the District nor the Engineer will be responsible for or have control or charge over the acts or omissions of the Contractor, or any of their subcontractors, agents or employees, or any other persons performing any of the work. Any general control of the work exercised by the District or its authorized representatives shall not make the Contractor an agent of the District, and the liability of the Contractor for all damages to persons and/or to public or private property arising from the Contractor's execution of the work shall not be lessened because of such general control.

5.2 CONTRACTOR'S UNDERSTANDING

It is understood and agreed that the Contractor has, by careful examination, satisfied itself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way affect the work under this Contract. No verbal agreement or conversation with any officer, agent or employee of the District, either before or after the execution of this Contract, shall affect or modify any of the terms or obligations herein contained.
5.3 CHANGES IN THE WORK

5.3.1 The District reserves the right to make such alterations, deviations, additions to, deletions or omissions from the plans and specifications, including the right to increase or decrease the quantity of any item or portion of the work, as may be deemed by the Engineer to be necessary or advisable and to require such extra work as may be determined by the Engineer to be required for the proper completion or construction of the whole work contemplated. Such changes, no matter how many, shall be within the contemplation of this Contract and shall not be the basis for a compensable delay or a claim for lost profits.

5.3.2 The Engineer shall have the authority to order minor changes in the work not involving any increase or decrease in the Contractor's cost of, or time required for, performance of the Contract. Such minor changes shall be effected by written order of the Engineer, and the Contractor shall carry out such written orders promptly. If the Contractor disagrees with the Engineer's determination that the minor change does not involve any increase or decrease in the Contractor's cost of, or time required for, performance of the Contract, then the Contractor may file and pursue a claim pursuant to section 5.4. The written claim must be submitted to the Engineer within 15 days after the date of the Engineer's written order. If the Contractor believes that any such work is beyond the scope of the contract documents, the Contractor shall provide a written “Daily Extra Work Report” documenting the alleged extra work, which will be submitted to and verified by the Engineer or the District’s representative at the end of the day the work was performed.

5.3.3 If any change in the work ordered by the Engineer causes an increase or decrease in the Contractor's cost of, or time required for, performance of the Contract, an adjustment and modification of the Contract will be made in the form of a Change Order which will set forth (a) the changes, additions and/or deductions in the work to be done, (b) the increase or decrease in compensation due the Contractor, if any, or the method by which the increase or decrease, if any, will be calculated, and (c) the adjustment in the time of completion of the work, if applicable. A Change Order may be issued to the Contractor at any time.

5.3.4 The compensation to be paid for any work addressed in a Change Order shall be determined in one or more of the following ways as shown in the Change Order:

a. By unit prices;

b. By an agreed-upon lump sum; or

c. By the cost plus basis determined pursuant to section 5.3.9.

5.3.5 Contractor shall keep full and complete records of the cost of any work addressed in a Change Order in the form and manner prescribed by the Engineer and shall permit the Engineer to have access to such records as may be necessary to assist in the determination of the compensation payable for such work.
5.3.6 With respect to a Change Order involving the deletion or reduction of work, the Engineer shall determine the appropriate reduction in the Contract price based on the lump sum and/or per unit prices in the bid schedule for the items of work deleted or reduced by the Change Order. The Contractor shall not be entitled to claim damages for anticipated profits on any portion of the work that may be deleted.

5.3.7 Upon receipt of a Change Order signed by the Engineer, the Contractor shall forthwith proceed with the ordered work, unless otherwise directed by the Engineer. If the Contractor agrees with the terms and conditions of the Change Order, then it shall sign the Change Order.

5.3.8 Should the Contractor disagree with any terms or conditions set forth in a proposed Change Order, it shall submit a written protest to the Engineer within 15 days after the receipt of the proposed Change Order. The protest shall state the points of disagreement, addressing, if applicable, the quantities and cost involved and the adjustment of time for completion.

5.3.8.1 If a written protest is not timely submitted by the Contractor, then the proposed Change Order, including all cost and time adjustment provisions, if any, that was submitted to the Contractor shall be deemed final and acceptable to the Contractor even if not signed by the Contractor. Any payment under an unprotested Change Order's cost adjustment provisions shall constitute full compensation for all work included in or required by the Change Order.

5.3.8.2 If the Contractor timely protests a proposed Change Order, it shall nevertheless proceed with the ordered work pending resolution of the protest.

5.3.8.3 If the Contractor timely protests a proposed Change Order, the Engineer shall render in writing its determination of the protest. If the Contractor disputes the determination, then the Contractor may file and pursue a claim pursuant to section 5.4. The written claim must be submitted to the Engineer within 15 days after the date of the Engineer's written determination on the protest. If the Contractor does not timely file a claim, then the proposed Change Order (as may have been revised by the Engineer's determination on the protest), including all cost and time adjustment provisions, if any, shall be deemed final and acceptable to the Contractor even if not signed by the Contractor. Any payment under such a Change Order's cost adjustment provisions shall constitute full compensation for all work included in or required by the Change Order.

5.3.8.4 If the Contractor refuses to accept a Change Order, the District may issue it unilaterally. The Contractor shall comply with the requirements of the Change Order. The District shall provide for an equitable adjustment to the Contract, and compensate the Contractor accordingly. If the Contractor does not agree that the adjustment is equitable, it may submit a claim in accordance with section 5.4.

5.3.9 The following shall constitute the cost plus basis of payment:
5.3.9.1 Charges for all of the labor furnished and used by the Contractor shall be made for manual classifications up to and including general foreman. It will not include charges for assistant superintendents, superintendents, office personnel, timekeepers and maintenance mechanics. The time charged to work shall be subject to the daily approval of the Engineer and evidence of such approval shown on approved Daily Extra Work Reports shall be submitted with the billing. Labor rates used to calculate the costs shall be those basic wages including current employer contributions for fringe benefits and federal and state surcharges and including applicable subsistence and travel allowances, all as actually paid to workers under collective bargaining agreements or as a regular practice of the employer. No time or charges will be allowed except when the workers are actually engaged in the proper, efficient and diligent performance or completion of the work as authorized. Overtime shall not be worked without prior approval of the Engineer.

5.3.9.2 Charges for the rental and operation of the equipment furnished and used by the Contractor shall be made for all prime construction and automotive equipment. It shall not include charges for listed equipment or major tools with a new cost of $500 or less. Equipment time charges shall be itemized on a Daily Extra Work Report, subject to the daily approval of the Engineer and evidence of such daily approval shall be submitted with the billing. The equipment rental and operation rates used shall be those agreed upon by the Engineer and the Contractor prior to commencement of the work and shall include an approved allowance for depreciation. The cost for each type of approved equipment (active or standby) shall be no greater than the amount allowed in the latest edition of the Caltrans Standard Equipment Rates. Time and charges shall be allowed only when equipment is actually being used for the proper and efficient performance or completion of the work as authorized.

5.3.9.3 Charges for the cost of materials furnished by the Contractor shall be made, provided such furnishing was specifically authorized in the work order and the actual use verified by the Engineer. Charges shall be net cost to the Contractor delivered at the job, including all applicable sales taxes; and a vendor's invoice must accompany the billing along with verification of use of such materials by the Engineer.

5.3.9.4 A charge for major tools, supplies, overhead, supervision and profit will be allowed in the amount of 15% of the total direct labor costs, equipment costs, and material costs, as defined in sections 5.3.9.1 to 5.3.9.3.

5.3.9.5 When all or any part of work is performed by any of the Contractor's subcontractors, the markup percentage established in section 5.3.9.4 shall be applied to the subcontractor's actual cost of such work (as determined in sections 5.3.9.1 to 5.3.9.3), to which a markup of 5% on the subcontracted portion of the extra work may be added by the Contractor.

5.3.10 Lump sum change orders shall include all work and costs associated with the change work item(s) and shall be agreed to and signed by both the Contractor and the District prior to commencing the work.
5.3.10.1 A charge for major tools, supplies, overhead, supervision and profit will be allowed an amount no greater than 15% of the total direct labor, equipment, and material costs.

5.3.10.2 When all or any part of work is performed by any of the Contractor's subcontractors, the markup percentage established in section 5.3.10.1 shall be applied to the subcontractor's actual cost of such work, to which a markup of no greater than 5% on the subcontracted portion of the extra work may be added by the Contractor.

5.3.11 The consent of the Contractor's bond sureties shall not be required as to any change or extra work ordered by the District, and the liability of the Contractor's bonds and sureties shall be increased or decreased accordingly without notice to the sureties.

5.3.12 The District reserves the right to contract with any person or firm other than the Contractor for any or all extra work.

5.3.13 If the total pay quantity of any item of work required under the Contract to be paid at a unit price exceeds the item as bid by more than 25 percent, then in the absence of an executed contract change order specifying the compensation to be paid, the work in excess of 125 percent of such estimate may, at the District's discretion, be paid for by a cost plus basis of payment as described at section 5.3.9, instead of at the unit price.

5.3.14 Any extra work related to differing site conditions pursuant to Public Contract Code section 7104 shall be addressed in accordance with section 5.45.7.5 of these General Conditions. No claim of the Contractor under this clause shall be allowed unless the Contractor has promptly given the notice required before any such claimed conditions are disturbed.

5.4 CLAIMS AND RESOLUTION OF DISPUTES

5.4.1 General. The parties intend by this section 5.4 that differences between the parties, arising under the Contract, be brought to the attention of the Engineer at the earliest possible time in order that such matters may be settled, if possible, or other appropriate action promptly taken. The parties agree to initially strive to resolve all disputes amicably and in an informal manner. Any dispute resolved informally shall be documented by the Engineer, and if the dispute resolution involves a change in the contract work, increase or decrease in the compensation due the contractor, or adjustment in the time of completion of the Work, then the informal dispute resolution shall be confirmed by a Change Order pursuant to section 5.3. Informal discussions or negotiations with the Engineer or other District representatives concerning informal resolution of a dispute shall not toll or suspend the claim filing and other deadlines provided below, unless so provided by the Engineer in writing. The willingness of the Engineer to engage in any such discussions is not a waiver of the District’s right to deny a claim or dispute it based on lack of merit, or procedural deficiency, or both.
5.4.2 Compliance Required. Contractor shall not be entitled to any additional time to complete Work or to the payment of any additional compensation for claimed extra work (or otherwise on account of any claim, cause, act, failure to act, or happening of any event or occurrence) unless either District has issued a Change Order pursuant to section 5.3 or a claim has been timely filed and approved pursuant to this section 5.4. If the Contractor fails to file a written claim within the claim deadline of section 5.4.4, then the Contractor agrees that it has waived any right or remedy to thereafter pursue the claim against the District in any administrative, arbitration or litigation proceeding, and the District may elect to document this waiver.

5.4.3 Scope of Claims. A claim for purposes of this section 5.4 means a separate demand by the Contractor for (a) a time extension (including a demand for relief from damages or penalties for delay assessed by the District under the Contract), (b) payment of money or damages arising from work done by, or on behalf of, the Contractor pursuant to the Contract and payment of which is not otherwise expressly provided for or the Contractor is not otherwise entitled to, or (c) an amount the payment of which is disputed by the District.

5.4.4 Filing of Contract Claim; Contents; Filing Deadline

5.4.4.1 The Contractor shall file any “Contract Claim” with the Engineer. A Contract Claim must (a) be in writing, (b) be labeled or clearly indicated as a claim under the Contract, (c) set forth in detail the reasons why the Contractor believes additional compensation or a time extension is or may be due, the nature of the costs involved, and, insofar as possible, the amount of the claim, and (d) include (or reference earlier provided) documents that support and substantiate the claim as to both entitlement and quantification of time, money, or both.

5.4.4.2 A Contract Claim must be submitted to the Engineer within the following claim filing deadlines: (a) if a deadline is set forth in the Contract Documents for filing of the particular claim, then the claim must be filed by the specified time; (b) if the claim relates to extra, additional or unforeseen work for which the Contractor intends to demand additional compensation, a time extension, or both, notice shall be given to the Engineer prior to the time that the Contractor commences performance of the work giving rise to the potential claim for additional compensation or time extension, and Contractor shall not proceed with that work until so directed by the Engineer; and (c) for all other claims not included within (a) or (b), the claim must be filed on or before 15 days after the date of the occurrence, event or circumstance giving rise to the claim. In no event shall a Contract Claim be filed later than the date of final payment.

5.4.5 Processing of Claims, Generally. This Contract provides for three types of Contract Claims, which will be processed and resolved under different subsections. Any claim for money or damages of $375,000 or less or for a time extension (i.e., any claim subject to Public Contract Code section 20104) shall be processed and resolved in accordance with section 5.4.6. Any claim for money or damages of more than $375,000 (i.e., any claim not subject to Public Contract Code section 9204 or 20104) shall be processed and resolved in accordance with section 5.4.7. Any Contract Claim sent to District
by registered mail or certified mail with return receipt requested (i.e., any claim subject to Public Contract Code section 9204) shall be processed and resolved pursuant to section 5.4.8.

5.4.6 Claims for $375,000 or Less or for Time Extension

5.4.6.1 Application. This section applies to all claims for $375,000 or less in value, including any claim for a time extension or for a time extension that includes claimed delay damages of $375,000 or less.

5.4.6.2 District Response to Contract Claim. The Engineer shall respond in writing to the Contract Claim within 60 days of receipt of the claim (or within 45 days of receipt for claims of less than $50,000), or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the District may have against the Contractor. If additional information is thereafter required, it shall be requested and provided pursuant to this subsection, upon mutual agreement of the Engineer and the Contractor. The Engineer's written response to the claim, as further documented, shall be submitted to the Contractor within 30 days after receipt (or 15 days after receipt for claims of less than $50,000) of the further documentation, or within a period of time no greater than that taken by the Contractor in producing the additional information or requested documentation, whichever is greater. The District shall not fail to pay money as to any portion of a Contract Claim that is undisputed except as otherwise provided in the Contract Documents.

5.4.6.3 Meet and Confer. If the Contractor disputes the Engineer's written response, or the Engineer fails to respond within the time prescribed, the Contractor may notify the District, in writing, either within 15 days of receipt of the Engineer's response or within 15 days of the Engineer's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon such a demand, the District shall schedule a meet and confer conference within 30 days for the parties to consider settlement of the dispute. If the Contractor fails to timely demand a meet and confer conference within the applicable 15-day period, then the Contractor shall be deemed not to dispute the Engineer's written response to the Contract Claim and the Engineer's decision on the Contract Claim shall be final, conclusive and binding, and the Contractor shall be deemed to have waived all its rights to further protest, judicial or otherwise.

5.4.6.4 Government Code Claim. Following the meet and confer conference, if the Contract Claim or any portion remains in dispute, the Contractor may file a Government Code Claim as provided in Government Code title 1, division 3.6, part 3, chapters 1 (commencing with section 900) and 2 (commencing with section 910). The running of the period of time within which Contractor must file a Government Code Claim shall be tolled from the time the Contractor submits a timely Contract Claim pursuant to section 5.4.4 until the time that the Contract Claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process. The District shall respond to any Government Code Claim in accordance with the Government Claims Act.

5.4.6.5 Lawsuit. If the claim is not resolved pursuant to section 5.4.6.4, the Contractor may file a lawsuit on the claim within the limitations period provided by the Government Claims Act. If the Contractor fails to timely file a lawsuit within the
limitations period of the Government Claims Act, then the District’s response to the Government Code Claim shall be final, conclusive and binding on the Contractor, and the Contractor thereafter shall be barred from filing a lawsuit on the claim.

5.4.6.6 Mediation. If the Contractor timely files a lawsuit, then within 60 days, but no earlier than 30 days, following the filing of responsive pleadings, the court shall submit the matter to non-binding mediation (unless waived by mutual stipulation of both parties). The mediation process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator. The mediator’s fees and expenses shall be split and paid equally between the parties. The court may, upon request by any party, order any witnesses to participate in the mediation process.

5.4.6.7 Arbitration. If the matter remains in dispute following the mediation or if the parties waive the mediation, then the case shall be submitted to judicial arbitration pursuant to Code of Civil Procedure part 3, title 3, chapter 2.5 (commencing with section 1141.10), notwithstanding section 1141.11 of that code. The Civil Discovery Act of 1986 (Code of Civil Procedure part 4, title 3, chapter 3, article 3 (commencing with section 2016)) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration. The arbitrator shall be experienced in public works construction law. The arbitrator’s fees and expenses shall be split and paid equally by the parties, except where the arbitrator, for good cause, determines a different division. The court may, upon request by any party, order any witnesses to participate in the arbitration process. Any party who, after receiving an arbitration award, requests a trial de novo but does not obtain a more favorable judgment shall (in addition to payment of any costs and fees under Code of Civil Procedure part 3, title 3, chapter 2.5 (commencing with section 1141.10)) pay the attorney's fees of the other party arising out of the trial de novo.

5.4.6.8 Interest. In any lawsuit filed under this subsection, District shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the lawsuit is filed in court.

5.4.7 Claims for More Than $375,000

5.4.7.1 Application. This section applies to all claims that exceed $375,000 in value, including any claim for time extension that includes claimed delay damages exceeding $375,000.

5.4.7.2 District Response to Contract Claim. The Engineer shall respond in writing to the Contract Claim within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim that the District may have against the Contractor. If additional information is thereafter required, it shall be requested and provided pursuant to this subsection, upon mutual agreement of the Engineer and the Contractor. The Engineer's written response to the
claim, as further documented, shall be submitted to the Contractor within 30 days after receipt of
the further documentation. If the Contractor fails to timely dispute the Engineer's decision on the
matter in accordance with section 5.4.7.3, then the Contractor shall be deemed not to dispute the
Engineer's written response to the Contract Claim and the Engineer's decision shall be final,
conclusive and binding, and the Contractor shall be deemed to have waived all its rights to further
protest, judicial or otherwise.

5.4.7.3 Government Code Claim. If the Contractor disputes the
Engineer’s written response to the Contract Claim, the Contractor may file a Government Code
Claim as provided in Government Code title 1, division 3.6, part 3, chapters 1 (commencing with
section 900) and 2 (commencing with section 910). District shall respond to any Government Code
Claim in accordance with the California Government Claims Act.

5.4.7.4 Lawsuit. If the claim is not resolved pursuant to
section 5.4.7.3, the Contractor may file a lawsuit on the claim within the limitations period
provided by the Government Claims Act. If the Contractor fails to timely file a lawsuit within the
limitations period of the Government Claims Act, then the District’s response to the Government
Code Claim shall be final, conclusive and binding on the Contractor, and the Contractor thereafter
shall be barred from filing a lawsuit on the claim.

5.4.7.5 Judicial Reference. If the Contractor timely files a
lawsuit, the case shall be submitted to judicial reference pursuant to California Code of Civil
Procedure sections 638 and 640 through 645.1 (or any successor statute) and California Rules of
Court title 3, division 9 (commencing with section 3.900). As authorized by Code of Civil
Procedure section 638, a referee will consider and decide all factual and legal issues in the action.
Each party acknowledges that it will not have any right to a jury trial or to have any judicial officer
besides the referee hear or decide the action. When Contractor initiates the superior court lawsuit,
it will, at the same time it files the complaint in the action, also file a motion for appointment of a
single referee.

(a) Appointment of a referee shall be by mutual agreement within 30 days between the
parties, and if unsuccessful, then by the court and will be governed by Code of Civil
Procedure section 640, and subject to objection by either party as provided by Code
of Civil Procedure section 641. The referee must be a retired judge or a licensed
attorney with at least ten years substantive experience in public works construction
matters.

(b) The parties shall be entitled to discovery and the referee shall oversee discovery
and may enforce all discovery orders in the same manner as a superior court judge.
The referee shall have the authority to consider and rule on appropriate pre-hearing
and post-hearing motions in the same manner as a superior court judge. The referee
will have the authority to set a briefing and hearing schedule for any such motion
or for a hearing on the merits.

(c) The referee’s statement of decision shall include findings of fact and conclusions
of law. The statement of decision will stand as the decision of the superior court
and, upon filing of the statement with the clerk of the court, judgment may be
entered pursuant to Code of Civil Procedure section 644, subsection (a). The parties will have rights to appeal the final judgment so entered.

(d) Each Party will pay half of the costs of the referee and the administrative fees of the reference proceeding, and each party will bear its own costs, expenses and attorney fees for the reference proceeding.

5.4.8 Claims Subject to Public Contract Code section 9204

5.4.8.1 The Contract Claim will be processed and resolved pursuant to Public Contract Code section 9204, which is summarized here:

(a) District Review of Claim. Within 45 days after receiving a complete Contract Claim, District shall review the claim and provide the Contractor a written statement identifying what portion of the claim is disputed and what portion is undisputed. District will pay any undisputed portion of the claim within 60 days from the date of the written statement. If District fails to timely issue a written statement, the claim shall be deemed rejected in its entirety.

(b) Meet and Confer Conference. If the Contractor disputes the District’s written statement or if the Contract Claim is deemed rejected, the Contractor may demand and the parties will conduct an informal conference to meet and confer regarding settlement in accordance with section 9204, subsection (d)(2). Within 10 business days following the conclusion of the meet and confer conference, District shall provide Contractor a written statement identifying the portion (if any) of the claim remaining in dispute and any undisputed portion will be paid by District within 60 days after this written statement.

(c) Non-Binding Mediation. Any remaining disputed portion of the claim shall be submitted to nonbinding mediation in accordance with section 9204, subsection (d)(2).

(d) Interest. Any amount not paid in a timely manner as required by this subsection shall bear interest at a rate of 7 percent per annum until paid.

The foregoing is a summary of section 9204. In the event of any conflict between the summary and section 9204, the statute will govern.

5.4.8.2 Lawsuit and Reference. If mediation is unsuccessful and all or parts of the Contract Claim remain in dispute, then the Contractor may pursue a lawsuit (with judicial reference) in accordance with the procedures set forth at sections 5.4.7.4 through 5.4.7.5.

5.4.9 Contract Work Pending Claim Resolution. Unless otherwise directed in writing by the Engineer, pending resolution of a claim under this section 5.4, the Contractor shall continue to diligently prosecute the Contract work in accordance with the Contract Documents and the instructions of the Engineer.
5.4.10 Tort Claims. The provisions of this section 5.4 apply only to contract-based claims and they shall not apply to tort claims, and nothing in this section 5.4 is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Government Code title 1, division 3.6, part 3, chapters 1 (commencing with section 900) and 2 (commencing with section 910).

5.5 GUARANTEE

5.5.1 In addition to warranties, representations and guarantees stated elsewhere in the Contract Documents, or implied-in-fact or in-law, the Contractor unconditionally guarantees all materials and workmanship furnished hereunder, and agrees to repair or replace or both at its sole cost and expense, and to the satisfaction of the Engineer and the District, any and all materials which may be defective or improperly installed.

5.5.2 The Contractor shall repair or replace to the satisfaction of the Engineer any or all such work that may prove defective in workmanship or materials, ordinary wear and tear excepted, together with any other work which may be damaged or displaced in so doing. Contractor shall leave the site of any such repair or replacement work in satisfactory working order and condition.

5.5.3 In the event of failure to comply with the above stated conditions within a reasonable time, the District is authorized to have the defect repaired and made good at the expense of the Contractor who will pay the costs and charges therefor immediately upon demand, including any reasonable management and administrative costs, and engineering, legal and other consultant fees incurred to enforce this section.

5.5.4 The signing of the Contract by the Contractor shall constitute execution of the above guarantees. Except as otherwise provided in this Contract, the guarantees and warranties shall remain in effect for one year from the date of recording a notice of completion. The District shall have the right to call for such inspection or inspections of the work before the end of the one-year guarantee period and Contractor shall attend and participate in such inspection(s) upon request of the District. This guarantee does not excuse the Contractor from breaches of contract causing defects that occur or are discovered more than one year after the notice of completion. In addition, the warranty and guaranty period for repaired or replaced work or part shall be one year from the date of acceptance of said repaired or replaced work or part, but not less than the remaining warranty period of the original work.

5.6 AUTHORITY OF THE ENGINEER

5.6.1 The Engineer is the representative of the District and has full authority to interpret the Contract Documents, to conduct the construction review and inspection of the Contractor's performance, and to decide questions which arise during the course of the work; and its decisions on these matters shall be final and conclusive. The Engineer has the authority to reject all work and materials that do not conform to the Contract Documents, and has the authority to stop the work whenever such stoppage may be necessary to insure the proper execution of the Contract.
5.6.2 If at any time the Contractor's work force, tools, plant or equipment appear to the Engineer to be insufficient or inappropriate to secure the required quality of work or the proper rate of progress, the Engineer may order the Contractor to increase their efficiency, improve their character, to augment their number or to substitute other personnel, new tools, plant or equipment, as the case may be, and the Contractor shall comply with such order. Neither the failure of the Engineer to demand such increase of efficiency, number, or improvement, nor the compliance by the Contractor with the demand, shall relieve the Contractor of its obligation to provide quality work at the rate of progress necessary to complete the work within the specified time.

5.6.3 The Engineer shall have the authority to make minor changes in the work, not involving extra costs, and not inconsistent with the purposes of the work.

5.6.4 Any order given by the Engineer, not otherwise required by the Contract Documents to be in writing shall, on request of the Contractor, be given or confirmed by the Engineer in writing.

5.6.5 Whenever work, methods of procedure, or any other matters are made subject to direction or approval, such direction or approval will be given by the Engineer.

5.7 DRAWINGS

5.7.1 Drawings furnished herewith are for bidding purposes. The Engineer will furnish the Contractor, free of charge, copies of full size Drawings which are reasonably necessary for the execution of the work. The Contractor shall have no claim for excusable delay on account of the failure of the Engineer to deliver such Drawings unless the Engineer shall have failed to deliver the same within two weeks after receipt of written demand therefor from the Contractor. If the Contractor, in the course of the work, finds any discrepancy between the Drawings and the physical condition of the locality, or any errors or omissions in the Drawings, or in the layout as given by points and instructions, it shall be its duty to inform the Engineer in writing, and the Engineer will promptly verify the same. Any work done after such discovery, until authorized, will be done at the Contractor's risk. All Drawings, Specifications, and copies thereof furnished by the Engineer are the property of the Engineer and shall not be reused on other work and, with the exception of the signed Contract sets, are to be returned to it, on request, at the completion of the work. All models are the property of the District.

5.7.2 The Contractor shall maintain at the site of work one record copy of the Drawings, in good order, and available to the Engineer. The Contractor shall mark the Drawings to record all changes and corrections made during construction. The Contractor shall make all corrections and changes on the Drawings as necessary to produce accurate and complete record Drawings showing the “as built” work. Marked Drawings shall be updated at least weekly. The Contractor shall submit to the Engineer a final, complete and accurate set of record Drawings prior to or simultaneously with the Contractor’s request for final payment.
5.7.3 The Drawings shall be supplemented by such shop drawings prepared by the Contractor as are necessary to adequately control the work. Contractor shall not make any changes in any shop drawings after they have been reviewed by the Engineer.

5.7.4 Shop drawings for any structure shall include, but not be limited to: stress sheets, anchor bolt layouts, shop details, and erection plans, which shall be reviewed and approved by the Engineer before any such work is performed.

5.7.5 Shop drawings will be required for cribs, cofferdams, falsework, centering and form work and for other temporary work and methods of construction the Contractor proposes to use. Such drawings shall be subject to the review and approval of the Engineer insofar as the details affect the character of the finished work, but details of design will be left to the Contractor who shall be responsible for the successful construction of the work.

5.7.6 Contractor agrees that shop drawings processed by the Engineer are not Contract Change Orders, and that the purpose of shop drawings submitted by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept, and to demonstrate its understanding by indicating which equipment and material it intends to furnish and by detailing the fabrication methods it intends to use.

5.7.7 It is expressly understood, however, that favorable review of the Contractor's shop drawings shall not relieve the Contractor of any responsibility for accuracy of dimensions and details, or for mutual agreements of dimensions and details. It is mutually agreed that the Contractor shall be responsible for agreement and conformity of its shop drawings with the Specifications. Contractor further agrees that if deviations, discrepancies or conflicts between shop drawings and Specifications are discovered either prior to or after shop drawings are processed by the Engineer, the Specifications shall control and shall be followed.

5.7.8 Unless otherwise stated, the Engineer shall have 30 days from the date of receipt of shop drawings for review.

5.7.9 Full compensation for furnishing all shop drawings shall be considered as included in the prices paid for the Contract items of work to which such drawings relate and no additional compensation will be allowed therefor. Any cost related to the Engineer's review of any particular set of shop drawings more than twice, due to incompleteness or unacceptability, shall be borne by the Contractor, and the District reserves the right to withhold such costs from payments due the Contractor.

5.8 CONSTRUCTION STAKING AND SURVEYS

The Engineer will provide the Contractor with drawings showing benchmarks and reference points as it deems necessary to establish lines and grades required for the completion of the site work specified in the Contract Documents. The Contractor shall make or furnish all surveys and set all construction stakes necessary for the completion of the work.
Stakes and marks set by the District or Engineer, if any, shall be carefully preserved by the Contractor. The Contractor shall be charged for the cost of replacing or restoring the stakes and marks that are destroyed or damaged by its operation. This charge will be deducted from any monies due or to become due to the Contractor under the Contract.

5.9 PERMITS AND REGULATIONS

5.9.1 Permits and licenses, of a temporary nature, necessary for the prosecution of the work shall be secured and paid for by the Contractor. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the District unless otherwise specified.

5.9.2 The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as shown on the plans and described in the Specifications. The Contractor shall promptly notify the Engineer in writing of any specification at variance therewith and any necessary changes shall be adjusted as provided in the Contract for changes in the work. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules, and regulations and without such notice to the Engineer, it shall bear all costs arising therefrom.

5.10 CONFORMITY WITH CONTRACT DOCUMENTS

Work and materials shall conform to the lines, grades, cross sections, dimensions and material requirements, including tolerances, shown on Contract Documents. Although measurement, sampling, and testing may be considered evidence as to such conformity, the Engineer shall be the sole judge as to whether the work or materials deviate from the Specifications and plans, and his decision as to any allowable deviations therefrom shall be final and conclusive.

5.11 COORDINATION & INTERPRETATION OF CONTRACT DOCUMENTS

5.11.1 The Contract Documents are complementary and a requirement occurring in one is as binding as though occurring in all.

5.11.2 In the event of conflict between the Plans and the Specifications, the Specifications shall govern, except that, where items are shown on the Plans and are not specifically included in the Specifications, the Plans shall govern.

5.11.3 Should it appear that the work to be done or any of the matters relative thereto are not sufficiently detailed or explained in the Specifications and Plans, the Contractor shall apply to the Engineer for such further explanations as may be necessary and shall conform to them as part of the Contract. In the event of any doubt or question arising respecting the true meaning of the Specifications and Plans, reference shall be made to the Engineer, whose decision thereon shall be final and conclusive.
5.11.4 In the event of any discrepancy between any Plans and the figures written thereon, the figures shall be taken as correct. Detailed drawings shall prevail over general drawings.

5.11.5 Any reference made in the Specifications or on the Plans to any specification, standard, method, or publication of any scientific or technical society or other organization shall, in the absence of a specific designation to the contrary, be understood to refer to the Specification, standard, method, or publication in effect as of the date that the work is advertised for Bids.

5.12 SUBCONTRACTS

5.12.1 The attention of the Contractor is directed to California Public Contract Code section 4100, et seq., regarding subcontracting and said provisions are by this reference incorporated herein and made a part hereof.

5.12.2 Each subcontract shall contain a suitable provision for the suspension or termination thereof should the work be suspended or terminated or should the subcontractor neglect or fail to conform to every provision of the Contract Documents insofar as such provisions are relevant. No subcontractor or supplier will be recognized as such, and all persons engaged in work will be considered as employees of the Contractor, and the Contractor will be held responsible for their work, which shall be subject to the provisions of the Contract Documents. The Contractor shall be fully responsible to the District for the acts or omissions of its subcontractors and of the persons either directly or indirectly employed by them. Nothing contained in the Contract Documents shall create any contractual relationship between any subcontractor and the District. If a legal action, including arbitration and litigation, against the District is initiated by a subcontractor or supplier, the Contractor shall reimburse the District for the amount of legal, engineering and all other expenses incurred by the District in defending itself in said action.

5.12.3 The District and the Engineer reserve the right to approve all subcontractors. Such approval shall be a consideration to the awarding of the Contract and unless notification to the contrary is given to the Contractor prior to the signing of the Contract, the list of subcontractors that is submitted with its proposal will be deemed to be acceptable.

5.13 COOPERATION OF CONTRACTORS

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

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

5.14 SUPERINTENDENCE

5.14.1 The Contractor shall designate in writing before starting work an individual as authorized representative who shall have the authority to represent and act for the Contractor. This authorized representative shall be present at the site of the work at all times while work is actually in progress on the Contract. When work is not in progress and during periods when work is suspended, arrangements acceptable to the Engineer shall be made for any emergency work that may be required.

5.14.2 The Contractor is solely responsible, at all times, for the superintendence of the work and for its safety and progress.

5.14.3 Whenever the Contractor or its authorized representative is not present on any particular part of the work where it may be desired to give direction, orders will be given by the Engineer, which shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which the orders are given.

5.14.4 Any order given by the Engineer, not otherwise required by the Contract Documents to be in writing, will on request of the Contractor, be given or confirmed by the Engineer in writing.

5.15 INSPECTION OF WORK

5.15.1 Unless otherwise provided, all equipment, materials, and work shall be subject to inspection and testing by the Engineer. The Engineer will observe the progress and quality of the work and determine, in general, if the work is proceeding in accordance with the intent of the Contract Documents. He shall not be required to make comprehensive or continuous inspections to check the quality of the work, and he shall not be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the work. Visits and observations made by the Engineer shall not relieve the Contractor of its obligation to conduct comprehensive inspections of the work and to furnish proper materials, labor, equipment and tools, and perform acceptable work, and to provide adequate safety precautions, in conformance with the intent of the Contract.

5.15.2 Whenever the Contractor varies the period during which work is carried on each day, it 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 subject to rejection. Proper facilities for safe access for inspection to all parts of the work shall at all times be maintained for the necessary use of the Engineer and other agents of the District, and agents of the Federal, State, or local governments at all reasonable hours for inspection by such agencies to ascertain compliance with laws and regulations.
5.15.3 One or more inspectors may be assigned to observe the work and to act in matters of construction under this Contract. It is understood that inspectors shall have the power to issue instructions and make decisions within the limitations of the authority of the Engineer. Such inspection shall not relieve the Contractor of its obligation to conduct comprehensive inspections of the work, to furnish proper materials, labor, equipment and tools, and perform acceptable work, and to provide adequate safety precautions in conformance with the intent of the Contract.

5.15.4 The Engineer and his representatives shall at all times have access to the work wherever it is in preparation or progress; and the Contractor shall provide safe and convenient facilities for such access and for inspection. If the Specifications, the Engineer's instructions, laws, ordinances, or any public authority require any material, equipment or work to be specifically tested or approved, the Contractor shall give the Engineer timely notice of its readiness for inspection, and if the inspection is by an authority other than the District, of the time fixed for inspection. Inspections by the Engineer will be made promptly and, where practicable, at the source of supply.

5.15.5 Work performed without inspection may be required to be removed and replaced under proper inspection and the entire cost of removal and replacing, including the cost of District-furnished materials used in the work, shall be borne by the Contractor, regardless of whether or not the work exposed is found to be defective. Examination of questioned work, other than that installed without inspection, may be ordered by the Engineer and, if so ordered, the work must be uncovered by Contractor. If such work is found to be in accordance with the Contract Documents, the District will pay the cost of reexamination and replacement. If such work is found to be not in accordance with the Contract Documents, the Contractor shall pay such cost unless it can show that the defect in the work was caused by another contractor, and in that event the District will pay such costs.

5.15.6 The inspection of the work shall not relieve the Contractor of its obligation to fulfill the Contract as herein prescribed, or in any way alter the standard of performance provided by the Contractor; and defective work shall be made good and unusable materials may be rejected, notwithstanding that such work and materials have been previously overlooked by the Engineer and accepted or estimated for payment. If the work or any part thereof shall be found defective, Contractor shall, within ten (10) calendar days, make good such defect in a manner satisfactory to the Engineer. If the Contractor shall fail or neglect to make ordered repairs of defective work or to remove the condemned materials from the work within ten (10) calendar days after direction by the Engineer in writing, the District may make the ordered repairs, or remove the condemned materials, and deduct the cost thereof from any monies due the Contractor.

5.15.7 The Contractor shall furnish promptly without additional charge all facilities, labor and materials reasonably needed by the Engineer for performing all inspection and tests. Contractor shall be charged with any additional cost of inspection when material and workmanship are not ready at the time specified by the Contractor for its inspection.
5.15.8 Where any part of the work is being done under an encroachment permit or building permit, or is subject to Federal, State, County or City codes, laws, ordinances, rules or regulations, representatives of the government agency shall have full access to the work and shall be allowed to make any inspection or tests in accordance with such permits, codes, laws, ordinances, rules, or regulations. If advance notice of the readiness of the work for inspection by the governing agency is required, the Contractor shall furnish such notice to the appropriate agency.

5.15.9 The Engineer may inspect the production of material, or the manufacture of products at the source of supply. Plant inspection, however, will not be undertaken until the Engineer is assured of the cooperation and assistance of both the Contractor and the material producer. The Engineer or his authorized representative shall have free entry at all times to such parts of the plant as concerns the manufacture or production of the materials. Adequate facilities shall be furnished free of charge to make the necessary inspection. The District assumes no obligation to inspect materials at the source of supply.

5.16 TESTS

The Contractor shall perform at its expense all tests specified or required by the Specifications. The Engineer will perform such tests as he deems necessary to determine the quality of work or compliance with Contract Documents. The Contractor shall furnish promptly without additional charge all facilities, labor, and material reasonably required for performing safe and convenient tests as may be required by the Engineer. All tests by the Engineer will be performed in such a manner as will not unnecessarily delay the work. The Contractor shall not be required to reimburse the District for tests performed by the District or Engineer. If samples of materials are submitted which fail to pass the specified tests, the Contractor shall pay for all subsequent tests.

5.17 REMOVAL OF REJECTED/UNAUTHORIZED WORK AND MATERIALS

5.17.1 All work or materials which have been rejected shall be remedied, or removed and replaced by the Contractor in an acceptable manner and no compensation will be allowed it for such removal, replacement, or remedial work.

5.17.2 Any work done beyond the lines and grades shown on the Plans or established by the Engineer or any extra work done without written authority will be considered as unauthorized work and will not be paid for. Upon order of the Engineer, unauthorized work shall be remedied, removed, or replaced at the Contractor's expense.

5.17.3 Upon failure of the Contractor to comply with any order of the Engineer made under this section, the District may cause rejected or unauthorized work to be remedied, removed, or replaced, and may deduct the costs therefrom from any monies due or to become due the Contractor.
5.18 DEDUCTIONS FOR UNCORRECTED WORK.

If the Engineer deems it inexpedient to correct work damaged or not done in accordance with the Contract Documents, an equitable deduction from the Contract price shall be made therefor; and such sum may be withheld by the District from Contractor's payment.

5.19 EQUIPMENT AND PLANTS

5.19.1 Only equipment and plants suitable to produce the quality of work and materials required will be permitted to operate on the project.

5.19.2 Plants will be designed and constructed in accordance with general practice for such equipment and shall be of sufficient capacity to insure the production of sufficient material to carry the work to completion within the time limit.

5.19.3 The Contractor shall provide adequate and suitable equipment and plants to meet the above requirements, and when ordered by the Engineer, shall remove unsuitable equipment from the work and discontinue the operation of unsatisfactory plants.

5.19.4 The Contractor shall identify each piece of its equipment, other than hand tools, by means of an identifying number plainly stenciled or stamped on the equipment at a conspicuous location, and shall furnish to the Engineer a list giving the description of each piece of equipment and its identifying number. In addition, the make, model number and empty gross weight of each unit of compacting equipment shall be plainly stamped or stenciled in a conspicuous place on the unit. The gross weight shall be either the manufacturer's rated weight or the scale weight.

5.19.5 In the case of termination of this Contract before completion from any cause whatever, the Contractor, if notified to do so by the District, shall promptly remove any part or all of its equipment and supplies from the property of the District. If the Contractor fails to do so, the District shall have the right to remove such equipment and supplies at the expense of the Contractor.

5.20 CHARACTER OF WORKER

If any subcontractor or person employed by the Contractor or any subcontractor shall be incompetent or act in a disorderly or improper manner, that subcontractor or person shall be removed from the work immediately, and such subcontractor or person shall not again be employed on the work. Such discharge shall not be the basis for any claim for compensation or damages against the District, the Engineer or any of their officers, directors, employees or agents.

5.21 SEPARATE CONTRACTS

5.21.1 The District reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate its work with the other contractor's work.
5.21.2 If any part of the Contractor's work depends for proper execution or results upon the work of any other contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such work that render it unsuitable for such proper execution and results. The Contractor's failure to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of the Contractor's work, except as to defects that may develop in the other contractor's work after the execution of its work. To insure the proper execution of its subsequent work, the Contractor shall measure work already in place and shall at once report to the Engineer any discrepancy between the executed work and the drawings.

5.22 MATERIALS

5.22.1 Unless otherwise specifically stated in the Specifications, the Contractor shall furnish all materials necessary for the execution and completion of the work. Unless otherwise specified, all materials shall be new and shall be manufactured, handled, and installed in a workmanlike manner to insure completion of the work in accordance with the Contract Documents. The Contractor shall, upon request of the Engineer, furnish satisfactory evidence as to the kind and quality of materials.

5.22.2 Where materials are to be furnished by the District, the type, size, quantity and location at which they are available will be stated in the Contract Documents.

5.22.3 Manufacturers' and suppliers’ warranties, guarantees, operating manuals, instruction sheets and parts listed, which are furnished with certain articles or materials incorporated in the work, shall be delivered to the Engineer before final acceptance of the Contract work.

5.23 STORAGE OF MATERIALS; STORAGE AREAS

5.23.1 Articles or materials to be incorporated in the work shall be stored in such a manner as to insure the preservation of their quality and fitness for the work, and to facilitate inspection.

5.23.2 The Contractor's work and storage areas are detailed in Section 01500 – Construction Facilities and Temporary Controls. The plant facilities are to be installed in property or easements owned by the District as shown on the Plans. The District shall be specifically exempted in any agreement from any liability incurred from the use of private property for construction purposes. The Contractor shall make arrangements and pay for property off-site as required for storage, offices, work assembly areas, etc. The Contractor shall take all responsibility for storage of materials. No equipment for incorporation in the project may be stored in an area subject to flooding.

5.24 TRADE NAMES AND ALTERNATIVES

For convenience in designation in the Specifications and Plans, certain articles or materials to be incorporated in the work may be designated under a trade name or the name of a manufacturer and its catalog information. The use of an alternative article or material that is of equal quality
and of the required characteristics for the purpose intended will be permitted, subject to the following requirements:

5.24.1 The burden of proof as to the quality and suitability of alternatives shall be upon the Contractor and it shall furnish all information necessary as required by the Engineer. The Engineer shall be the sole judge as to the quality and suitability of alternative articles or materials and his decision shall be final.

5.24.2 Whenever the Specifications and Plans permit the substitution of a similar or equivalent material or article, no tests or action relating to the approval of such substitute material or article will be made until the request for substitution is made in writing by the Contractor accompanied by complete data as to the equality of the material or article proposed. Such request by the Contractor must be made within thirty five (35) days after award of Contract.

5.25 CERTIFICATES OF COMPLIANCE

5.25.1 A Certificate of Compliance shall be furnished prior to the use of any materials for which the Specifications require that such a certificate be furnished. In addition, when so authorized in the Specifications, the Engineer may permit the use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance. The Certificate shall be signed by the manufacturer of the material or the manufacturer of assembled materials and shall state that the materials involved comply in all respects with the requirements of the Contract. A Certificate of Compliance shall be furnished with each lot of material delivered to the work and the lot so certified shall be clearly identified in the Certificate.

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

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

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

5.26 ASSIGNMENT

The Contractor shall not assign the Contract or sublet it as a whole or in part without the written consent of the District, nor shall the Contractor assign any monies due, or to become due to it hereafter, without the prior written consent of the District.
5.27 DISTRICT ENTRY ON WORK SITE; RIGHT TO OPERATE UNSATISFACTORY EQUIPMENT OR FACILITIES

5.27.1 The District may, at any time, and from time to time, during the performance of the work, enter the work site for the purpose of installing any necessary work by District labor or other contracts, and for any other purpose in connection with the installation of facilities. In doing so, the District shall endeavor not to interfere with the Contractor and the Contractor shall not interfere with other work being done by or on behalf of the District.

5.27.2 The District reserves the right, prior to completion and final acceptance, to occupy, or use, any completed part or parts of the work, providing these areas have been approved for occupancy by the District. The exercise of this right shall in no way constitute an acceptance of such parts, or any part of the work, nor shall it in any way affect the dates and times when progress payments shall become due from the District to the Contractor or in any way prejudice the District's rights in the Contract, or any bonds guaranteeing the same. The Contract shall be deemed completed only when all the work contracted has been duly and properly performed and accepted by the District.

Prior to such occupancy or use, the District and Contractor shall agree in writing regarding the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the work, insurance, the period for correction of the work, and the commencement of warranties required by the Contract Documents.

In exercising the right to occupy or use completed parts of the work prior to the completion thereof, the District shall not make any use which will materially increase the cost to the Contractor, without increasing the Contract Amount, nor materially delay the completion of the Contract, without extending the time for completion.

5.27.3 If, following installation of any equipment or facilities furnished by the Contractor, defects requiring correction by the Contractor are found, the District shall have the right to operate such unsatisfactory equipment or facilities and make reasonable use thereof until the equipment or facilities can be shut down for correction of defects without injury to the District.

5.28 LANDS FOR WORK; RIGHTS OF WAY; CONSTRUCTION ROADS; TEMPORARY UTILITY SERVICES

5.28.1 The District will provide the lands, easements, rights of way, and/or encroachment permits necessary or other rights to enter and work on lands necessary for the performance of the work. Other permits and licenses are addressed by section 5.9. Should the Contractor find it advantageous to use any additional land for any purpose whatever, the Contractor shall provide for the use of such land at its expense. The Engineer shall be furnished with a copy of written agreements or otherwise be notified in writing of additional working space which is acquired. Nothing herein contained and nothing marked on the Plans shall be interpreted as giving the Contractor exclusive occupancy of the territory provided by the District. When two or more contracts are being executed at one time on the
same or adjacent land in such a manner that work on one contract may interfere with that on another, the Engineer shall decide which contractor shall cease work, and which shall continue, or whether the work on both contracts shall progress at the same time and in what manner; and the decision of the Engineer shall be final and binding. When the territory of one contract is the necessary or convenient means of access for the performance of another contract, such privilege of access or any other reasonable privilege may be granted by the Engineer to the contractor so desiring, to the extent, amount, in the manner, and at the time permitted. No such decision as to the method or time of conducting the work or the use of territory shall be the basis of any claim for delay or damage.

5.28.2 Lands, easements or rights of way to be furnished by the District for construction operations will be specifically shown on the Plans.

5.28.3 The Contractor shall construct and maintain all roads necessary to reach the various parts of the work and for the transportation thereto of construction material and personnel. The cost of constructing and maintaining such roads shall be borne by the Contractor.

5.28.4 The Contractor shall make its own arrangements for any utility services it may require during the life of this project. The Contractor shall make its own arrangements for telephone service which it will require for its field office.

5.29 PROGRESS SCHEDULE

5.29.1 The Contractor shall submit within 10 days after Date of the Contract a schedule or schedules which shall show the dates at which the Contractor will start and complete the several parts of the work. This schedule shall conform to the completion time specified in the Contract. The Contractor shall review and, if necessary, revise the progress schedule at least once per month, and in any event shall submit a current schedule to the Engineer at his request at any time during the contract period.

5.29.2 The Engineer shall be advised in advance by the Contractor when any part of the work is scheduled and the days when no work will take place. If the Contractor fails to notify the Engineer in advance of the day or days when no work will be done, the Contractor will be charged the cost of inspection for that day or days and such charges may be deducted from any payment due the Contractor.

5.29.3 When, in the judgment of the Engineer, it is necessary to accelerate any part of the work ahead of schedule, the Contractor shall, when directed, concentrate its efforts on such part of the work.

5.30 COMMENCEMENT AND PROGRESS OF THE WORK AND TIME OF COMPLETION; CONSTRUCTION SEQUENCE; DELAYS

5.30.1 The Contractor shall commence the work covered by this Contract within fifteen (15) days after date of issuance of Notice to Proceed from the District to proceed with the work. Work will be considered to have commenced when the Contractor
begins ordering materials and equipment or starts site work. The Contractor shall not commence work or incur any expenses in connection therewith, before it is notified to proceed with the work. Work on the total project shall be completed within **One Hundred and Fifty (150) calendar days** from the date of the Notice to Proceed. The time allowed for completion includes an allowance for working time lost due to normal inclement weather. A Pre-Construction conference will be scheduled by the Engineer prior to the Contractor starting work.

5.30.2 The Contractor shall give the Engineer written notice not less than two (2) working days in advance of the actual date on which the work will be started. The Contractor shall be entirely responsible for any delay in the work that may be caused by this failure to give such notice. The Engineer shall have the right to specify the locations where the Contractor shall start and proceed with the work.

5.30.3 The Contractor shall diligently pursue the work and complete the work as specified within the time limits as set forth in the Contract Documents.

5.30.4 When the Contractor foresees a delay in the prosecution of the work and, in any event, immediately upon the occurrence of a delay, the Contractor shall notify the Engineer in writing of the probability of the occurrence and the estimated extent of the delay, and its cause. The Contractor shall take immediate steps to prevent, if possible, the occurrence or continuance of the delay. The Contractor agrees that no claim shall be made for delays that are not called to the attention of the Engineer at the time of their occurrence.

5.30.5 Non-excusable delays in the prosecution of the work shall include delays which could have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its subcontractors, at any tier level, or suppliers.

5.30.6 Excusable delays in the prosecution or completion of the work shall include delays which result from causes beyond the control of the Contractor and District and which could not have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its subcontractors, at any tier level, or suppliers.

5.30.7 Delays caused by acts of god, fire, unusual storms, floods, tidal waves, earthquakes, strikes, labor disputes, and freight embargoes, shall be considered as excusable delays insofar as they prevent the Contractor from proceeding with at least seventy five (75) percent of the normal labor and equipment force for at least five (5) hours per day toward completion of the current critical activity item(s) on the latest favorably reviewed progress schedule.

5.30.8 Should inclement weather conditions or the conditions resulting from weather prevent the Contractor from proceeding with seventy five (75) percent of the normal labor and equipment force engaged in the current critical activity item for a period of at least five (5) hours per day toward completion of such operation or operations, and the crew is dismissed as a result thereof, it shall be a weather delay day.
5.30.9 Upon the submission of satisfactory proof to the Engineer by the Contractor, shortages of material may be acceptable as grounds for granting a time extension. In order that such proof may be satisfactory and acceptable to the Engineer, it must be demonstrated by the Contractor that the Contractor has made every effort to obtain such materials, or obtain acceptable substitute materials, from all known sources within reasonable reach of the proposed work. Only the physical shortage of material, caused by unusual circumstances, will be considered under these provisions as a cause for extension of time, and no consideration will be given to any claim that material could not be obtained at a reasonable, practical, or economical cost or price, unless it is shown to the satisfaction of the Engineer that such material could have been obtained only at exorbitant prices entirely out of line with current rates, taking into account the quantities involved and usual practices in obtaining such quantities. A time extension for shortage of material will not be considered for material ordered or delivered late or whose availability is affected by virtue of the mishandling of procurement. The above provisions apply equally to equipment to be installed in the work.

5.30.10 Compensable delays in the prosecution or completion of the work shall include delays that occur through no fault of the Contractor and prevent the Contractor from proceeding with at least seventy-five (75) percent of the normal labor and equipment force for at least five (5) hours per day toward completion of the current critical activity item(s) on the latest favorably reviewed progress schedule due to the following cause(s):

a. Delays due solely to the actions and/or inactions of the District.

b. Delays due to differing site conditions as addressed in sections 5.3.14 and 5.45.7.5.

c. Delays due to other Contractors employed by the District who interfere with the Contractor's prosecution of the work as defined above.

No delay shall be compensable unless the claimed event or occurrence delays completion of the work beyond the contractual completion date or the completion date shown in the accepted initial or updated schedules, and the delay affects a critical activity while such activity is on the critical path.

5.30.11 Concurrent delays are those delay periods when the prosecution of the work is delayed during the same period of time due to causes from a combination of the delays defined in sections 5.30.5 (Non-excusable delays) 5.30.6 (Excusable delays) or 5.30.10 (Compensable delays). During such concurrent delay periods, time extensions will be granted in accordance with the sections below in this section 5.30; however, the Contractor shall not be compensated for its delay damages as defined in section 5.30.14, or for any other damages, and the District shall not assess its actual costs as defined in section 5.30.12 (non-excusable delays).

5.30.12 Non-excusable Delays - The District may in its sole discretion grant an extension of time for non-excusable delays if the District deems it is in its best interest. If the District grants an extension of time for non-excusable delays, the
Contractor agrees to pay the District's actual costs, including charges for engineering, inspection and administration incurred during the extension.

5.30.13  Excusable or Compensable Delays - If the Contractor is delayed in the performance of its work as defined in section 5.30.6 (excusable delays), or section 5.30.10 (compensable delays), then the Contract completion date may be extended by the District for such time that, in the District's and Engineer's determination, the Contractor's completion date will be delayed, provided that the Contractor strictly fulfills the following:

a. The Contractor shall provide notification, in accordance with section 5.30.4 and as otherwise provided by this Contract, and may submit in writing a request for an extension of time to the Engineer stating at a minimum the probable cause of the delay and the number of days being requested. Any Contractor time extension request shall be submitted as a change order request in accordance with the requirements of section 5.3.

b. If requested by the Engineer, the Contractor shall promptly provide sufficient information to the Engineer to assess the cause or effect of the alleged delay, or to determine if other concurrent delays affected the work.

c. Weather Delays. The Contractor will be granted a non-compensable time extension for weather caused delays, pursuant to section 5.30.8 (weather delays), over and above any allowance provided for in this Agreement for weather days or weather delays.

Should the Contractor fail to fulfill any of the foregoing, which are conditions precedent to the right to receive a time extension, the Contractor waives the right to receive a time extension.

During such extension of time, neither extra compensation for engineering, inspection and administration nor damages for delay will be charged to the Contractor. It is understood and agreed by the Contractor and District that time extensions due to excusable or compensable delays will be granted only if such delays involve controlling operations which would prevent completion of the whole work within the specified Contract time.

Should the Contractor fail to complete the work within the time specified in the Contract, as extended in accordance with this clause if appropriate, the Contractor shall pay to the District liquidated damages in accordance with section 5.34.

5.30.14  Delay Damages

5.30.14.1  Indirect Overhead - The Contractor shall be reimbursed for indirect overhead expenses for periods of time when the work is delayed as defined in section 5.30.10 (Compensable delays). However, no reimbursement for indirect overhead or any other costs or damages shall be made for compensable delays which occur during a concurrent delay as defined in section 5.30.11 (Concurrent delays). No reimbursement for indirect overhead as covered in this section shall be made for any time extensions granted for Contract change orders as provided in section 5.4. As a condition precedent to any reimbursement, the Contractor must
fulfill all conditions as provided in section 5.30.13 (Excusable or Compensable delays). No additional markup for overhead or profit shall be provided for such indirect overhead expenses.

Payment to the Contractor for indirect overhead expenses will be made only if the extended Contract period granted for the compensable delay(s) is required to complete the work following the depletion of the original contract period and any time extensions granted other than compensable time extensions. Except as provided herein, the Contractor shall have no claim for damage or compensation for any delay including not limited to extended field costs, extended home office overhead costs, impact, inefficiency, unabsorbed home office overhead, underabsorbed home office overhead, hindrance, disruption, or any other damage arising from delay, no matter how characterized, including delay claims of its subcontractors/suppliers of every tier.

5.30.14.2 Indirect Field Overhead - For those allowable delay periods as defined in section 5.30.14.1 (Indirect Overhead), the Contractor shall be reimbursed for its indirect field overhead based on:

a. Invoices for all field office equipment.

b. Actual salary for field office staff.

c. Fair rental values acceptable to the Engineer for construction equipment idled due to the delay.

5.30.14.3 Indirect Home Office Overhead - For those allowable delay periods as defined in section 5.30.14.1 (Indirect Overhead), the Contractor shall be reimbursed for its daily home office overhead based on the following formula:

\[
\text{Contract Bid Price ($)} \div \text{Contract Period (Days)} \times (0.04) = \text{Daily Home Office Overhead ($/Day)}.
\]

As it is impractical to determine the actual home office overhead, such reimbursement shall be mutually agreed between the District and Contractor to encompass full payment for any home office overhead expenses for such periods of time for the Contractor and all subcontractors. The Contractor agrees to indemnify, defend and hold the District harmless for any indirect overhead claims from its subcontractors.

5.31 SUSPENSION OF WORK

5.31.1 The Engineer may at any time, by notice in writing to the Contractor, suspend any part of the work for such period of time with or without cause, and the Contractor shall have no claim for damages or additional compensation on account of any such suspension.

5.31.2 Upon receipt of a written notice to suspend any portion of the work issued by the Engineer, the Contractor shall thereupon discontinue all work suspended except for all operations necessary to prevent loss or damage to work already executed as may be directed by the Engineer. In the event a part of the work is suspended, the
Contractor, if the suspension is not through its fault or the fault of its subcontractors or agents, shall be paid in accordance with section 5.3.9 for costs of work performed in accordance with such orders of the Engineer during such suspension, provided that this shall not include any cost pertaining to work not suspended by the notice to suspend work. Work shall be resumed by the Contractor after such suspension on subsequent written notice to resume work from the District. In the event of suspension of the entire work by the District, the Contractor, if the suspension is not through the fault of the Contractor or the fault of its subcontractors or agents, shall be paid the sum of $50 for each calendar day during which the entire work shall have been suspended. Said sum is hereby mutually agreed upon as fixed and liquidated damages in full settlement of all costs and expenses, losses and damages resulting to the Contractor from such suspension.

5.31.3  In the event of any suspension of the work in whole or in part under subsection 5.31.2, if the suspension is not through the fault of the Contractor or the fault of its subcontractors or agents, the Contractor shall be entitled to an extension of time wherein to complete the work to the extent of the delay caused the Contractor thereby. If no agreement can be reached as to the time for extension, the Contractor shall submit a claim to the District within fifteen (15) days of a notice from the District that no agreement can be reached. The claim shall be processed in accordance with section 5.4.

5.31.4  In the event the entire work shall be suspended by order of the District, and shall remain so suspended for a period of ninety (90) consecutive days, through no fault of the Contractor or its subcontractors or agents, and notice to resume the work shall not have been served on the Contractor, Contractor may, at its option, by written notice to the District, terminate the Contract in the same manner and on the same terms as if the termination had been initiated by the District pursuant to section 5.32, and the District shall have no claim for damages because of such termination of the Contract.

5.32 TERMINATION FOR DEFAULT; DAMAGES FOR DELAY; TIMELY EXTENSION

5.32.1  Subject to prior notice from the District and the Contractor’s cure rights set forth in this section, the District will have the right to terminate the Contract for cause and/or the Contractor’s right to proceed with the work upon the occurrence of any of the following:

a.  Contractor becomes insolvent or files for relief under the bankruptcy laws of the United States.

b.  Contractor makes a general assignment for the benefit of its creditors or fails to pay its debts as the same become due.

c.  A receiver is appointed to take charge of Contractor’s property.

d.  The work is not completed within the applicable Contract time, as such Contract time may be adjusted in accordance with this Contract, and Contractor is not diligently prosecuting the completion or correction of the work.
e. Contractor persistently or repeatedly refuses or fails to supply skilled supervisory personnel, an adequate number of properly skilled workers, proper materials, or necessary equipment to prosecute the work in accordance with the Contract Documents.

f. Contractor fails to make prompt payment of amounts properly due subcontractors after receiving payment from District.

g. Contractor disregards applicable laws, regulations or other governmental requirements.

h. Contractor persistently or materially fails to execute the work in accordance with the Contract Documents.

i. Contractor persistently or materially fails to comply with applicable safety requirements.

j. Contractor abandons the work.

k. Contractor is in default of any other material obligation under the Contract Documents.

5.32.2 Upon the occurrence of any of the preceding events, District will have the right to terminate the Contract for cause and/or the Contractor’s right to proceed with the work if Contractor fails to promptly commence to cure such default and diligently prosecutes such cure within 5 days after notice from District, or within such longer period of time as is reasonably necessary to complete such cure.

5.32.3 The rights and remedies of the District provided in this section are in addition to any of the rights and remedies provided by law or under this Contract.

5.32.4 In addition to the District's rights under this section, if at any time before completion of the work under the Contract, it shall be determined by the District that it is advisable for it, for whatever reason, to terminate the work, it may do so upon ten (10) days written notice to the Contractor. Upon service of such notice of termination, the Contractor shall discontinue the work in such manner, sequence, and at such times as the Engineer may direct. The Contractor shall have no claim for damages for such discontinuance or termination, nor any claim for anticipated profits on the work thus dispensed with or uncompleted, nor any other claim except for the work actually performed up to the time of termination, including any extra work ordered by the Engineer to be done, nor for any claim for liquidated damages in accordance with the provisions of section 5.31.

5.32.5 Upon receipt of notice of termination of the Contract and/or the Contractor’s right to proceed with the work under this section 5.32, the Contractor shall, unless the notice directs otherwise, do the following:

a. Immediately discontinue the work to the extent specified in the notice.
b. Place no further orders or subcontracts for materials, equipment, services, or facilities, except as may be necessary for completion of such portion of the work as is not discontinued.

c. Promptly cancel, on the most favorable terms reasonably possible, all orders and subcontracts to the extent they relate to the performance of the discontinued portion of the work.

d. Thereafter do only such work as may be necessary to preserve and protect work already in progress and to protect materials, plants, and equipment on the project site or in transit thereto.

Upon termination of the Contract, the obligations of the Contract shall continue as to portions of the work already performed and, subject to the Contractor’s obligations under this section 5.32, as to bona fide obligations assumed by the Contractor prior to the date of termination.

Upon termination of the Contract or the Contractor’s right to proceed with the work, the District shall pay to the Contractor the sum of the following:

a. The amount of the Contract price allocable to the portion of the work properly performed by the Contractor as of the date of termination, less sums previously paid to the Contractor.

b. Plus previously unpaid costs of any items delivered to the project site that were fabricated for subsequent incorporation into the work.

c. Plus any proven losses with respect to materials and equipment directly resulting from such termination.

d. Plus reasonable demobilization costs.

e. Plus reasonable costs of preparing a statement of the aforesaid costs, expenses, and losses in connection with such termination.

The above payment shall be the sole and exclusive remedy to which the Contractor is entitled in the event of termination of the Contract by the District and/or the Contractor’s right to proceed with the work pursuant to this section 5.32; and the Contractor will be entitled to no other compensation or damages and expressly waives same. The District shall have the right to subtract from the above payment such sums as may be deducted consistent with the terms of the Contract Documents.

5.33 RIGHTS OF DISTRICT UPON TERMINATION

5.33.1 In the event the right of the Contractor to proceed with the work, or any portion thereof, has been terminated because of the fault of the Contractor and the Contractor has been given five (5) days’ notice to cure such fault and has not done so, the District may take over the work and prosecute the same to completion by contract or any other method the District deems expedient, and may take possession of and utilize in completing the
work such materials, appliances, equipment and plant as may be on the site of the work and necessary therefor. Whether or not the Contractor's right to proceed with the work is terminated, it and its sureties shall be liable for all damages, including but not limited to, costs of managerial and administrative services, engineering, legal and other consultant fees, sustained or incurred by the District in enforcing the provisions of section 5.32 and in completing or causing to complete the Contract work.

5.33.2 Upon termination, the Contractor shall not be entitled to receive any further payment until the work is finished. If upon completion of the work the total cost to the District, including, but not limited to, engineering, legal and other consultant fees, costs of managerial and administrative services, construction costs and liquidated damages, shall be less than the amount which would have been paid if the work had been completed by the Contractor in accordance with the terms of the Contract, then the difference shall be paid to the Contractor in the same manner as the final payment under the Contract. If the total cost incurred by the District on account of termination of the Contractor and subsequent completion of the work by the District by whatever method the District may deem expedient shall exceed said amount which the Contractor would otherwise have been paid, the Contractor and its sureties shall be liable to the District for the full amount of such excess expense.

5.33.3 The rights and remedies of the District provided in this section are in addition to any of the rights and remedies provided by law or under this Contract.

5.34 FAILURE TO COMPLETE THE WORK IN THE TIME AGREED UPON; LIQUIDATED DAMAGES

5.34.1 It is agreed by the parties to the Contract that time is of the essence; and that in case all the work is not completed before or upon the expiration of the time limit as set in the Bid, Contract and/or Progress Schedule as designated by the District (Generally the date of final completion), or as revised by any time extensions that may have been granted, damage will be sustained by the District; and that it may be impracticable to determine the actual amount of damage by reason of such delay; and it is, therefore, agreed that the Contractor shall pay to the District as damages the amount of $800.00 per calendar day, for each and every day's delay in finishing the work in excess of the number of days specified. The parties expressly agree that this liquidated damage clause is reasonable under the circumstances existing at the time the Contract was made. The District shall have the right to deduct the amount of liquidated damages from any money due or to become due the Contractor.

5.34.2 Notwithstanding the above, the parties expressly agree that the liquidated damages specified above do not include the District’s legal, engineering, inspection, superintendence and other similar expenses. Accordingly, the District shall have the right to charge to the Contractor and to deduct from the final or progress payments for the work the actual cost to the District of legal, engineering, inspection, superintendence, loss of revenue due to water delivery interruptions, and other expenses, which are directly chargeable to the Contract and which accrue during the period of such delay, except that the cost of final inspection and preparation of the final estimate shall not be included in the charges.
5.34.3 Notwithstanding the provisions of section 5.34.1, the Contractor shall not be liable for liquidated damages or delays caused by the removal or relocation of utilities when such removal or relocation is the responsibility of the District or the owner of the utility under California Government Code section 4215.

5.35 CLEAN UP

5.35.1 During the progress of the work, the Contractor shall maintain the site and related structures and equipment in a clean, orderly condition and free from unsightly accumulation of rubbish. Upon completion of work and before the final estimate is submitted, the Contractor shall at its own cost and expense remove from the vicinity of the work all plants, buildings, rubbish, unused work materials, concrete forms, and temporary bridging and other like materials, belonging to it or used under its direction during the construction; and in the event of its failure to do so, the same may be removed by the District after ten (10) calendar days’ notice to the Contractor, such removal to be at the expense of the Contractor. Where the construction has crossed yards or driveways, they shall be restored by the Contractor to the complete satisfaction of the Engineer, at the Contractor's expense.

5.35.2 The Contractor shall dispose of all testing or disinfection water without damage to property, and all in accordance with applicable regulations. All chlorinated water shall be dechlorinated prior to discharge.

5.36 COMPLIANCE WITH LAWS; PERMITS; TAXES

Contractor is an independent contractor and shall at its sole cost and expense do the following: comply with all laws, rules, ordinances and regulations of all federal, state and local agencies having jurisdiction over the work; procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the lawful prosecution of the work; pay all federal, state and local taxes, including manufacturers' taxes, sales taxes, use taxes, processing taxes, and payroll, wage, insurance, social security, and unemployment taxes on wages, salaries or any remuneration paid to Contractor's employees, whether levied under existing or subsequently enacted laws, rules or regulations; and pay all property tax assessments on materials or equipment used until acceptance by the District. If any discrepancy or inconsistency is discovered in the Plans or Specifications, or in this Contract in relation to any such law, rule, ordinance, regulation, order or decree, the Contractor shall forthwith report the same to the Engineer in writing. The Contractor shall also protect, defend, hold harmless and indemnify the District, the Engineer, and all of the District's officers, directors, agents, and employees against any claim or liability arising from or based upon the violation of any such law, rule, ordinance, regulation, order or decree, whether by the Contractor itself or by its employees. Particular attention is called to the following:

5.36.1 Contractor is responsible for the safety of its workers and Contractor shall comply with, and require its workers to comply with, all applicable federal and state worker and job site safety-related laws and regulations, including, but not limited to, applicable federal Department of Labor, Occupational Safety and Health Administration ("OSHA") regulations and California Department of Industrial Relations (including the
Division of Occupational Safety and Health and Occupational Safety and Health Standards Board ("Cal/OSHA")) regulations and safety orders.

5.36.2 The Contractor, upon request, shall furnish evidence satisfactory to the District and Engineer that any or all of the foregoing obligations have been or are being fulfilled. The Contractor warrants to the District that it is licensed by all applicable federal, state and local governmental bodies to perform this Contract and will remain so licensed throughout the progress of the work, and that it has, and will have, throughout the progress of the work, the necessary experience, skill and financial resources to enable it to perform this Contract.

5.37 PREVAILING WAGE PENALTIES; WAGE CLAIMS PROHIBITED

5.37.1 The Contractor shall forfeit as penalty to the District not more than the sum of two hundred dollars ($200) and not less than forty dollars ($40) for each calendar day or portion thereof for each worker (whether employed by the Contractor or subcontractor) paid less than the stipulated prevailing rates for any work done under the Contract in violation of the provisions of the California Labor Code and in particular, sections 1772 to 1780. The amount of this penalty shall be determined by the Labor Commissioner and shall be based on consideration of the contractor's mistake, inadvertence, or neglect in failing to pay the correct rate of prevailing wages, the previous record of the contractor in meeting its prevailing wage obligations, and a contractor's willful failure to pay the correct rates of prevailing wages. A mistake, inadvertence, or neglect in failing to pay the correct rate of prevailing wages is not excusable if the contractor had knowledge of its obligations under Labor Code sections 1720, et seq. In addition to the aforementioned penalty, each worker shall be paid the difference between the prevailing wage rate and the amount paid to each worker for each calendar day or portion thereof for which said worker was paid less than the prevailing wage.

5.37.2 The District will not recognize any claims for additional compensation because of the payment of the wages set forth in the Contract Documents. The possibility of wage increases is one of the elements to be considered by the Contractor in determining its Bid, and will not under any circumstances be considered as the basis of a claim against the District or the Engineer.

5.38 LABOR DISCRIMINATION

Attention is directed to California Labor Code section 1735 which is applicable to the work under this Contract and which reads as follows: “A contractor shall not discriminate in the employment of persons upon public works on any basis listed in subdivision (a) of section 12940 of the Government Code, as those bases are defined in sections 12926 and 12926.1 of the Government Code, except as otherwise provided in section 12940 of the Government Code. Every contractor for public works who violates this section is subject to all the penalties imposed for a violation of this chapter.”
5.39 EIGHT HOUR DAY LIMITATION; CERTIFIED PAYROLL REPORTS

5.39.1 In accordance with the provisions of the California Labor Code, and in particular, sections 1810 to 1815, eight hours labor shall constitute a day's work, and no worker, in the employ of the Contractor, or any subcontractor, doing or contracting to do any part of the work contemplated by this Contract, shall be required or permitted to work more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week in violation of those provisions; provided that subject to Labor Code section 1815, a worker may perform work in excess of either eight (8) hours per day or forty (40) hours during any one week upon compensation for all hours worked in excess of eight (8) hours per day or forty (40) hours during any one week at not less than one and one half times the basic rate of pay. Except as just provided, the Contractor shall forfeit as a penalty to the District the sum of twenty-five dollars ($25) for each worker employed in the performance of this Contract by it or by any subcontractor under it for each calendar day during which such worker is required or permitted to labor more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week in violation of sections 1810 through 1815.

5.39.2 The Contractor shall comply in all respects with the provisions of Labor Code section 1776, whose provisions are incorporated herein by this reference. In accordance with section 1776, the Contractor and each subcontractor shall keep an accurate record showing the names, addresses, social security numbers, work classifications, and straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by it in connection with the work specified therein, which record shall be open at all reasonable hours at the principal office of the Contractor to the inspection of the District, State and Federal officers and agents. Certified copies of the payroll records shall be furnished or made available for inspection to others as provided in section 1776. These payroll records shall be certified and shall be on forms provided by the State Division of Labor Standards Enforcement, or shall contain the same information as the forms provided by the Division. The Contractor shall file a certified copy of the payroll records with the entity that requested the records within 10 days after receipt of a written request. Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the District, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement shall be marked or obliterated in a manner so as to prevent disclosure of an individual's name, address, and social security number. The name and address of the Contractor shall not be marked or obliterated. The Contractor shall inform the District of the location of the payroll records, including the street address, city and county, and shall, within five working days, provide a notice of a change of location and address. The Contractor shall have 10 days in which to comply subsequent to receipt of written notice specifying in what respects the Contractor must comply with this section. In the event that the Contractor fails to comply with the 10-day period, he or she shall, as a penalty to the District, forfeit one hundred dollars ($100) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.
5.40 EMPLOYMENT OF APPRENTICES

The Contractor's attention is directed to California Labor Code sections 1777.5, 1777.6 and 1777.7 pertaining to employment of indentured apprentices, which are hereby incorporated by reference into this Contract. As applicable, the Contractor or any subcontractor employed by it in the performance of the Contract work shall take such actions as necessary to comply with the provisions of sections 1777.5, 1777.6 and 1777.7.

5.41 WATER POLLUTION

5.41.1 The Contractor shall exercise every reasonable precaution to protect streams, lakes, reservoirs, and canals from pollution with fuels, oils, bitumens, calcium chloride, and other harmful materials and shall conduct and schedule its operations so as to avoid or minimize muddying and silting of said streams, lakes, reservoirs, and canals. Care shall be exercised to preserve vegetation beyond the limits of construction. The Contractor shall comply with California Fish and Game Code section 5650 and all other applicable statutes and regulations relating to the prevention and abatement of water pollution.

5.42 PATENTS

The Contractor shall assume all costs arising from the use of patented materials, equipment, devices, or processes used on or incorporated into the work, and agrees to indemnify, defend, protect and save harmless the District, the Engineer, and all of their officers, directors, employees, and other representatives, from all suits at law, or actions of every nature for, or on account of, the use of any patented materials, equipment, devices, or processes.

5.43 PUBLIC CONVENIENCE

5.43.1 This section defines the Contractor's responsibility with regard to convenience of the public and public traffic in connection with its operations.

5.43.2 The Contractor shall conduct its operations as to offer the least possible obstruction and inconvenience to the public; and it shall have under construction no greater length or amount of work than it can prosecute properly with due regard to the rights of the public.

5.43.3 Unless otherwise provided in the Contract Documents, all public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible.

5.43.4 Spillage resulting from hauling operations along or across any publicly traveled way shall be removed immediately by the Contractor at its expense.

5.43.5 Construction operations shall be conducted in such a manner as to cause as little inconvenience as possible to abutting property owners.

5.43.6 Convenient access to driveways, houses and buildings along the line of the work shall be maintained and temporary approaches to crossings or intersecting

WATER TREATMENT PLANT
RESIDUAL AREA STORMWATER LIFT STATION PROJECT
highways shall be provided and kept in good condition. When the abutting property owner's access across the right of way line is to be eliminated, or to be replaced under the Contract by other access facilities, the existing access shall not be closed until the replacement access facilities are usable.

5.43.7 Water shall be supplied at Contractor's expense if ordered by the Engineer for the alleviation or prevention of dust nuisance as provided in the Contract Documents.

5.43.8 In order to expedite the passage of public traffic through or around the work, the Contractor shall install signs, lights, flares, barricades, and other facilities for the sole convenience and direction of public traffic. Also, the Contractor shall provide and station competent flagpersons whose sole duties shall consist of directing the movement of public traffic through or around the work. The cost of furnishing and installing such signs, lights, flares, barricades, and other facilities, and the cost of providing and stationing such flagpersons, all for the convenience and direction of public traffic, will be considered as included in the Contract price and no additional compensation will be allowed.

5.43.9 Flagpersons and guards, while assigned to traffic control, shall perform their duties and shall be provided with the necessary equipment in accordance with the current "Instructions to Flagmen" of the California Department of Transportation. The equipment shall be furnished and kept clean and in good repair by the Contractor at its expense.

5.44 UNDERGROUND UTILITIES

Prior to conducting any excavation, the Contractor shall contact the appropriate regional notification center as required by and shall otherwise comply with California Government Code section 4216, et seq. 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 Engineer before commencing work on locating, repairing damage to, removing or relocating such utilities.

5.45 SAFETY AND TRENCHING

5.45.1 The Contractor shall be solely and completely responsible for the conditions of the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. Safety procedures and practices shall conform to all applicable Federal, State, and local laws, ordinances, and codes, and to the rules and regulations established by OSHA and Cal/OSHA, and to other rules of law applicable to the work. Any District obligations relating to safety of the work are separate from and do not alter the Contractor’s primary responsibility for safety as provided in this Contract.
5.45.2 The Contractor shall have an Injury/Illness Prevention Program (IIPP) in place to protect the safety of its employees and ensure that its subcontractors also have an IIPP or comply with Contractor’s program. The Contractor’s IIPP shall comply with and be at least as effective as the requirements of section 3203 of Title 8 of the California Code of Regulations. Upon request, the Contractor will submit a copy of its IIPP to the District.

5.45.3 The services of the Engineer in conducting construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's work methods, equipment, bracing or scaffolding or safety measures, in, on, or near the construction site, and shall not be construed as supervision of the actual construction nor make the Engineer or the District responsible for providing a safe place for the performance of work by the Contractor, subcontractors, or suppliers; or for access, visits, use work, travel or occupancy by any person.

5.45.4 All work and materials shall be in strict accordance with all applicable State, Federal and local laws, rules, regulations, and codes. The Contractor shall carefully instruct all personnel working in potentially hazardous work areas as to potential dangers and shall provide such necessary safety equipment and instruction as is necessary to prevent injury to personnel and damage to property. Special care shall be exercised relative to electrical work, work involving excavation and in pump sump work.

5.45.5 Nothing in this Contract is to be construed to permit work not conforming to governing law. When Contract Documents differ from governing law, the Contractor shall furnish and install the higher standards called for without extra charge. All equipment furnished shall be grounded and provided with guards and protection as required by applicable federal and state safety regulations and orders.

5.45.6 Shoring and Trench Safety Plan Attention is directed to California Civil Code section 832 relating to lateral and subjacent support, and the Contractor shall comply with this law.

5.45.7 In accordance with California Labor Code section 6705, if the total amount of the contract is in excess of $25,000 and if the work involves the excavation of any trench or trenches five feet or more in depth, the Contractor shall submit to the District for acceptance, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any such trench or trenches.

5.45.7.1 In accordance with California Labor Code section 6705, if the total amount of the contract is in excess of $25,000 and if the work involves then excavation of any trench or trenches five feet or more in depth, the Contractor shall submit to the District for acceptance, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any such trench or trenches.

5.45.7.2 The District or the Engineer or their consultants may have made investigations of subsurface conditions in areas where the work is to be performed. If
so, these investigations are identified in the Contract Documents and the records of such investigations are available for inspection at the office of the Engineer. The detailed plan showing the design of shoring, etc., which the Contractor is required to submit to the District for acceptance of excavation will be not accepted by the District if the plan is based on subsurface conditions which are more favorable than those revealed by the investigations made by the District or the Engineer or their consultants; nor will the plan be accepted if it is based on soils-related criteria which is less restrictive than the criteria set forth in the report on the aforesaid investigations of subsurface conditions.

5.45.7.3 The detailed plan showing the design of shoring, etc., shall include surcharge loads for nearby embankments and structures, for spoil banks, and for construction equipment and other construction loadings. The plan shall indicate for all trench conditions the minimum horizontal distances from the side of the trench at its top to the near side of the surcharge loads.

5.45.7.4 Nothing contained in this section shall be construed as relieving the Contractor of the full responsibility for providing shoring, bracing, sloping, or other provisions which are adequate for worker protection. Review of the plan by the District and/or Engineer is only for general conformance to OSHA and Cal/OSHA requirements. Their failure to note exception(s) to the submittal does not relieve Contractor of any responsibility or liability for the plan. Contractor remains solely and completely responsible for all trench safety and for the means, methods, procedures, and materials therefor.

5.45.7.5 In accordance with California Public Contract Code section 7104, in the event that the work involves digging trenches or other excavations that extend deeper than four (4) feet below the surface, the Contractor shall promptly, and before the following conditions are disturbed, notify the District in writing, of any:

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

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

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

The District shall promptly investigate the conditions reported by the Contractor, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the work shall issue a change order under the procedures described in the Contract. In the event that a dispute arises between the District and the Contractor about whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's
cost of, or time required for, performance of any part of the work, the Contractor shall not be
excused from any scheduled completion date provided for by the Contract, but shall proceed with
all work to be performed under the Contract. The Contractor shall retain any and all rights
provided either by Contract or by law which pertain to the resolution of disputes and protests
between the contracting parties.

5.46 PROTECTION OF PERSON AND PROPERTY

5.46.1 The Contractor shall take whatever precautions are
necessary to prevent damage to all existing improvements, including above ground and
underground utilities, trees, shrubbery that is not specifically shown to be removed, fences,
signs, mailboxes, survey markers and monuments, buildings, structures, the District's property,
adjacent property, and any other improvements or facilities within or adjacent to the work. If
such improvements or property are injured or damaged by reason of the Contractor's
operations, they shall be replaced or restored, at the Contractor's expense, to a condition at least
as good as the condition they were in prior to the start of the Contractor's operations.

5.46.2 The Contractor shall adopt all practical means to minimize
interference to traffic and public inconvenience, discomfort or damage. The Contractor shall
protect against injury to any pipes, conduits or other structures crossing the trenching or
encountered in the work and shall be responsible for any injury done to such pipes or structures,
or damage to property resulting therefrom. The Contractor shall support or replace any such
structures without delay and without any additional compensation to the entire satisfaction of
the Engineer. All obstructions to traffic shall be guarded by barriers illuminated at night. The
Contractor shall be responsible for all damage to persons and property directly or indirectly
cau sed by its operations and, under all circumstances, it must comply with the laws and
regulations of the County and the State of California relative to safety of persons and property
and the interruption of traffic and the convenience of the public within the respective
jurisdictions.

5.46.3 The Contractor is cautioned that it must replace all
improvements in rights of way and within the public streets to a condition equal to what existed
prior to its entry onto the job.

5.46.4 Type and time of construction required at any road subject
to interference by Contract work will be determined by those authorities responsible for
maintenance of said road. It shall be the responsibility of the Contractor to determine the
nature and extent of all such requirements, including provision of temporary detours as
required; however, any construction right of way obtained by the District at affected roadways
will be adequate for provision of all required detours. As required at any road crossing, the
Contractor shall provide all necessary flagpersons, guardrails, barricades, signals, warning
signs and lighting to provide for the safety of existing roads and detours. Immediately after
the need for temporary detours ceases, or when directed, the Contractor shall remove such
detours and perform all necessary cleanup work, including replacement of fences, and removal
of pavement. Included shall be all necessary replacement of existing roadway appurtenances,
grading work, soil stabilization and dust control measures, as required and directed. The cost
of all work specified under this section shall be borne by the Contractor.
5.46.5 The Contractor shall examine all bridges, culverts, and other structures over which it will move its materials and equipment, and before using them, it shall properly strengthen such structures as necessary for their safe operation and use. The Contractor shall be responsible for any and all injury or damage to such structures caused by reason of its operations.

5.47 HAZARDOUS MATERIALS; HAZARD COMMUNICATION

5.47.1 Proposition 65 and the California Health and Safety Code requires businesses to provide warnings prior to exposing individuals to materials listed by the Governor as chemicals “known to cause cancer or reproductive toxicity.” The District may use chemicals on the Governor’s list at many of its facilities. In addition, many of these chemicals are present at non-District-owned facilities and locations. Accordingly, in performing the work or services contemplated under this Contract, Contractor, its employees, agents, and subcontractors may be exposed to chemicals on the Governor’s list. Except as provided in section 5.47.2, Contractor is responsible for notifying its employees, agents, and subcontractors that work performed hereunder may result in exposures to chemicals on the Governor’s list.

5.47.2 Before starting work, the Contractor shall have a written Hazard Communication Program (“HCP”) in place that complies with the requirements of section 5194 of Title 8 of the California Code of Regulations, including the requirements of 8 C.C.R. section 5194(e). The information in the Contractor’s HCP must include the methods by which the Contractor will communicate to the District which hazardous substances it will use and store on the job site(s) to which the District’s and Contractor’s employees and subcontractors may be exposed. The Contractor will submit its HCP to the District at the same time as submittal of its initial project schedules as provided in section 5.29 of these General Conditions. The Contractor also will provide copies of safety data sheets (“SDS”) for all hazardous substances brought onto and used or stored on the job site(s). The Contractor also will ensure that all hazardous substances are marked with Proposition 65 and any other visible warning labels as required by law. Whenever possible, the Contract shall provide SDS for all hazardous substances to the District prior to bringing a hazardous substance onto a job site, but will provide all SDS by no later than the time the hazardous substance is physically brought onto the site. The District will communicate the Contractor’s HCP and SDS information to the District’s employees who work on or will enter the job site(s). The District will provide the Contractor with a copy of the District’s HCP and SDS information specific to District operations on the job site(s). The Contractor shall, in turn, convey this information to its employees and subcontractors. During the course of the work, the Contractor will keep copies of both its and the District’s HCP, SDS and other relevant information at Contractor’s office on the job site(s).

5.47.3 If the Work includes the construction, alteration, improvement, or maintenance of electric power generation, control, transformation, transmission or distribution lines or equipment within the meaning of Code of Federal Regulations title 29, section 1910.269 or 1926.950, then the Contractor will implement and comply with the requirements of the “contract employer” as described and set forth in sections 1910.269 and 1926.950, including, but not limited to, the obligations to properly train the
Contractor workers on safety-related work practices and procedures, exchange information with the District concerning unique hazardous conditions presented by the Work, instruct the Contractor workers about the hazardous conditions relevant to the Work, and coordinate with the District on safety-related work rules and procedures. The Contractor also shall be responsible for transmitting safety-related information under sections 1910.269 and 1926.950 with any subcontractors retained by it to perform electrical-related Work under the Contract.

5.48 RESPONSIBILITY FOR REPAIR OF FACILITIES

All public or private facilities, including but not limited to canals, structures, telephone cables, roadways, curbs, gutters, parking lots, private drives, levees and embankments for creeks, ponds and reservoirs disturbed during construction of the work shall be repaired and/or replaced by the Contractor to match facilities existing prior to construction. In addition, the Contractor shall be responsible for any settlement damage to such facilities or adjoining areas for a period of one year after acceptance of such required facilities.

5.49 DISTRICT'S REPAIR

In the event the Contractor refuses or neglects to make good any loss or damage for which it is responsible under this Contract, the District may itself, or by the employment of others, make good any such loss or damage, and the cost and expense of doing so, including any reasonable engineering, legal and other consultant fees, and any costs of administrative and managerial services, shall be charged to the Contractor. Such costs and expenses may be deducted by the District from claims for payment made by the Contractor for work completed or remaining to be completed.

5.50 CONTRACTOR'S LICENSE NOTICE

STATEMENT REQUIRED BY CALIFORNIA BUSINESS & PROFESSIONS CODE SECTION 7030: "CONTRACTORS ARE REQUIRED BY LAW TO BE LICENSED AND REGULATED BY THE CONTRACTORS STATE LICENSE BOARD WHICH HAS JURISDICTION TO INVESTIGATE COMPLAINTS AGAINST CONTRACTORS IF A COMPLAINT REGARDING A PATENT ACT OR OMISSION IS FILED WITHIN FOUR YEARS OF THE DATE OF THE ALLEGED VIOLATION. A COMPLAINT REGARDING A LATENT ACT OR OMISSION PERTAINING TO STRUCTURAL DEFECTS MUST BE FILED WITHIN 10 YEARS OF THE DATE OF THE ALLEGED VIOLATION. ANY QUESTIONS CONCERNING A CONTRACTOR MAY BE REFERRED TO THE REGISTRAR, CONTRACTORS STATE LICENSE BOARD, P.O. BOX 26000, SACRAMENTO, CALIFORNIA 95826."

5.51 PUBLIC WORKS CONTRACTOR REGISTRATION

In accordance with California Labor Code Section 1771.1(a), a contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this Division 2, Part 7, Chapter 1 of the Labor Code (commencing with Section 1720),
unless currently registered and qualified to perform public work pursuant to Section 1725.5 of the Labor Code. In accordance with Labor Code section 1771.4(a)(1), this project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

5.52 INSURANCE

5.52.1 The Contractor shall procure and maintain for the duration of the Contract the following insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, its agents, representatives, employees or subcontractors.

5.52.2 Coverage shall be at least as broad as:

a. Commercial general liability coverage (Insurance Services Office occurrence form CG 0001), including liability coverage for premises and operations, explosion and collapse hazard, underground hazard, products/completed operations hazard, contractual liability, use of independent contractors, and broad form property damage with completed operations.

b. Automobile liability coverage (Insurance Services Office form CA 0001, code 1, any auto).

c. Workers' compensation insurance in the statutory limits required by the State of California and employer's liability insurance.

d. Course of construction (also known as builder’s risk) insurance form providing coverage for all risks of physical loss, damage or destruction to the work, to insure against such losses until final acceptance of the work by the District.

5.52.3 The Contractor shall maintain coverage limits of not less than:

a. General Liability: $5,000,000 per occurrence for general liability, bodily injury, personal injury, and property damage. If commercial general liability insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.

b. Automobile Liability: $2,000,000 per accident for bodily injury, including death, and property damage.

c. Employer's Liability: $1,000,000 per accident for bodily injury or disease.

d. Course of construction: Completed value of the project.

The above minimum insurance coverage limits can be met through provision of umbrella or excess policy insurance coverage consistent with the provisions of this section 5.52.
5.52.4 Any deductibles or self-insured retentions must be declared to and approved by the District. At the option of the District, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the District, its officers, officials, employees and volunteers; or the Contractor shall procure a bond or other security guaranteeing payment of losses and related investigations, claim administration and defense fees, costs and expenses. All policies that include a self-insured retention shall include a provision that payments of defense costs and damages (for bodily injury, property damage, personal injury or any other coverages included in the policy) by any party, including additional insureds and insurers, shall satisfy the self-insured retention limits.

5.52.5 The general liability and automobile liability policies are to contain, or be endorsed to contain, the following provisions:

5.52.5.1 The District, its officers, officials, employees, agents and volunteers are to be covered as additional insureds as respects: liability arising out of activities performed by or on behalf of the Contractor, products and completed operations of the Contractor; premises owned, occupied or used by the Contractor; or automobiles owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the District, its officers, officials, employees, agents or volunteers. The additional insured coverage or endorsement shall comply with California Insurance Code section 11580.04.

5.52.5.2 For any claims related to this project, the Contractor’s insurance coverage shall be primary insurance as respects the District, its officers, officials, employees, agents and volunteers. Any insurance or self-insurance maintained by the District, its officers, officials, employees, agents or volunteers shall be excess of the Contractor's insurance and shall not contribute with it.

5.52.5.3 Any failure to comply with reporting or other provisions of the policies including breaches of warranties shall not affect coverage provided to the District, its officers, officials, employees, agents or volunteers.

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

5.52.5.5 Each insurance policy required by this section shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, or reduced in coverage or in limits except after 30 days’ prior written notice by U.S. mail has been given to the District, or after 10 days’ written notice in the case of cancellation for non-payment of premium.

5.52.6 Course of Construction Coverage Requirements. Course of construction policies shall contain, or be endorsed to contain, the following provisions: (a) District shall be named as loss payee; and (b) The insurer shall waive all rights of subrogation against the District.
5.52.7 Acceptability of Insurers. Insurance is to be placed with insurers with a current A.M. Best’s rating of no less than A-VII or equivalent and that are admitted to do business and in good standing in California, unless otherwise approved by District. In the case of Workers’ Compensation and Employer’s Liability insurance, coverage provided by the California State Compensation Insurance Fund is acceptable.

5.52.8 Verification of Coverage. Before commencing work, Contractor shall provide to District the following proof of insurance: (a) certificate(s) of insurance on ACORD Form 25-S (or insurer's equivalent) evidencing the required insurance coverages; and (b) endorsement(s) on ISO Form CG 20 10 (or insurer's equivalent), signed by a person authorized to bind coverage on behalf of the insurer(s) and certifying the additional insured coverages, or equivalent additional insured blanket endorsement. The District reserves the right to require complete copies of all required insurance policies and/or endorsements affecting required insurance coverage at any time.

5.52.9 Subcontractors. The Contractor shall include all actions and activities of its subcontractors as insureds under its policies, or shall require each subcontractor to provide insurance coverage consistent with the foregoing and to furnish separate endorsements or certificates to the District. All coverages for subcontractors shall be subject to all of the requirements stated in this section.

5.52.10 Obligation to Maintain Coverage. Contractor shall maintain all required insurance coverages for the period provided in this section 5.52. If any of the required coverages expire during the coverage period, Contractor shall obtain renewal or replacement coverages and deliver certificates for the renewed or replacement coverages and any required endorsements to the District at least 10 days before the expiration date of the existing coverage.

5.52.11 Survival of Guarantee. Any products/completed operations insurance coverage shall be maintained after completion of the project for the full guarantee period.

5.52.12 The requirements as to the types, limits, and the District's approval of insurance coverage to be maintained by the Contractor are not intended to and shall not in any manner limit or qualify the liabilities and obligations assumed by the Contractor under the Contract.

5.52.13 In addition to any other remedy the District may have, if the Contractor or any of the subcontractors fails to maintain the insurance coverage as required in this section 5.52, the District may obtain such insurance coverage as is not being maintained, in form and amount substantially the same as required herein, and the District may deduct the cost of such insurance from any amounts due or which may become due the Contractor under this Contract.
5.53 INDEMNITY AND DEFENSE OBLIGATION

5.53.1 To the fullest extent permitted by law, Contractor shall protect, defend, indemnify and hold harmless the District and Engineer, and their respective officers, directors, agents, employees, volunteers, representatives, boards, and consultants from and against all penalties and fines imposed by law and all loss, claim, cause of action, demand, suit, judgment, cost, damage, expense, and liability (including but not limited to court or arbitration costs and reasonable attorneys' and expert witness fees) resulting from injury to or death of persons, including without limitation employees of the District, Engineer and Contractor, or damage to or loss of property, caused by, arising out of or in any way connected with the Contractor’s or its subcontractors’ or suppliers’ performance, operations or activities under this Contract, except to the extent the sole negligence, active negligence or willful misconduct of an indemnified party proximately causes the loss, claim, demand, cost, suit, judgment, penalty, fine, cause of action, damage, expense, or liability.

5.53.2 Contractor’s duty to defend is a separate and distinct obligation from Contractor’s duty to indemnify. Upon the request of an indemnified party hereunder, Contractor shall defend any suit asserting a claim covered by this indemnity and shall pay any costs and expenses that may be incurred by an indemnified party in enforcing this indemnity. The Contractor shall be obligated to defend, in all legal, equitable, administrative, or special proceedings, the District and/or Engineer, and their respective officers, directors, agents, employees, volunteers, representatives, boards, and consultants, immediately upon tender to Contractor of the claim in any form or at any stage of an action or proceeding, whether or not liability has been established. The obligation to defend extends through final judgment, including exhaustion of any appeals. In all cases, the indemnified party shall have the right to approve counsel selected by Contractor in the defense of any legal action or with respect to any claim, which approval shall not be unreasonably withheld. In addition, the indemnified party shall have the right to participate in and be represented by counsel of its own choice and at its own expense in any legal action or with respect to any claim. The defense obligation includes an obligation to provide independent defense counsel if the Contractor asserts that liability is caused in whole or in part by the negligence or willful misconduct of an indemnified party.

5.53.3 The District may withhold from payment due Contractor hereunder such amounts as, in the District’s opinion, are sufficient to provide security against all loss, damage, expense, penalty, fine, cost, claim, demand, suit, cause of action, judgment, or liability covered by the foregoing indemnity provision.

5.53.4 In any and all claims against the District or the Engineer and his consultants, and each of their officers, directors, employees and agents by any employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation under this section shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable under Workers’ Compensation statutes, disability benefit statutes or other employee benefit statutes.
5.53.5 Neither termination of this Contract, completion of the acts to be performed under this Contract, nor the Engineer’s approval or the District’s acceptance of the work shall release Contractor from its obligations to indemnify and defend the District, and the Engineer, and their respective officers, directors, agents, employees, volunteers, representatives, boards, and consultants, as provided in sections 5.53.1 and 5.53.2, so long as the event upon which the claim is predicated shall have occurred prior to the effective date of any such termination or completion and arose out of or was in any way connected with performance of operations under this Contract by Contractor, its employees, agents, suppliers or subcontractors, or the employee, agent or subcontractor of any one of them.

5.53.6 Submission of insurance certificates or submission of other proof of compliance with the insurance requirements in this Contract does not relieve Contractor from liability under this indemnification and hold harmless clause. The obligations of this indemnity section shall apply whether or not such insurance policies shall have been determined to be applicable to any of such damages or claims for damages.

5.53.7 In accordance with California Public Contract Code section 9201(b), if District receives any written third-party claim relating to work performed under this Contract, then District agrees to promptly notify Contractor about the third-party claim.

5.54 PROTECTION OF WORK

5.54.1 The Contractor shall be responsible for the care of all work until its completion and final acceptance; and it shall, at its own expense, replace damaged or lost material and repair damaged parts of the work or the same may be done at its expense by the District and the Contractor and its sureties shall be liable therefor. The Contractor shall make its own provisions for properly storing and protecting all material and equipment against theft, injury, or damage from any and all causes. Damaged material and equipment shall not be used in the work. The Contractor shall take all risks from floods and casualties except as provided by law, and shall make no charge for the restoration of such portions of the work as may be destroyed or damaged by flood or other casualties or because of danger from flood or other casualties or for delays from such causes. The Contractor may, however, be allowed a reasonable extension of time on account of such delays, subject to the conditions hereinbefore specified.

5.54.2 The Contractor shall effectively secure and protect adjacent property and structures, livestock, crops and other vegetation. If applicable, the Contractor shall open fences on or crossing the right of way and install temporary gates of sound construction thereon so as to prevent the escape of livestock. Adjacent fence posts shall be adequately braced to prevent the sagging or slackening of the wire. Before such fences are opened, the Contractor shall notify the owner or tenant of the property and, where practicable, the opening of the fence shall be in accordance with the wishes of said owner or tenant. The Contractor shall be responsible that no loss or inconvenience shall accrue to the owner or tenant by virtue of its fences having been opened or the gate not having been either shut or attended at all times. Where special types of fences are encountered, the Contractor shall install temporary gates made of similar materials and of suitable quality to serve the purposes of the original fences. In all cases when the Contractor removes fences to obtain work room, it shall
provide and install temporary fencing as required, and on completion of construction shall restore the original fence to the satisfaction of the Engineer. All costs of providing, maintaining and restoring gates and fencing shall be borne by the Contractor. The Contractor shall provide and maintain all passageways, guard fences, lights and other facilities for protection required by public authority or local conditions.

5.54.3 The Contractor shall use extreme care during construction to prevent damage from dust to crops and adjacent property. The Contractor, at its own expense, shall provide adequate dust control for the right of way and take other preventative measures as directed by the Engineer.

5.54.4 The Contractor shall be responsible for all damage to any property resulting from trespass by the Contractor or its employees in the course of their employment, or subcontractors or their employees in the course of their employment, or anyone directly or indirectly employed by any of them, where such trespass was committed with or without the consent or knowledge of the Contractor.

5.54.5 The Contractor shall see that the worksite is kept drained and free of all ground water and any other water which may impede the progress or execution of the Contract work.

5.54.6 The Contractor shall be responsible for any damage caused by drainage or water runoff from construction areas and from construction plant areas.

5.54.7 In an emergency affecting the safety of life, or of the work, or of adjoining property, the Contractor, without special instruction or authorization from the Engineer, is hereby permitted to act at its discretion to prevent such threatened loss or injury, and it shall so act without appeal if so instructed or authorized. Should the Engineer deem an emergency condition to exist, the Contractor shall immediately do those things and take those steps ordered by the Engineer. The decision of the Engineer in this respect shall be final and conclusive. Any claims for compensation made by the Contractor on account of emergency work shall be determined as specified under section 5.3.

5.54.8 Except as provided by California Government Code section 4215, the Contractor shall be responsible for the removal, relocation and protection of all public and private utilities, including irrigation facilities in the nature of utilities, located on the site of the construction project if and to the extent that the same are identified in the Contract Documents; and the Contractor shall not be entitled to any extension of time or claim for damages for extra compensation in connection therewith. If and to the extent that such utilities or facilities are not identified in the Contract Documents, as between the Contractor and the District, the District will be responsible for the cost of their removal, relocation or protection, as the case may be, but the Contractor shall perform any such work in conformance with applicable provisions of section 5.3, if so directed by the Engineer and in such situation the Contractor shall not be responsible for delay in completion of the project caused by the failure of the District or the owner of the utility to provide for such removal or relocation. If the Contractor, while performing the Contract, discovers utility or irrigation facilities not
identified by the District in the Contract Documents, it shall immediately notify the Engineer in writing.

5.54.9 When the work to be performed under the Contract crosses or otherwise interferes with existing streams, watercourses, canals, farm ditches, pipelines, drainage channels, or water supplies, the Contractor shall provide for such watercourse or pipelines and shall perform such construction during the progress of the work so that no damage will result to either public or private interests; and the Contractor shall be liable for all damage that may result from failure to so provide during the progress of the work.

5.55 ACCIDENTS

5.55.1 The Contractor shall provide and maintain, in accordance with California Labor Code section 6708 and Cal/OSHA requirements, adequate emergency first aid treatment for its employees and anyone else who may be injured in connection with the work.

5.55.2 The Contractor shall promptly report in writing to the Engineer all accidents of any nature arising out of, or in connection with, the performance of the work, on or adjacent to the site, which caused death, personal injury, or property damage, giving full details and statements of witnesses. In addition, if death or serious injury or serious damage are caused, the accident shall be reported immediately by telephone or messenger to the District and the Engineer.

5.55.3 If any claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Engineer, giving full details of the claim.

5.56 NO PERSONAL LIABILITY

Neither the District, the Engineer, nor any of their officers, directors, agents, or employees shall be personally responsible for any liability arising under the Contract, except such obligations as are specifically set forth herein.

5.57 MEASUREMENT OF QUANTITIES

Where the Contract provides for payment on a lump sum price basis, no measurement of quantity will be made. Where the Contract provides for payment on a unit price basis, the quantities of work performed will be computed by the Engineer on the basis of measurements taken by the Engineer, and these measurements shall be final and conclusive. All quantities of work computed under the Contract shall be based upon measurements by the Engineer according to United States Measurements and Weights. Methods of measurement are specified herein and in the Specifications.

5.58 SCOPE OF PAYMENT

5.58.1 The Contractor shall accept the compensation provided in the Contract as full payment for furnishing all labor, materials, tools, equipment, and
incidental necessary to the completed work and for performing all work contemplated and embraced under the Contract; also for loss or damage arising from the nature of the work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the acceptance by the District and for all risks of every description connected with the prosecution of the work; also for all expenses incurred in consequence of the suspension or discontinuance of the work as provided in the Contract; and for completing the work according to the Specifications and Plans. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material.

5.58.2 No compensation will be made in any case for loss of anticipated profits. Increased or decreased work involving supplemental agreements will be paid for as provided in such agreements.

5.59 PROGRESS ESTIMATE

For each calendar month of Contract work, the Engineer will prepare a progress estimate of all work performed under the Contract. Within the first ten (10) days of each succeeding calendar month, the Engineer will prepare in writing and certify to the District, an estimate which in his opinion is a fair approximation of the value of all work done under the Contract, including any amounts due the Contractor for extra work and change orders. In arriving at the value of the work done, the Engineer will give consideration to the value of labor and materials which have been incorporated into the permanent work by the Contractor during the preceding month. Consideration will not be given to preparatory work done or for materials or equipment on hand. In order to assist the Engineer, the Contractor shall furnish the Engineer with copies of invoices for all such items delivered to the job site and incorporated into the work.

5.60 PROGRESS PAYMENTS

5.60.1 Unless otherwise provided for at a different rate in the Invitation to Bid and the Contract, the District will pay the Contractor ninety-five (95%) percent of the amount of each properly submitted and undisputed progress payment request. Five (5%) percent, or any higher rate specified in the Invitation to Bid and the Contract, of the amount of each payment request shall be retained by the District until final completion and acceptance of all work under the Contract; provided, however, that if the Engineer, at any time after fifty (50%) percent of the work has been completed, finds that satisfactory progress is being made, the District may, in its sole discretion, pay any or all of the remaining progress payments in full or at a lower retention. In no case shall the District make a progress payment to the Contractor that exceeds one hundred percent (100%) of the value of the work actually completed to the date of the payment request.

5.60.2 The Contractor may invoice the District for no more than seventy-five (75%) percent of the cost of materials and equipment stored onsite, as long as the material or equipment has been inspected and approved by the Engineer or the District’s representative, the quantity of material or equipment can be determined to the District’s satisfaction after Contractor delivery of a paid invoice for such materials or equipment, and the materials or equipment are properly stored and protected in accordance with the
manufacturer’s recommendations. The Contractor retains liability for any damage or degradation of the quality of stored materials and equipment until after they are incorporated into the work and the work is approved by the District in accordance with the applicable requirements of the Contract Documents.

5.60.3 In accordance with California Public Contract Code section 20104.50, a written payment request from the Contractor shall be reviewed by the Engineer as soon as practicable in order to determine whether it is proper. If it is determined not to be a proper payment request suitable for payment, then the Engineer shall return it to the Contractor with a written explanation of the deficiencies as soon as practicable, but not later than 7 days after receipt of the payment request. If the payment request is determined to be properly submitted and is undisputed, the Engineer will certify the payment as provided above and the District shall make the payment to the Contractor within 30 days after receipt of the payment request. If a properly submitted and undisputed payment request is not paid within this 30 day period, then the District shall pay interest on the overdue amount to the Contractor at the legal rate set forth at California Code of Civil Procedure section 685.010. This section shall not apply if District funds are not available for payment of the payment request or if payment is delayed due to an audit inquiry by the financial officer of the District.

5.60.4 The Contractor may, in accordance with California Public Contract Code section 22300, substitute securities for any monies which the District may withhold to insure performance under the Contract. Alternatively, on written request of the Contractor and at its expense, the District shall make payments of the retention earnings directly to an escrow agent pursuant to an escrow agreement entered into consistent with the terms of Public Contract Code section 22300.

5.60.5 When, in the judgment of the Engineer, the work is not proceeding in accordance with the provisions of the Contract, or when in his judgment the total amount of the work done since the last estimate amounts to less than $1,000, no pay estimate will be prepared and no progress payment will be made.

5.60.6 No progress estimate or payment shall be considered to be an approval or acceptance of any work, materials or equipment. Estimated amounts and values of work done and materials and equipment incorporated into the work will be conformed with actual amounts and values as they become available in subsequent progress estimates, progress payments and the final estimate and payment. All estimates and payments will be subject to correction in subsequent progress estimates and payments and the final estimate and payment.

5.60.7 It is mutually agreed between the parties to the Contract that no payments made under the Contract, including progress payments and the final payment, shall be evidence of the performance of the Contract, either wholly or in part, and no payment shall be construed to be an acceptance of any defective or incomplete work or improper materials.

5.60.8 District reserves the right to make payments jointly to the order of the Contractor and to any of its subcontractors or suppliers that might have a right to
file a stop notice with the District. The District shall have no obligation to pay or to ensure the payment of money to a subcontractor or supplier, except as may otherwise be required by law.

5.60.9 Each progress payment made to the Contractor in accordance with the Engineer’s determination of progress payment requests is contingent upon the Contractor furnishing the District with a signed written waiver and release of all claims against the District arising out of or in any way connected to the Contract. Disputed Contract claims must be specifically stated and excluded by the Contractor from the operation of the waiver and release. The waiver and release shall be substantially in the form provided in Civil Code sections 8132 (Exhibit A) or 8134 (Exhibit B). The Contractor may only use the conditional waiver and release if the District does not pay all or a portion of a progress payment estimate submitted by the Contractor and the Contractor disputes the District’s determination.

In the event that the Contractor fails or refuses to furnish the District with a signed written waiver and release of all claims against the District arising out of or in any way connected to the Contract, Contractor’s acceptance of each progress payment shall be Contractor’s release of all claims against the District in relation to all work paid to date to the fullest extent permitted by law.
CONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT (EXHIBIT A)

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT’S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Identifying Information

Name of Claimant: _____________________________________________________________
Name of Customer: _____________________________________________________________
Job Location: __________________________________________________________________
Owner: _______________________________________________________________________
Through Date: _________________________________________________________________

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant’s receipt of payment from the financial institution on which the following check is drawn:

Maker of Check: _______________________________________________________________
Amount of Check: $ ____________________________________________________________
Check Payable to: ______________________________________________________________

Exceptions

This document does not affect any of the following:

(1) Retentions.
(2) Extras for which the claimant has not received payment.
(3) The following progress payments for which the claimant has previously given a conditional waiver and release but has not received payment:
Date(s) of waiver and release: __________________________________________________
Amount(s) of unpaid progress payment(s): $ _______________________________________

(4) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Signature

Claimant’s Signature: ___________________________________________________________
Claimant’s Title: _______________________________________________________________
Date of Signature: _____________________________________________________________
UNCONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT (EXHIBIT B)

NOTICE TO CLAIMANT: THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Identifying Information

Name of Claimant: _____________________________________________________________
Name of Customer: _____________________________________________________________
Job Location: __________________________________________________________________
Owner: _______________________________________________________________________
Through Date: _________________________________________________________________

Unconditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has received the following progress payment:
$ ___________________________________________________________________________.

Exceptions

This document does not affect any of the following:
(1) Retentions.
(2) Extras for which the claimant has not received payment.
(3) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Signature
Claimant’s Signature: _____________________________________________________________
Claimant’s Title: _______________________________________________________________
Date of Signature: _______________________________________________________________
5.61 COMPLETION AND FINAL ACCEPTANCE

5.61.1 The following definitions govern in interpreting this article and wherever such terms may appear in the Contract Documents:

5.61.1.1 “Final Completion” means the time when the work has been fully completed in accordance with the Contract Documents and is ready for acceptance and final payment by the District.

5.61.1.2 “Final Inspection” means the inspection conducted by the District after to verify that the work has reached Final Completion.

5.61.1.3 “The Final Punch List” is the listing of items that, in the Engineer’s opinion, remain uncompleted after Substantial Completion but that must be completed by the Contractor prior to Final Completion.

5.61.1.4 “Semi-Final Inspection” means that inspection conducted by the Engineer to determine if the work is Substantially Complete.

5.61.1.5 “Substantial Completion” means the work has progressed to the point that: (1) the work is ready for beneficial use and occupancy by the District for the intended purpose, (2) all fire and life safety work has been completed, inspected and accepted, (3) all mechanical and process systems and equipment are complete and have been put in automatic operation, (4) the total value of uncompleted work is less than one-half of one percent of the Contract Price and any approved cost extensions and (5) completing the work will not significantly interfere with the District’s convenience, or use or cost of operating the work.

5.61.2 When specifically provided for in the Contract Documents or when agreed to in writing by the District and the Contractor, the District may begin using a portion of the work even though it is not Substantially Complete. In such a case, the Contractor, the District and the Engineer shall first agree on and document responsibilities for security, operation, safety, maintenance, utilities, insurance, warranties, and guarantees for that portion of the work being used by the District. The District, the Contractor and the Engineer shall inspect such portion of the work and shall prepare a list of work to be completed or corrected before final acceptance. The District’s use of any portion of the work shall not constitute final acceptance of that portion of the work prior to Final Completion and acceptance of the work as a whole. The District shall allow the Contractor reasonable access to complete or correct work in areas being used by the District. Partial beneficial occupancy shall not relieve the Contractor of Liquidated Damages or waive any of the District’s rights under the Contract unless the Contract Documents expressly provide for and identify such portion of the work to be considered Substantially Complete before the remaining portions of the work or waiver of specific District rights.

5.61.3 When the Contractor considers the work nearly complete, the Contractor shall review the Contract Documents, inspect the work and prepare a list of deficiencies (Punch List). When the Punch List is prepared, the Contractor will deliver copies to the Engineer and the District. The Contractor shall complete or correct the items on the
Punch List until, in the Contractor’s opinion, the work is Substantially Complete and ready for occupancy and use by the District. The Contractor shall then deliver the completed Punch List to the Engineer and notify the Engineer in writing that the Contractor believes the work is Substantially Complete and ready for Semi-Final Inspection.

5.61.4 After the Contractor notifies the Engineer in writing that it believes the work is substantially complete, the Engineer will conduct the Semi-Final Inspection and may add additional items to the Contractor’s Punch List. As a result of this inspection, the Engineer may determine that: (1) the work is not sufficiently complete to warrant a Semi-Final Inspection, additions to the Contractor’s Punch List, or the preparation of a Final Punch List; (2) the work is sufficiently complete for the Engineer to prepare a Final Punch List but certain incomplete or Defective work prohibits use of the work for its intended purpose and therefore, the work is not Substantially Complete; or (3) that the work is Substantially Complete and usable for its intended purpose and the Engineer can prepare a Final Punch List. In preceding cases (1) and (2), the Contractor shall continue the work and call for a second Semi-Final Inspection when it believes the work is ready. If the Contractor does not achieve Substantial Completion on the second attempt, it shall reimburse the District the cost of the Engineer’s services for additional inspections. In case (3), the Engineer will prepare a Final Punch List and a notice of Substantial Completion, which shall state the time agreed to by the District and the Contractor, not to exceed 30 days, in which the Contractor shall complete all remaining Punch List items and ready the work for Final Inspection. The Engineer shall attach a copy of the Final Punch List to the notice of Substantial Completion. Time to complete punch list items provided in this section 5.61.4 is for the convenience of the District and is intended as a deadline; and therefore, nothing in this section shall extend the time of completion for the fixed in the Contract Documents or excuse the failure of the Contractor to timely deliver the work as complete in accordance with the Contract Documents.

5.61.5 When the Contractor has completed or corrected all items on the Engineer’s Final Punch List and has made all required final submittals, the Contractor shall give the Engineer written notice that the work is ready for Final Inspection and acceptance and upon receipt of a final Application for Payment, the Engineer shall make a Final Inspection. If the Engineer finds the work is not fully complete, it shall notify the Contractor of items still requiring completion or correction. The Contractor shall immediately correct these deficiencies and call for a re-inspection. When, on the basis of its knowledge of the work, observations and inspections, the Engineer finds that the work is acceptable and fully complete in accordance with the Contract Documents, and when all final submittals have been made, the Engineer will recommend that the District issue and file a Notice of Completion designating Final Completion of the work, make Final Payment and accept the work in accordance with the terms and conditions of the Contract Documents.

5.61.6 The Engineer’s failure to include an item on the Final Punch List, to make the Semi-Final or the Final Inspection, or to recommend final acceptance shall not alter the Contractor’s responsibility to complete all work in accordance with the Contract Documents. If any lien or stop notice remains unsatisfied, the Contractor shall immediately take all steps necessary to remove any such lien or stop notice before Final Payment is made.
5.61.7 The making of Final Payment shall constitute a waiver of claims by the Contractor except those arising from:

5.61.7.1 Liens, claims, security interests or encumbrances arising out of the Contract and unsettled;

5.61.7.2 Failure of the work to comply with the requirements of the Contract Documents; or

5.61.7.3 Terms of the one-year guarantee period and special warranties required by the Contract Documents.

5.61.7.4 Any of the Contractor’s continuing obligations under the Contract Documents.

5.62 FINAL PAYMENT

Within 10 days after the date of completion and Contractor’s delivery to the District of a complete release of all liens arising out of this Contract, or receipts in full covering all labor, materials and equipment for which a lien could be filed, or a bond satisfactory of the District to defend and indemnify the District against such liens, the District shall accept the work and file in the office of the County Recorder, a Notice of Completion of the work herein agreed to be done by the Contractor. On the expiration of 60 days after the recordation of such Notice of Completion and there being no liens or stop notices filed, the difference between said final estimate and all payments theretofore made to the Contractor shall be due and payable to the Contractor, subject to any requirements concerning the furnishing of a maintenance bond, and excepting only such sum or sums as may be withheld or deducted in accordance with the provisions of this Contract or as required by law. All prior certifications upon which partial payments may have been made, being merely estimates, shall be subject to correction in the final certificate. In accordance with California Public Contract Code section 7107(c), in the event of a dispute between the District and the Contractor, the District may withhold from the final payment an amount not to exceed 150% of the disputed amount. If any liens are filed or exist after Final Payment is made, the Contractor shall refund to the District all money that the District may be compelled to pay in discharging such liens, including all costs and reasonable attorney’s fees.

5.63 FINAL RELEASE

Final payment to the Contractor in accordance with the approved final estimate is contingent upon the Contractor furnishing the District with a signed written waiver and release of all claims against the District arising out of or in any way connected to the Contract. Disputed Contract claims in stated amounts may be specifically excluded by the Contractor from the operation of the waiver and release. The waiver and release shall be substantially in the form provided in Civil Code sections 8138 (Exhibit A) or 8136 (Exhibit B). The Contractor may only use the conditional waiver and release form if the District does not pay all or a portion of the final payment estimate submitted by the Contractor and the Contractor disputes the District’s determination on such estimate. In the event the Contractor fails to furnish the District with a signed written waiver and release of all claims against the District arising out of or in any way
connected to the Contract, Contractor’s acceptance of final payment is Contractor’s release of all claims against the District to the fullest extent permitted by law.
UNCONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT (EXHIBIT A)

NOTICE TO CLAIMANT: THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Identifying Information

Name of Claimant: ______________________________________________________________
Name of Customer: __________________________________________________________________
Job Location: ___________________________________________________________________
Owner: _______________________________________________________________________

Unconditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for all labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has been paid in full.

Exceptions
This document does not affect any of the following:
Disputed claims for extras in the amount of: $ ______________________________________

Signature
Claimant’s Signature: ____________________________________________________________
Claimant’s Title: _______________________________________________________________
Date of Signature: ______________________________________________________________
CONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT (EXHIBIT B)

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT’S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Identifying Information
Name of Claimant: ______________________________________________________________
Name of Customer: _____________________________________________________________
Job Location: __________________________________________________________________
Owner: _______________________________________________________________________

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant’s receipt of payment from the financial institution on which the following check is drawn:
Maker of Check: _______________________________________________________________
Amount of Check: $ ______________________________________________________________
Check Payable to: _______________________________________________________________

Exceptions
This document does not affect any of the following:
Disputed claims for extras in the amount of: $____________________________________

Signature
Claimant’s Signature: ___________________________________________________________
Claimant’s Title: _______________________________________________________________
Date of Signature: _____________________________________________________________
5.64 RIGHT TO WITHHOLD PAYMENTS

In addition to all other rights and remedies of the District hereunder and by virtue of law, the District may withhold or nullify the whole or any part of any progress payment or withhold up to 150% of the disputed amount from the final payment (see Public Contract Code section 7107(c)) to such extent as may reasonably be necessary to protect the District from loss on account of:

5.64.1 Defective work not remedied, irrespective of when any such work be found to be defective;

5.64.2 Claims or liens filed or reasonable evidence indicating probable filing of claims or liens including, but not limited to, claims under California Labor Code sections 1775, 1776, or 1777.7;

5.64.3 Failure of the Contractor to make payments properly for labor, materials, equipment, or other facilities, or to subcontractors and/or suppliers;

5.64.4 A reasonable doubt that the work can be completed for the balance then unearned;

5.64.5 A reasonable doubt that the Contractor will complete the work within the agreed time limits;

5.64.6 Costs to the District resulting from failure of the Contractor to complete the work within the proper time; or

5.64.7 Damage to work or property.

Whenever the District shall, in accordance herewith, withhold any monies otherwise due the Contractor, written notice of the amount withheld and the reasons therefor will be given the Contractor. After the Contractor has corrected the enumerated deficiencies, the District will promptly pay to the Contractor the amount so withheld. When monies are withheld to protect the District against claims or liens of mechanics, suppliers, materialmen, subcontractors, etc., the District may at its discretion permit the Contractor to deliver a surety bond in terms and amount satisfactory to the District, indemnifying the District against any loss or expense, and upon acceptance thereof by the District, the District shall release to the Contractor monies so withheld.

5.65 WAIVER OF INTEREST

The District shall have no obligation to pay and the Contractor hereby waives the right to recover interest with regard to monies that the District is required to withhold by reason of judgment, order, statute or judicial process, or may withhold pursuant to the provisions of this Contract.

5.66 SATISFACTION OF CLAIMS AND LIENS

Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the District, a complete release of all liens and claims.
arising out of this Contract, or receipts in full in lieu thereof and, if required in either case, an affidavit that so far as it has knowledge or information the releases and receipts include all the labor and material for which a lien or claim could be filed; but the Contractor may, if any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the District, to indemnify the District against any lien or claim. If any lien or claim remains unsatisfied after all payments are made, the Contractor shall refund to the District all monies that the latter may be compelled to pay in discharging such a lien, or claim, including all costs and reasonable attorney's fees.

5.67 ASSIGNMENT

In accordance with California Public Contract Code section 7103.5, the Contractor hereby offers and agrees to assign to the District all rights, title, and interest in and to all causes of action it may have under section 4 of the Clayton Act (15 U.S.C. section 15) or under the Cartwright Act (Chapter 2 (commencing with section 16700) of part 2 of division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the Contract Documents. This assignment shall be made and become effective at the time the District tenders final payment to the Contractor, without further acknowledgment by the parties.

5.68 AVAILABILITY AND AUDIT OF INFORMATION

5.68.1 The District's duly authorized representatives shall have, during the term of the Contract and for three years thereafter, the right to inspect, copy and audit all of the Contractor's and its subcontractors' books, accounts, records, and other material of all description, including but not limited to source documents and computer files, and to interview personnel, pertaining to the Contract to verify or review the quantity, quality, work program and progress of the work, reimbursable costs, amounts claimed by the Contractor, pricing data, estimates of cost for fixed rates including those applicable to proposed changes, and for any other reasonable purposes. “Books,” “accounts,” and “records” as used herein shall include, but not be limited to, original estimates, subcontracts, bids, proposals, purchase orders, books, documents, accounting records, papers, correspondence, project files and scheduling information, including the original Bid and all documents related thereto and to its preparation, the as-planned construction schedule and any related documents.

5.68.2 The Contractor's and its subcontractors' accounts shall be kept in accordance with generally accepted accounting principles in the particular industry and shall be kept in such a manner and in sufficient detail to clearly disclose the nature and amounts of the different items of service and cost pertaining to the Contract and the basis for charges or allocations to the Contract. The Contractor and its subcontractors shall preserve all such accounts and records for a period of three years after the term of the Contract.

5.68.3 The Contractor shall include the necessary provisions in its subcontract to ensure that its subcontractors comply with this provision.
5.68.4 The parties acknowledge that this Contract, and performance and payments under this Contract, are subject to examination and audit by the State Auditor General for three years following final payment under this Contract pursuant to California Government Code section 8546.7.

5.69 INTEGRATION

The Contract Documents constitute the sole, final, complete, exclusive and integrated expression and statement of the terms of this contract among the parties concerning the subject matter addressed herein, and supersedes all prior negotiations, representations or agreements, either oral or written, that may be related to the subject matter of this Contract, except those other documents that are expressly referenced in the Contract Documents.

5.70 WAIVER

The waiver at any time by any party of its rights with respect to a default or other matter arising in connection with this Contract shall not be deemed a waiver with respect to any subsequent default or matter.

5.71 REMEDIES NOT EXCLUSIVE

The remedies provided in this Contract are cumulative and not exclusive, and are in addition to any other remedies that may be provided by law or equity. The exercise by either party of any remedy under this Contract shall be without prejudice to the enforcement of any other remedy.

5.72 SEVERABILITY

The invalidity, illegality or unenforceability of any provision of the Contract Documents shall not render the other provisions unenforceable, invalid or illegal.

5.73 GOVERNING LAW AND VENUE

Except as otherwise required by law, this Contract shall be interpreted, governed by, and construed under the laws of the State of California. The County shall be venue for any litigation concerning the enforcement or construction of this Contract.

5.74 NOTICES

Any notice, demand, invoice or other communication required or permitted to be given under this Contract shall be in writing and either served personally or sent by prepaid, first class U.S. mail and addressed as follows: for the District, either to the Engineer or the District at the addresses set forth in the Invitation to Bid; for the Contractor, at the address set forth in its Bid. Any party may change its address by notifying the other party in writing of the change of address.

(END OF GENERAL CONDITIONS.)
SECTION 00800

SUPPLEMENTARY PROVISIONS

The following supplementary conditions change portions of the General Conditions, as noted. When any provision is changed, the unaltered provisions shall remain in effect.

SP 5.3.5 Add to end of paragraph 5.3.5:

“Daily extra work reports shall be maintained by the Contractor and provided to the Engineer to verify the actual costs of change order work.”

SP 5.14.1 Modify paragraph 5.16.1 as follows:

“5.16.1 The Contractor shall designate in writing before starting work an individual as authorized representative who shall have the authority to represent and act for the Contractor. This authorized representative shall be present at the site of the work at all times while work is actually in progress on the Contract. The authorized representative shall not be changed during the course of the project without the expressed written consent of the District. When work is not in progress and during periods when work is suspended, arrangements acceptable to the Engineer shall be made for any emergency work that may be required.”

SP 5.30.8 Modify paragraph 5.30.8 as follows:

“5.30.8 Should inclement weather conditions or the conditions resulting from weather prevent the Contractor from proceeding with seventy five (75) percent of the normal labor and equipment force engaged in the current critical activity item for a period of at least five (5) hours per day toward completion of such operation or operations, and the crew is dismissed as a result thereof, it shall be a weather delay day. No extension of time will be granted for Work delays due to normal rainfall. Normal rainfall is defined as the normal number of rainfall days in a given month and average monthly rainfall totals, based on National Weather Service precipitation records as specified below. A rainfall day is defined as each day (midnight to midnight) of measurable rainfall (greater than 0.10-inches of rainfall) as reported by the National Weather Service in Sacramento, CA.

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Rainfall Days</th>
<th>Total Rainfall (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>11</td>
<td>4.2</td>
</tr>
<tr>
<td>February</td>
<td>9</td>
<td>3.8</td>
</tr>
<tr>
<td>March</td>
<td>10</td>
<td>3.2</td>
</tr>
<tr>
<td>Month</td>
<td>Number of Rainfall Days</td>
<td>Total Rainfall (Inches)</td>
</tr>
<tr>
<td>----------</td>
<td>-------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>April</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td>May</td>
<td>3</td>
<td>0.6</td>
</tr>
<tr>
<td>June</td>
<td>1</td>
<td>0.2</td>
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<td>July</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>August</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>September</td>
<td>2</td>
<td>0.4</td>
</tr>
<tr>
<td>October</td>
<td>4</td>
<td>1.0</td>
</tr>
<tr>
<td>November</td>
<td>8</td>
<td>2.6</td>
</tr>
<tr>
<td>December</td>
<td>9</td>
<td>2.8</td>
</tr>
</tbody>
</table>

A time extension will be granted for significantly higher than average rainfall and for rainfall days in excess of the normal number of rainfall days in a given month, as listed above, for each day for which Contractor can demonstrate that climatic conditions impacted Work on the critical path of the then currently accepted Construction Progress Schedule. Engineer will examine the information provided by Contractor and determine the number of days of Contract time extension to be allowed due to weather conditions more severe than normal. Engineer may reduce the time extension to reflect time savings to critical path activities due to less than normal rainfall during other months. No time extension for climatic conditions will be granted if the abnormal conditions did not delay critical path activities or if delays due to abnormal weather conditions are concurrent with delays within the control of Contractor.”

SP 5.36.1 Modify paragraph 5.36.1 as follows:

“5.36.1 Contractor is responsible for the safety of its workers and subcontractor workers and Contractor shall comply with, and require its workers and subcontractor workers to comply with, all applicable federal and state worker and job site safety-related laws and regulations, including, but not limited to, applicable federal Department of Labor, Occupational Safety and Health Administration ("OSHA") regulations and California Department of Industrial Relations (including the Division of Occupational Safety and Health and Occupational Safety and Health Standards Board ("Cal/OSHA")) regulations and safety orders.”

SP 5.45.2 Modify paragraph 5.45.2 as follows:

“5.45.2 The Contractor shall have an Injury/Illness Prevention Program (IIPP) in place to protect the safety of its employees and ensure that its subcontractors also have an IIPP or comply with Contractor’s program. The Contractor’s IIPP shall
comply with and be at least as effective as the requirements of section 3203 of Title 8 of the California Code of Regulations. The Contractor shall submit a copy of its IIPP to the District.”
PART 1 - GENERAL

1.01 Summary

A. The work to be done consists of furnishing all labor, materials, equipment, and services for the Water Treatment Plant Residual Area Stormwater Lift Station project, including a new lift station with local panel, all piping and valves, all site work including civil grading of the solids drying area, v-ditch and culverts, all concrete work including a new concrete pad and installation of the pre-cast wet well, all electrical supply, control and instrumentation work, all instrumentation and control work, and all miscellaneous work as shown, specified or required for a complete, operating installation.

1.02 Project Site Conditions

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>San Juan Water District Water Treatment Plant, Placer County, CA</td>
</tr>
<tr>
<td>Site Address</td>
<td>9935 Auburn Folsom Rd, Granite Bay, CA 95746</td>
</tr>
<tr>
<td>Elevation</td>
<td>406.0 Feet</td>
</tr>
</tbody>
</table>

1.03 Contractor Scope of Services:

A. The work comprises furnishing all labor, materials, equipment and services necessary for the new lift station, including underground piping, tie-ins, electrical and instrumentation, level controls, pre-cast wet well installation, process piping, mechanical pumping systems, electrical housekeeping pads, above ground piping, pump control valves and flow meters, local control panel with new main breaker in Equalization Basin Pump Station panel, low voltage control and instrumentation wiring, site grading, pavement work, rock lined v-ditch, site access and all miscellaneous work as shown and specified for the full start-up and operation of the new lift station installation. The Contractor will also furnish electrical service connections, underground yard electrical conduits, pull boxes and lids, electrical grounding system, above ground electrical conduits, above ground and surface mounted conduit, transformer, electrical sub-panel, provisions for future exterior lighting, and all necessary finish work associated with the lift station and its related components.

B. Furnish all labor, materials, equipment, services, permits, temporary controls and construction facilities, and all general conditions, seismic requirements, general requirements and incidentals required to complete the Work in its entirety as described in the Contract Documents.

C. The Work of this Contract comprises construction of all the Work indicated, described in the Specifications, or otherwise required by the Contract Documents.

D. Unless provided otherwise in the Contract Documents, all risk of loss to Work covered by Contract Documents shall rest with Contractor until Final Acceptance of the Work.

E. Contractor’s use of the premises for Work and storage is limited to the areas indicated.

F. Contractor shall be solely responsible for all utilities (including without limitation electricity, water, gas, etc.) required for construction. The District will provide permanent power and water as shown on Drawings and discussed in the specifications.
1.04 Work under Other Plans
A. The Work will be performed at an operating water treatment plant. Work at or near the Site performed by others includes the following:
   1. Filter Rehabilitation Project, Thickener Coating Project

1.05 Future Work
A. The Lift Station has been designed to service two phases of the project. The District plans to provide an engineered cement/geomembrane pad with a concrete trench drain for the solids retention bed in the future and site lighting.

1.06 Work Included
A. The Contractor shall furnish all labor, superintendence, materials, power, light, heat, fuel, water, tools, appliances, equipment, supplies, services, and other means of construction necessary or proper for performing and completing the work.
B. The Contractor shall obtain and pay for all required permits.
C. Contractor shall perform and complete the work in the manner best calculated to promote rapid construction consistent with safety of life and property, to the satisfaction of the District and in strict accordance with the Contract Documents.
D. The Contractor shall clean up the work site and maintain it during and after construction, until accepted, and shall do all of the work and pay all costs incidental thereto.
E. The Contractor shall repair all structures and property that may be damaged or disturbed during performance of the work.
F. The Contractor shall provide and maintain such modern plant, tools, and equipment as may be necessary to perform in a satisfactory and acceptable manner all the work required by this Contract. Only equipment of established reputation and proven efficiency shall be used. The Contractor shall be solely responsible for the adequacy of his plant and equipment.

1.07 Work Days and Hours
A. Construction shall be allowed only between the hours of seven (7:00) a.m. and three (3:00) p.m. on weekdays unless otherwise approved in writing by the District or as limited by statements below.
B. No work can take place outside of working hours as established by a project’s conditions of approval, encroachment permit, or based on restrictions that may be created by noise as defined in the Placer County Noise Ordinance.
C. The Contractor shall be responsible for any inspection and additional administration costs incurred by the District, or its agents and representatives, for work by the Contractor outside the hours defined above on weekdays, or any work on weekends or holidays recognized by the District. Such costs shall be withheld from the succeeding monthly progress payment. Any work specifically required to be performed outside the normal working hours is excluded from the provisions of this paragraph.
D. The Contractor shall notify the District at least one working day prior to any work outside the normal working hours defined above, on weekends or holidays.
E. The Contractor shall maintain continued open access to gate on east side of the Hinkle Reservoir.
F. The Contractor shall not block or restrict access to chemical trucks entering the WTP.
G. The Backwash Equalization basin will continue to be an active operational process while construction is taking place. Contractor to take measures necessary to ensure unscheduled interruptions to the process do not occur.

1.08 Contractor Use of Premises
A. Confine operations at Site to areas permitted by Contract Documents, permits, ordinances, and laws.
B. Do not unreasonably encumber Project Site with materials or equipment.
C. Assume full responsibility for protection and safekeeping of products stored on premises.
D. Move any stored products that interfere with operations of other contractor.
E. Parking, storage, staging, and work areas shall be coordinated with the District, and comply with all other Contract documents requirements.

1.09 Punch List Verification
A. A punch list examination will be performed upon Substantial Completion of Work. One follow up review of punch list items for each discipline will be provided. If further Site visits are required to review punch list items due to incompleteness of the Work by Contractor, Contractor shall reimburse the District for these visits.

1.10 Unfavorable Construction Conditions
A. 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. The Contractor will employ best practices to manage the construction site during inclement weather.

1.11 Site Administration
A. Contractor shall be responsible for all areas of the Site used by it 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 District 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 to observe the same regulations as Contractor requires of its employees. Site Administrator will ensure all employees or sub-contractor comply with the Districts PSM program.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

** END OF SECTION **
PART 1 - GENERAL

1.01 Summary
A. Payment for the various items of the Bid Schedule, as further specified herein, shall include all compensation to be received by the Contractor for furnishing all labor, materials, equipment and services, and do all work for the construction, maintenance, testing, and placing in trouble-free operation all items of work being described, including all appurtenances thereto and including the costs of any additional permits as needed for construction and the cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the California Division of Industrial Safety and the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA).

B. No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs therefor shall be included in the prices named in the Bid Schedule for the various items of work.

C. Related Sections

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>01301</td>
<td>Schedule of Values</td>
</tr>
</tbody>
</table>

1.02 Submittals
A. Submit:
   1. Schedule of Values
   2. Initial Monthly Cash Flow Spreadsheet
      a. Update as required by the District’s Representative
   3. Application for Payment
      b. In a format acceptable to the District.
      c. For review by District’s Representative.
      d. Based on approved Schedule of Values and percentage of work completed.
      e. Include separate line items for approved Change Orders.
   4. Final Application for Payment

1.03 Measurement of Pay Quantities
A. Contractor shall determine by measurement or estimate of quantities or percentages complete and submit the Application for Payment to the District’s Representative.
   1. District’s Representative shall review and concur with all proposed quantities and percentages complete.
   2. Contractor and District’s Representative will meet to resolve differences in payment estimates.
   3. Contractor shall submit adjusted Final Application for Payment after resolution of differences with District’s Representative.

B. No payment will be made for:
1. Work performed or materials placed outside of the lines indicated on the Drawings or as established by the Engineer or County.

2. Materials wasted, used, or disposed of in a manner not called for under the Contract Documents.

3. Rejected materials (including material rejected after it has been placed, if rejection is due to the Contractor’s failure to comply with the provisions of the Contract Documents).


5. Material on hand.

6. Material not unloaded from a transport vehicle.

7. Defective Work not accepted by the District.

1.04 Payment for Materials On Hand

A. None

1.05 Basis of Payment

A. Unit Price Quantities: When estimated quantity for specific portions of Work is listed in Bid Form, quantity of Work to be paid for shall be actual number of units satisfactorily completed, as determined by the District and certified by Contractor, in accordance with Contract Documents.

B. Lump Sum: When estimated quantity for specific portion of Work is not indicated and unit is designated as lump sum, payment will be on a lump sum basis for Work satisfactorily completed in accordance with Contract Documents.

C. Allowances: Allowance items (if any) will be paid for as provided in funds authorized for Allowance work. Allowance work will not be released for Contract payments unless District has authorized Allowance work in writing.

D. District does not expressly, or by implication, agree, warrant, or represent in any manner, that actual amount of Work will correspond with amounts shown or estimated and reserves right to increase or decrease amount of any class or portion of Work, to leave out entire Bid Item or Items, or to add work not originally included in Bid or Contract Documents, when in its judgment such change is in best interest of District. No change in Work shall be considered a waiver of any other condition of Contract Documents. No claim shall be made for anticipated profit, for loss of profit, for damages, or for extra payment whatever, except as otherwise expressly provided for in Contract Documents, because of any differences between amount of work actually done and estimated amount as set forth herein, or for elimination of Bid Items.

1.06 Bid Items, Allowances, and Alternates

A. Any Bid Item may be deleted from the Work and Contract Sum, in total or in part, prior to or after award of Contract without compensation in any form or adjustment of other Bid Items or prices therefore.

B. Payment of all items is subject to provisions of Contract Documents, including without limitation

C. For all Bid Items, furnish and install all work indicated and described in Specifications and all other Contract Documents, including connections to existing systems. Work and requirements applicable to each individual Bid Item, or unit of Work, shall be deemed incorporated into the description of each Bid Item (whether Lump Sum, or Unit Price).

The items below are broken down into lump sum and unit price items. The Contractor shall provide bid prices based on the descriptions, plans, and specifications with the understanding that all work must be included in the stipulated items. Payment for lump sum items will be made at the contract
lump sum price upon completion, unless otherwise specified. Payment for unit price items will be made at the contract unit price for each unit installed or completed.

All items involving materials and installation are on a furnish and install basis.

In underground installations no extra compensation will be made for removal of surface improvements, excavation regardless of material, over excavation shown or placement and removal of temporary asphalt as required, disposal of surplus material in a lawful manner, bedding, backfill, and compaction, testing, or any other work specified or shown.

Compensation for safety measures, traffic control, cleanup and any site restoration necessary to pre-existing conditions shall be included in the prices of the various contract items of work unless specified elsewhere.

Compensation for construction facilities and temporary control including erosion control measures, dust control, temporary facilities, work site maintenance and construction facilities, bonds and insurance and compliance with General Conditions shall also be included in the prices of the various contract items of work unless specified elsewhere.

Item 1 – Mobilization and Demobilization

a. Measurement - Item will be measured on a lump sum basis. Line Item 1 cannot represent more than 5% of the overall bid price for the entire project.

b. Payment – Includes all required submittals. Payment of 60% of line Item 1 will be made after the Contractor has mobilized to the site, provided all submittals (which have been approved by the District) and started work. Payment of the remaining 40% of Line Item 1 will be made after final completion of the project, including removal of all equipment, performing site cleanup, submission of warranties, record drawings, and acceptance of the entire project by the District.

Item 2 – Site Civil Work

a. Measurement – Item will be measured on a lump sum basis.

b. Payment – Work involves demolition to prepare the site for grading, processing earthwork, backfill and compaction and includes associated grading work, dewatering, shields, sheeting, shoring and bracing necessary to safely install all pipelines and structures to complete the work as specified in the Contract Documents. Work involves installation of a rock lined ditch and access roads across the ditch including furnishing and installation of aggregate base access roads and under concrete pads including subgrade work. Progress payments made based on percentage of work completed

Item 3 – Lift Station, Piping and Mechanical Finished Work

a. Measurement – Item will be measured on a lump sum basis.

b. Payment – Work involves furnishing and installation of the new pre-cast wet well, cast-in-place mat slab, grading, above grade pipe manifold and grout as indicated in the Contract Documents. Work involves furnishing and installing all the new submersible pumps and accessories. Work involves furnishing and installing all items associated with the new pump station, including but not limited to all valves, piping (collection and force main piping), cleanout, flow meter, water service piping, miscellaneous pipe appurtenances, protective lining/coating, and equipment supports. Progress payments made based on percentage of work completed.
Item 4 – Electrical and Instrumentation
  a. Measurement – Item will be measured on a lump sum basis.
  b. Payment – Work involves furnishing, installing, and programming all electrical equipment and SCADA equipment associated with the project. Progress payments will be made based on percentage of work completed as accepted by the District.

Item 5 – Start-up, Commissioning and Testing
  a. Measurement – Item will be measured on a lump sum basis.
  b. Payment – Item includes all work and equipment associated with startup, testing, and commissioning provided in the project. Payment will be made in full upon acceptance by the District. Progress payments will not be accepted.

D. District Allowances:
  1. Allowance work shall be done as Change Order.
     a. The Amount given on Base Bid Form under each Allowance Item is the sum of money set aside for each Allowance Item. These amounts shall be included in the Contract Sum on the Bid Form.
     b. If the cost of work done under any Allowance Item is less than the amount given on the Bid Form under that Allowance Item, the Contract Sum shall be reduced by the difference between the amount given in the Bid Form and the cost of work actually done.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**END OF SECTION**
PART 1 - GENERAL

1.01 Datum

A. Vertical and horizontal datum are based on local control points shown on the Drawings. The Contractor shall establish other vertical and horizontal control from these District furnished reference points as required to properly lay out and construct the Work. All connections shall be installed based on actual elevations of existing structures to which connections are made.

1.02 Lines and Grades

A. All Work shall be done to the lines, grades, and elevations indicated on the Drawings.

B. The Drawings provide basic horizontal and vertical control points to be used as datums for the Work.

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

D. The District's Surveyor will stake the control points needed to properly layout the work.

E. The Contractor shall lay out all work, including structures and pipelines, and shall be responsible for any errors resulting therefrom. Contractor shall remove and reconstruct Work which is improperly located. In all questions arising as to proper location of lines and grades, the District's decision will be final.

F. 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.

   1. All Contractor surveying shall be done by a registered land surveyor.

   2. Contractor shall provide at its cost 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 at its cost competent persons and such tools, stakes, and other materials as may be required in establishing or designating control points, or in checking survey, layout, and measurement work performed by Contractor.

   3. Contractor shall submit the surveyor's credentials prior to any layout work.

   4. 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 proper operation and function. The Contractor shall stake the work limits.

G. The Contractor shall supply such labor as required, at no extra charge, to aid and assist the District's Representative in checking line, location and grades of the work as set by the Contractor, if requested by the District's Representative. Work shall include moving materials and equipment that interfere with a clear line of sight between horizontal control points and the construction work.

H. The Contractor shall survey the forms of the first slab pour of all major structures to check line and grade of the concrete forms.
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**END OF SECTION**
SECTION 01060
REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 Applicable Codes and Regulations
A. Including but not limited to:
   1. California Building Code
   2. California Plumbing Code
   3. California Mechanical Code
   4. National Electrical Code
   5. California Fire Code
   6. Green Building Standards Code
   7. Energy Code
   8. CAL-OSHA Requirements

PART 2 - FEES AND PERMITS

2.01 Contractors Fees and Permits
A. Contractor shall have in possession prior to award and throughout construction a valid Business License and a valid Contracting License. Current registration with California DIR as a Public Works Contractor is also required.

2.02 Grading Permit

**END OF SECTION**
PART 1 - GENERAL

1.01 General
A. The construction of this project may expose the contractor’s workers to areas that may be considered a confined space and/or hazardous to open flame or sparks. The Contractor shall require the workers to observe proper safety and hygienic precautions.

B. The Contractor shall be solely responsible for the storage, usage, handling, and application of all hazardous materials encountered or provided in the Contract.

1.02 Safety and Health Regulations
A. The Contractor shall comply with all applicable regulations, including but not limited to 29 CFR Parts 1910 through 1926, of the Occupational Safety and Health Administration (OSHA) for Construction Work as promulgated by the US Department of Labor and the California Labor Code, Division 5, Safety in Employment, Occupational Safety and Health.

B. Prior to excavation of trenches 5-feet or deeper, the Contractor shall submit to the Construction Manager a copy of the company’s annual Cal-OSHA trenching permit.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**END OF SECTION**
SECTION 01071
STANDARD REFERENCES

PART 1 - GENERAL

1.01 Abbreviations
A. Wherever used in these specifications, the following abbreviations will have the meanings listed:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Title</th>
</tr>
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<tbody>
<tr>
<td>AAMA</td>
<td>Architectural Aluminum Manufacturer’s Association</td>
</tr>
<tr>
<td>AASHO</td>
<td>American Association of State Highway Officials</td>
</tr>
<tr>
<td>ACI</td>
<td>American Concrete Institute</td>
</tr>
<tr>
<td>AFBMA</td>
<td>Anti-Friction Bearing Manufacturer’s Association</td>
</tr>
<tr>
<td>AGA</td>
<td>American Gas Association</td>
</tr>
<tr>
<td>AGMA</td>
<td>American Gear Manufacturers Association</td>
</tr>
<tr>
<td>AISC</td>
<td>American Institute of Steel Construction</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute, Inc.</td>
</tr>
<tr>
<td>ASCE</td>
<td>American Society of Civil Engineers</td>
</tr>
<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>AWS</td>
<td>American Welding Society</td>
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<tr>
<td>AWWA</td>
<td>American Water Works Association</td>
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<tr>
<td>CALSPEC</td>
<td>Standard Specifications, State of California</td>
</tr>
<tr>
<td>CBC</td>
<td>California Building Code</td>
</tr>
<tr>
<td>CMC</td>
<td>California Mechanical Code</td>
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<tr>
<td>CPC</td>
<td>California Plumbing Code</td>
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<tr>
<td>CALTRANS</td>
<td>Department of Transportation</td>
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<td></td>
<td>State of California</td>
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<td></td>
<td>Business &amp; Transportation Agency</td>
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<tr>
<td>FEDSPEC</td>
<td>Federal Specifications</td>
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<tr>
<td></td>
<td>General Services Administration</td>
</tr>
<tr>
<td></td>
<td>Specification and Consumer Information</td>
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<td></td>
<td>Distribution Branch</td>
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<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers</td>
</tr>
<tr>
<td>ISA</td>
<td>Instrument Society of America</td>
</tr>
<tr>
<td>NEC</td>
<td>National Electrical Code</td>
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<tr>
<td>Abbreviation</td>
<td>Title</td>
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<tr>
<td>NEMA</td>
<td>National Electrical Manufacturer's Association</td>
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<tr>
<td>OSHA</td>
<td>Occupation Safety and Health Act</td>
</tr>
<tr>
<td></td>
<td>U.S. Department of Health</td>
</tr>
<tr>
<td></td>
<td>Occupational and Health Administration</td>
</tr>
<tr>
<td>SSPWC</td>
<td>Standard Specifications for Public Works Construction</td>
</tr>
<tr>
<td>U.L., Inc.</td>
<td>Underwriter's Laboratories, Inc.</td>
</tr>
</tbody>
</table>

1.02 Applicable Publications

A. Wherever references are made to published specifications, codes, standards, or other requirements, and where no date is specified, it shall be understood that the latest specifications, standards, or requirements of the respective issuing agencies published as of the date that the work is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**END OF SECTION**
SECTION 01201
PROJECT MEETINGS

PART 1 - GENERAL

1.01 General

1.02 Pre-construction Conference
A. Date, Time and Location: A Preconstruction Conference will be held after execution of the Contract and before construction is started at the site. The District’s Representative will fix the date, time and location of the meeting in accordance with requirements of the General Conditions.
B. The District’s Representative will prepare the agenda, preside at the meeting, and prepare and distribute a transcript of the proceedings to all parties.
C. The Contractor shall provide data required, contribute appropriate items for discussion, and be prepared to discuss all items on the agenda.
D. The Engineer and District shall respond to requests for information and provide construction administrative services as requested by the Construction Manager.
E. Required Attendance
   1. District's Representative.
   2. Contractor and Major Subcontractors Representatives.
   3. Engineer.
F. Agenda will include, but will not necessarily be limited to, the following:
   1. Designation of Responsible Personnel.
   2. Project Directory.
   3. Contractor’s Emergency Contact List.
   4. Subcontractors.
   5. Coordination with other Contractors.
   7. Project Schedule Constraints.
   9. Processing of Shop Drawings and Distribution of Submittals.
   10. Contractor’s List of Submittals.
   15. Processing and Schedule of Payments.
   16. Use of Premises.
   17. Location of the Contractor’s Temporary Facilities.

19. Security

20. Housekeeping.

21. Record Drawings.

22. Letter of Notice to Proceed.

23. Any Other Project Related Items.

1.03 Progress Meetings

A. Regular progress meetings will be held at the site.
   1. Meetings will be held weekly, or as agreed upon by the District’s Representative.
   2. Meetings to be held at field office or other mutually agreed location.
   3. Agenda and minutes to be prepared by the District’s Representative.
   4. Contractors shall provide a two-week look-ahead construction schedule every week.

B. Required Attendance
   1. District’s Representative.
   2. Contractor
   3. Major Subcontractors (as necessary).
   4. Engineer.
   5. District, if needed.

C. Agenda will include, but will not necessarily be limited to, the following:
   1. Work Progress
   2. Schedule
   3. Submittals
   4. RFIs
   5. Coordination with District
   6. Resolution of conflicts or problems
   7. Payment Requests
   8. Change Orders
   9. Safety
   10. Other items affecting progress of Work

1.04 Pre-Installation Meetings

A. Contractor will meet with manufacturers, suppliers and installers of major units of construction or equipment which require coordination between subcontractors and suppliers.

B. Contractor to identify Pre-Installation Meetings at the regular Progress Meetings.

C. Meeting topics include review conditions of installation; preparation, installation and/or application procedures; coordination with related work and others; and inspection requirements.

D. Attendance
1. Contractor  
2. Subcontractors and Installers  
3. Suppliers  
4. Manufacturers  
5. District and/or District’s Representative  
6. Engineer  

1.05 Facility Startup Meetings  
A. As many meetings as required in advance of partial or complete facility startup.  
B. First meeting to be held prior to submitting Commissioning or Startup Plan.  
C. Agenda will include, but will not necessarily be limited to, the following:  
   1. Preliminary discussion of startup plan.  
   2. Coordination needed between various attendees.  
   3. Potential problems associated with startup.  
D. Attendance  
   1. Contractor  
   2. Subcontractors  
   3. Suppliers  
   4. Manufacturers  
   5. District and/or District’s Representative  
   6. Engineer  

PART 2 - MATERIALS (NOT USED)  

PART 3 - EXECUTION (NOT USED)  

** END OF SECTION **
SECTION 01301
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 Summary
A. This Section defines the process whereby the Schedule of Values (lump sum price breakdown) shall be developed. Monthly progress payment amounts shall be determined from the monthly progress updates of the Schedule activities.

B. Related Sections

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
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<tbody>
<tr>
<td>Section 01025</td>
<td>Measurement and Payment</td>
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</table>

1.02 Submittals
A. Preliminary Schedule of Values

1. The Contractor shall submit a preliminary Schedule of Values for the major components of the work at the Preconstruction Conference. The listing shall include, at a minimum, the proposed value for the following major work components in accordance with the project’s Contract Documents:
   a. Mobilization.
   b. The total value of Instrumentation and Control work.
   c. The total value of electrical work.
   d. The total value of pipeline construction, including excavation, pipe installation, testing and backfill of pipe, restoration and all incidental work associated with underground pipe installations.
   e. The total value of the lift station work. This includes all equipment, and appurtenances not pre-purchased by the District.
   f. The total value of site civil work including clearing and grubbing, grading, erosion control and drainage work.
   g. The total value of all other work not specifically included in the above items.

2. The Contractor and District’s Representative shall meet and jointly review the preliminary Schedule of Values and make any adjustments in value allocations if, in the opinion of the District’s Representative, these are necessary to establish fair and reasonable allocation of values for the major work components.
   a. Front end loading will not be permitted.
   b. The District’s Representative may require reallocation of major work components from items in the above listing if, in the opinion of the District’s Representative, such reallocation is necessary.
   c. This review and any necessary revisions shall be completed within 15 days from the date of Notice to Proceed.

B. Detailed Schedule of Values
1. The Contractor shall prepare and submit a detailed Schedule of Values to the District’s Representative within 30 days from the date of Notice to Proceed.

2. The detailed Schedule of Values shall be based on the accepted preliminary Schedule of Values for major work components. Because the ultimate requirement is to develop a detailed Schedule of Values sufficient to determine appropriate monthly progress payment amounts, sufficient detailed breakdown shall be provided to meet this requirement.

3. The District's Representative shall be the sole judge of acceptable numbers, details and description of values established. If, in the opinion of the District’s Representative, a greater number of Schedule of Values items than proposed by the Contractor are necessary, the Contractor shall add the additional items so identified by the District's Representative.

4. The Contractor and District's Representative shall meet and jointly review the detailed Schedule of Values within 35 days from the date of Notice to Proceed.

5. The value allocations and extent of detail shall be reviewed to determine any necessary adjustments to the values and to determine if sufficient detail has been proposed. Any adjustments deemed necessary to the value allocation or level of detail shall be made by the Contractor and a revised detailed Schedule of Values shall be submitted within 40 days from the date of Notice to Proceed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**END OF SECTION**
PART 1 - GENERAL

1.01 General
A. The scheduling of the work under the Contract shall be performed in accordance with the requirements of this Section.
B. The development of the schedule, the cost loading of the schedule, monthly payment requisitions and project status reporting requirements of the Contract shall employ computerized Critical Path Method (CPM) or bar chart scheduling.

1.02 Definitions and Requirements
A. Critical Path Method (CPM): CPM, as required by this Section, shall be interpreted to be generally as outlined in the Association of General Contractors (AGC) publication, "The Use of CPM in Construction." except that either "i-j" arrow diagrams or precedence diagramming format may be utilized. In the case of conflicts between this specification and the AGC Document, this specification shall govern.
B. Construction Schedules: Construction schedules shall include a graphic network diagram and computerized construction schedule reports.
C. Networks: The CPM network shall be in a form of a time scaled "i-j" activity-on-arrow or precedence type diagram and may be divided into a number of separate sheets with suitable match lines relating the interface points among the sheets.
   1. Individual sheets shall not exceed 36-inch by 60-inch.
D. All construction activities and procurements shall be indicated in a time-scaled format and a calendar time line shall be shown along the entire sheet length.
   1. Each activity arrow or node shall be plotted so that the beginning and completion dates of each activity are accurately represented along the calendar time line.
   2. All activities shall be shown using the symbols that clearly distinguish between critical path activities, non-critical activities and free float for each non-critical activity.
   3. All activity items shall be identified by their respective Activity Number, Responsibility Code, Work Duration, and their Dollar Value.
   4. All non-critical path activities shall show their total float time in scale form by utilizing a dotted line or some other graphical means.
E. Duration Estimates: The duration estimate indicated for each activity shall be computed in calendar days and shall represent the single best estimate considering the scope of the activity work and resources planned for the activity. Except for certain non-labor activities, such as curing of concrete or delivery of materials, activity duration shall not exceed 10 calendar days nor be less than one calendar day unless otherwise accepted by the District's Representative.
F. Float Time: Float time shall be as follows:
   1. Definition: Unless otherwise provided herein, float as referenced in these documents, is total float. Total float is the period of time measured by the number of calendar days each non-critical path activity may be delayed before it and its succeeding activities become part of the critical path. If a non-critical path activity is delayed beyond its float period, that activity then...
becomes part of the critical path and controls the end date of the project. Thus, the delay of
the non-critical path activity beyond its float period will cause delay to the project itself.

2. Float Ownership: Neither the District nor the Contractor owns the float time. The project owns
the float time. As such, liability for delay of the project completion date rests with the party
actually causing delay to the project completion date. For example, if Party A uses some, but
not all of the float time and Party B later uses the remainder of the float time as well as
additional time beyond the float time, Party B shall be liable for the costs associated with the
time that represents a delay to the project's completion date. Party A would not be responsible
for any costs since it did not consume all of the float time and additional float time remained,
therefore, the project's completion date was unaffected.

1.03 Submittals
A. Submit schedules per requirements of Section 01340-Submittals.
B. Preliminary Schedule
   1. The Contractor shall submit a preliminary schedule document at the Preconstruction
      Conference, to identify the manner in which the Contractor intends to complete all work within
      the Contract Time.
C. Original Schedule
   1. The Contractor shall submit an original schedule document within 21 days following the
      Preconstruction Conference.
D. Revised or Updated Schedules
   1. Submit when required to reflect changes to original schedule.

1.04 Construction Schedule
A. The schedule shall indicate the major components of the project work and the sequence relations
   between major components and subdivisions of major components.
B. The schedule shall be cost loaded based on the schedule of values as approved by the District's
   Representative.
C. Sufficient detail shall be included for the identification of subdivisions of major components into
   such activities as:
   1. All work tasks requiring a partial or complete shutdown of existing facilities.
   2. Foundation subgrade preparation.
   3. Foundation concrete.
   5. Yard piping.
   7. Electrical.
   8. Instrumentation and control work.
   9. Site work.
   10. Other important work within the overall project scope.
D. Planned durations and start dates shall be indicated for each work item subdivision. Each major
   component and subdivision component shall be accurately plotted on time scale sheets not to
exceed 36-inch by 60-inch in size. Not more than one sheet shall be employed to represent this information.

1.05 Schedule Review
A. The District’s Representative and the Contractor shall meet to review and discuss the preliminary schedule within 14 days after it has been submitted to the District’s Representative.
1. The District’s Representative's review and comment on the schedules shall be limited to Contract conformance with the sequencing and milestone requirements as stated in other sections of the specifications.
2. The Contractor shall make corrections to the schedules necessary to comply with the Contract requirements and shall adjust the schedules to incorporate any missing information requested by the District’s Representative.

1.06 Acceptance
A. The acceptance of the Contractor's schedule by the District's Representative and District will be based solely upon the schedule's compliance with the Contract requirements.
B. By way of the Contractor assigning activity durations and proposing the sequence of the Work, the Contractor agrees to utilize sufficient and necessary management and other resources to perform the work in accordance with the schedule.
C. Upon submittal of a schedule update, the updated schedule shall be considered the "current" project schedule.
D. Submission of the Contractor's progress schedule to the District or District's Representative shall not relieve the Contractor of the Contractor's total responsibility for scheduling, sequencing, and pursuing the Work to comply with the requirements of the Contract Documents, including adverse effects such as delays resulting from ill-timed work.

1.07 Monthly Updates and Periodic Schedule Submittals
A. Following the acceptance of the Contractor's Original Construction Schedule, the Contractor shall monitor the progress of the Work and adjust the schedule each month to reflect actual progress and any changes in planned future activities.
1. Each schedule update submitted must be complete including all information requested in the original schedule submittal.
2. Each update shall continue to show all work activities including those already completed.
3. These completed activities shall accurately reflect the "as built" information by indicating when the work was actually started and completed.
B. Neither the submission nor the updating of the Contractor's original schedule submittal nor the submission, updating, change or revision of any other report, curve, schedule or narrative submitted to the District's Representative by the Contractor under this Contract, nor the District's Representative's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying, in any way, the Contract completion date or milestone dates or of modifying or limiting, in any way, the Contractor's obligations under this Contract. Only a signed, fully executed change order can modify these contractual obligations.
C. The monthly schedule update submittal will be reviewed with the Contractor during a construction progress meeting held on a month end date to be determined. The goal of these meetings is to enable the Contractor and the District's Representative to initiate appropriate remedial action to minimize any known or unforeseen delay in completion of the Work and to determine the amount of Work completed since the last month's schedule update.
1. The status of the Work will be determined by the percent complete of each activity shown in the Schedule of Values.

2. These meetings are considered a critical component of the overall monthly schedule update submittal and the Contractor shall have appropriate personnel attend.

3. As a minimum, these meetings shall be attended by the Contractor's Project Manager and General Superintendent.

4. Within seven (7) calendar days after the progress meeting, the Contractor shall submit the revised schedule.

5. Within five (5) calendar days of receipt of the above noted revised submittals, the District's Representative will either accept or reject the monthly schedule update submittal.

6. If accepted, the percent complete shown in the monthly update will be the basis for the Application for Payment to be submitted by the Contractor.

7. If rejected, the update shall be corrected and resubmitted by the Contractor before the Application for Payment for the update period can be processed.

D. Schedule Revisions: The Contractor shall highlight or otherwise identify all changes from the previous schedule. The Contractor shall modify any portions of the schedule which become infeasible because of activities behind schedule or for any other valid reason.

1.08 Change Orders

A. Upon approval of a change order, or upon receipt by the Contractor of authorization to proceed with additional work, the change shall be reflected in the next submittal of the schedule by the Contractor.

B. The Contractor shall utilize a sub-network in the schedule depicting the changed work and its effect on other activities.

C. This sub-network shall be tied to the main network with the appropriate logic so that a true analysis of the Critical Path can be made.

1.09 Project Status Reporting

A. In addition to the submittal requirements for the scheduling identified in this Section, the Contractor shall provide monthly project status reports.

B. The Contractor shall prepare monthly written narrative reports of the status of the project for submission to the District's Representative. Written status reports shall include:

1. The status of major project components (Percent Complete, amount of time ahead or behind schedule) and an explanation of how the project will be brought back on schedule if delays have occurred.

2. The progress made on critical activities indicated on the schedule.

3. Explanations for any lack of work on critical path activities planned to be performed during the last month.

4. Explanations for any schedule changes, including changes to the logic or to activity durations.

5. A list of the critical activities scheduled to be performed in the next two month period.

6. The status of major material and equipment procurement.

7. The value of materials and equipment properly stored at the site, but not yet incorporated into the work-in-place.

8. Any delays encountered during the reporting period.

C. The Contractor may include any other information pertinent to the status of the project. The Contractor shall include additional status information requested by the District's Representative.

1.10 Inclement Weather Provisions of the Schedule

A. The Contractor's construction schedule shall include lost days on the CPM schedule's critical path due to inclement weather. No extension of time will be granted for Work delays due to normal rainfall.

B. Should inclement weather conditions or the conditions resulting from weather prevent the Contractor from proceeding with seventy-five (75) percent of the normal labor and equipment force engaged in the current critical activity item for a period of at least five (5) hours per day toward completion of such operation or operations, and the crew is dismissed as a result thereof, it shall be a weather delay day. No extension of time will be granted for Work delays due to normal rainfall.

C. Normal rainfall is defined as the normal number of rainfall days in a given month and average monthly rainfall totals, based on National Weather Service precipitation records as specified below. A rainfall day is defined as each day (midnight to midnight) of measurable rainfall (greater than 0.10-inches of rainfall) as reported by the National Weather Service in Sacramento, CA.

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Rainfall Days</th>
<th>Total Rainfall (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>11</td>
<td>4.2</td>
</tr>
<tr>
<td>February</td>
<td>9</td>
<td>3.8</td>
</tr>
<tr>
<td>March</td>
<td>10</td>
<td>3.2</td>
</tr>
<tr>
<td>April</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td>May</td>
<td>3</td>
<td>0.6</td>
</tr>
<tr>
<td>June</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>July</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>August</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>September</td>
<td>2</td>
<td>0.4</td>
</tr>
<tr>
<td>October</td>
<td>4</td>
<td>1.0</td>
</tr>
<tr>
<td>November</td>
<td>8</td>
<td>2.6</td>
</tr>
<tr>
<td>December</td>
<td>9</td>
<td>2.8</td>
</tr>
</tbody>
</table>

D. A time extension will be granted for significantly higher than average rainfall and for rainfall days in excess of the normal number of rainfall days in a given month, as listed above, for each day for which Contractor can demonstrate that climatic conditions impacted Work on the critical path of the then currently accepted Construction Progress Schedule. Engineer will examine the information provided by Contractor and determine the number of days of Contract time extension to be allowed due to weather conditions more severe than normal. Engineer may reduce the time extension to reflect time savings to critical path activities due to less than normal rainfall during other months. No time extension for climatic conditions will be granted if the abnormal conditions did not delay critical path activities or if delays due to abnormal weather conditions are concurrent with delays within the control of Contractor.
PART 2 - EXECUTION (NOT USED)

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. Section Includes:
   1. Description of general requirements for Submittals for the Work.

1.02 Submittals
A. Where required by the Specifications, the Contractor shall submit descriptive information which will enable the Engineer to advise the District whether the Contractor's proposed materials, equipment or methods of work are in general conformance with the design concept and are in compliance with the drawings and specifications and District specifications. The information to be submitted shall consist of drawings, specifications, descriptive data, certificates, samples, test results and other such information, all as specifically required in the Specifications.

B. The Contractor shall submit the following items:
   1. Schedule of Submittals and Shop Drawings
   2. List of Submittals, Shop Drawings, Product Data and Materials
   3. Contractor's Safety Program
   4. Designated Safety Supervisor
   5. Designated “Competent Person(s)”
   6. Schedule of Values
   7. Construction Schedule
   8. Substitutions List
   9. Shop Drawings
   10. Product Data
   11. Samples
   12. Material Safety Data Sheets
   13. Operation and Maintenance Manuals
   14. Project Closeout Information
   15. Warranty Data
   16. Others as Specified in the Technical Specifications
   17. Manufacturer’s Instructions
   18. Manufacturer’s Certifications and Test Reports

C. Quantity of Submittals:
   1. Submit one (1) digital, PDF format of all approved submittals.
      a. PDF submittal shall be clear and readable.
      b. PDF submittal shall be searchable (not scanned or copied).
c. Annotate or mark submittal to clearly highlight the item or model being submitted.

d. Submittal shall have a Cover Letter
   1) Cover Letter shall detail all relevant information included within the submittal package and describes the applicability of the submitted documentation.
   2) Cover letter shall note all product substitutions and summarize all proposed products or materials not consistent with the project documents.

e. Submittals shall have a detailed table of contents

2. For submittals that require paper copies or samples to be submitted for review:
   a. Provide Three (3) copies. Scanned hardcopy markups will be returned to the Contractor along with a standard submittal review sheet.
      1) Two (2) hard copies/samples shall go to the Engineer
      2) One (1) hard copy/sample shall go to the District.

D. Where the Contractor is required by these Specifications to submit samples of products, the Contractor shall provide a sufficient number of physical samples to allow three (3) to be retained by the District's Representative of all structural and architectural products involving color, finish, texture, or the like.

E. List of Submittals:
   1. Within thirty (7) days after the Notice to Proceed, the Contractor shall submit a preliminary List of Submittals to the District's Representative for review.
   2. The List shall include all items of equipment and materials for mechanical, piping, architecture, electrical, heating and ventilating, equipment piping, and plumbing work; and the names of manufacturers with whom purchase orders have been or will be placed.
   3. The List shall be arranged in the same order as the Specifications, and shall contain sufficient data to identify all items of material and equipment the Contractor proposes to furnish. The List shall include Specification and/or Drawing references.
   4. After the submission is favorably reviewed and returned to the Contractor by the District’s Representative, 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 as set forth in the Specifications. The approved list reviewed by the District’s Representative and Engineer shall not constrain or restrict the number of submittals requested by the Engineer from the Contractor. The Contractor must submit all construction related materials to the Engineer for review and approval prior to installation or mobilization. If the Contractor fails to submit on any individual item specific to any portion of the Construction project, the Engineer has every right to stop construction and require the Contractor to resubmit the proper documentation or re-perform the Activity based upon the Approved submittal documentation.
   5. At the close of the project, all approved submittals shall be compiled in searchable PDF form and submitted to the District, separate from the required O&M manual submittal.

F. The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall ensure that the material, equipment or method of work shall be as described in the submittal.
   1. Submittals shall contain all required information, including satisfactory identification of items, units and assemblies in relation to the contract drawings and specifications.
2. The Contractor shall verify that the material and equipment described in each submittal conforms to the requirements of the specifications and drawings.

3. Unless otherwise approved by the Engineer, submittals shall be made only by the Contractor, who shall indicate by a signed stamp on the submittals that the Contractor has checked the submittals and that the work shown conforms to contract requirements and has been checked for dimensions and relationship with work of all other trades involved.

4. If the information shows deviations from the specifications or drawings, the Contractor, by statement in writing accompanying the information, shall identify the deviations and state the reason(s) therefore.

5. The Contractor shall ensure that there is no conflict with other submittals and shall notify the Engineer in each case where the Contractor’s submittal may affect the work of another contractor or the District.

6. The Contractor shall ensure coordination of submittals among the related crafts and subcontractors.

1.03 Submittal Transmittal Procedure

A. General: Submittals regarding material and equipment shall be accompanied by a transmittal form from the Contractor. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete specification sections for which a submittal is required. However, submittals for various items shall be made with a single form only when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.

B. Submittal Identification: Each set of submittals or samples shall be attached to the submittal transmittal form.

1. The submittal number shall be made up of two parts: XXX-ZZ. The XXX shall be sequential number 001 for the first item submitted, 002 for the second, etc. The ZZ shall be the sequential number of a specific submittal or resubmittal (01 for the first submittal, 02 for the first resubmittal, etc.).

2. All submittals shall show the contract title, shall indicate the name of the vendor, and shall indicate when the equipment and/or material will be required by the construction schedule.

3. The submittal must be adequate to permit a comprehensive review without further reference to the Contractor. The documents submitted must be separately identifiable on the Contractor's submittal transmittal form.

C. Deviation from Contract: If the Contractor proposes to provide material or equipment which does not conform to the specifications and drawings, this shall be indicated under "deviations" on the submittal transmittal form accompanying the submittal copies.

1. If the District accepts such deviation, the District shall issue an appropriate Contract Change Order, except that, if the deviation is minor, or does not involve a change in price or in time of performance, a Change Order need not be issued.

2. If any deviations from the Contract requirements are not noted on the submittal, the review of the shop drawing shall not constitute acceptance of such deviations.

D. Submittal Completeness: Submittals which do not have all the information required to be submitted, including deviations, shall be considered as not complying with the intent of the contract and are not acceptable and will be returned without review.

1. A complete submittal shall contain sufficient data to demonstrate that the items comply with the Specifications, shall meet the minimum requirements for submissions cited in the technical
specifications, shall include materials and equipment data and seismic anchorage certifications where required, and shall include any necessary revisions required for equipment other than first named.

E. Review of Subsequent Resubmittals: It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the District’s Representative at least by the second submission of data. At the discretion of the District, costs associated with the review of any subsequent resubmittals may be borne by the Contractor. The Contractor will be billed for these costs by the District. Costs due may be deducted from progress payments due the Contractor by the District.

1.04 Submittal Review

A. Within 14 calendar days after receipt of the submittal by the Engineer, the submittal will be reviewed by the Engineer and the Engineer will return the marked-up submittal. On complex or critical drawings and equipment, the Engineer shall acknowledge receipt within 7 days and advise the Contractor when the submittal will be returned. The returned submittal shall indicate one of the following actions.

1. If the review indicates that the material, equipment or work method is in general conformance with the design concept and complies with the drawings and specifications, submittal copies will be marked "NO EXCEPTIONS TAKEN". In this event, the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.

2. If the review indicates limited corrections are required, copies will be marked "MAKE CORRECTIONS NOTED". The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in operation and maintenance data, a corrected copy shall be provided. Otherwise, no resubmittal will be required.

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

4. If the review indicates that the material, equipment or work method is not in general conformance with the design concept or in compliance with the drawings and specifications, copies of the submittal will be marked "REJECTED - SEE REMARKS". Submittal with deviations which have not been identified clearly may be rejected. The Contractor shall not undertake work covered by such submittal until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".

5. If the review has identified comments that pertain to a separate item or has general comments not subject to the project conformance, various comments within the Submittal review process can be marked "OTHER," requiring either no further action or action specific to a separate topic.

B. Review of drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide shall not relieve the Contractor of responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Engineer, the District’s Representative or the District, or by any officer, employee or subcontractor thereof, and the Contractor shall have no claim under the contract on account of the failure or partial failure of the method of work, material, or equipment so reviewed.

1. A mark of "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" shall mean that the Engineer or District has no objection to the Contractor, upon its own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.
2. Favorable review of submittals does not constitute a change order to the Contract requirements.

3. The favorable review of all submittals by the Engineer shall apply in general design only and shall in no way relieve the Contractor from responsibility for errors or omissions contained therein.

4. Favorable review by the Engineer shall not relieve the Contractor of its obligation to meet safety requirements and all other requirements of laws, nor constitute a Contract Change Order.

5. Favorable review by the Engineer will not constitute acceptance by the Engineer of any responsibility for the accuracy, coordination, and completeness of the submittals or the items of equipment represented on the submittals.

6. The favorable review of shop drawings shall be obtained prior to the fabrication, delivery and construction of items requiring shop drawing submittal.

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. Contractor shall supply Operations and Maintenance (O&M) Manuals for equipment as specified in other parts of the Project Documents for future use by the District or governing public agency.

1.02 Description
A. The Contractor shall provide one (1) sets of operating and maintenance instructions for all equipment and devices furnished under this contract and one (1) pdf set. The operating and maintenance material supplied shall be original printed copies of manufacturer's brochures and/or manuals. Photocopied material will not be acceptable. Operating and maintenance instructions for each item of equipment and each equipment assembly shall consist of:

1. Names and addresses of manufacturer, nearest representative of manufacturer, and nearest supplier of manufacturer's equipment and parts

2. For equipment requiring lubrication, the manufacturer's recommended lubricants and lubrication schedule.

3. For equipment containing integral electrical controls, diagrams showing internal and connection wiring.

4. Specified operating and maintenance information. This information shall include, but not necessarily be limited to, the following items:
   a. Equipment data: The Contractor shall provide a good quality photocopy of the Equipment Maintenance Summary sheets for review and shall make corrections to the originals as noted in the submittal review comments.
   b. Start-up procedures: These instructions shall include equipment manufacturer's recommendations regarding installation, adjustment, calibration and trouble-shooting.
   c. Operating procedures: These instructions shall include the equipment manufacturer's recommended step-by-step procedures for starting, operating and stopping the equipment under all modes of operation.
   d. Preventive maintenance procedures: These instructions shall include the equipment manufacturer's recommendations regarding the steps and schedules to be followed in maintaining the equipment.
   e. Parts list: This list shall include generic title and identification number of each component part of the equipment.
   f. Exploded views: These shall be provided where appropriate.
   g. Spare parts list: This list shall include the manufacturer's recommendations of number of parts that should be stored by the District.
   h. Overhaul instructions: These instructions shall consist of the manufacturer's directions for the disassembly, repair and reassembly of the equipment.

1.03 Submittal Procedure
A. Required submittals:
1. Initial Submittal: One (1) copy of O & M Manual shall be submitted for approval. Initial O&M submittal may be hard copy or PDF format.

2. Intermediate Submittal: One (1) copy of revised O & M Manual shall be submitted for approval. Intermediate O&M may be hard copy or PDF format.

3. Final Submittal: Once approved, submit four (4) paper copies and one (1) PDF.

4. The submitted O&M Manuals shall have a separate submittal numbering system from the general equipment and material submittals required to confirm conformance with the design specifications.

B. PDF Format shall be manufacturer's data converted directly to PDF. Scanned PDF information is not acceptable unless approved by the District's Representative.

1. PDF documents shall be bookmarked, indexed and all text shall be in a searchable format.

C. For ease of identification, each manufacturer's brochure and manual shall be appropriately labeled with the equipment name, equipment number and specification number, as it appears in the contract documents.

D. The information shall be organized in binders in numerical order by the specification section numbers assigned in the contract documents. The binders shall be provided with a table of contents and tab sheets to permit easy location of desired information. Each numerical section shall contain a complete itemized data list with equipment name and equipment number for the information contained in that section. Binders shall be three-ring with clear vinyl pockets on the front and spine. The binder title shall be clearly visible on the spine and the front cover.

E. The following procedures shall be used:

1. Contractor shall include in each O&M submittal a good quality photocopy of associated Equipment Maintenance Summary sheets, for each specification section for review.

2. Submittals will be returned with a review sheet and comments.

3. Contractor shall resubmit, if requested by the District's Representative, and retain all copies of approved submittals until all sections have been approved.

4. When all sections have been approved, Contractor shall organize and bind the manuals for all the sections of the contract specifications according to the above instructions and submit one complete set of O&M Manuals for final review. Contractor shall submit separately and unbound the completed original Equipment Maintenance Summary sheets.

5. Final review will be for the organization and binding of a complete set of manuals as specified and will not include review of previously approved material.

6. When the complete set is approved, the Contractor shall submit four (4) complete sets to the District's Representative as approved and specified.

F. If the manufacturer's standard brochures and manuals are used to describe operating and maintenance procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project.

1. Clearly mark or annotate the actual model supplied for the project.

2. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated.

1.04 Field Changes

A. Following the acceptable installation and operation of an equipment item, the item's operating and maintenance instructions, including drawings, shall be modified and supplemented by the Contractor to reflect any as-built conditions, field changes or information required by field conditions.
1.05 Payment

A. Acceptable operating and maintenance information must be delivered to the District’s Representative before the Contractor can be paid for more than 80 percent of the purchase value of that equipment and prior to installation of the equipment. Purchase value shall be the net price for the equipment as given on the paid invoice. Acceptable operating and maintenance information for the project must be delivered to the District’s Representative prior to the project being 75 percent complete. Progress payments for work in excess of 75 percent completion will not be made until the specific acceptable operating and maintenance information has been delivered to the District’s Representative.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. The Contractor shall provide all temporary facilities and utilities required for prosecution of the work, protection of employees and the public, protection of the work from damage by fire, weather or vandalism, and such other facilities as may be specified or required by any legally applicable law, ordinance, rule, or regulation.

B. The Contractor shall keep the work site clean and free from rubbish and debris. Materials and equipment shall be removed from the site when they are no longer necessary on a daily basis as directed by the District's Representative. All cables, slings and other materials used to set the pipe and equipment shall be removed from the project site. Upon completion of the work and before final acceptance, the work site shall be cleared of equipment, unused materials, and rubbish to present a clean and neat appearance.

1.02 Temporary Facilities
A. Electrical Service
   1. The Contractor shall provide, at its own cost, all electric power required for construction, testing, general and security lighting, and all other purposes whether supplied through temporary or permanent facilities.

B. Water
   1. The Contractor shall pay for and shall construct all facilities necessary to furnish water for its use during construction.
   2. Water used for human consumption shall be kept free from contamination and shall conform to the requirements of the State and local authorities for potable water.
   3. The Contractor shall pay for all water used for the Contractor's operations prior to final acceptance.

C. Heating and Ventilation
   1. The Contractor shall provide means for heating and ventilating all work areas as may be required to protect the Work from damage by freezing, high temperatures, weather, or to provide a safe environment for workers.
   2. Unvented direct fired heaters shall not be used in areas where freshly placed concrete will be exposed to the combustion gases until at least two hours after the concrete has attained its initial set.

D. Sanitary Conveniences
   1. The Contractor shall provide suitable and adequate sanitary conveniences for the use of all persons at the site of the Work.
   2. Such conveniences shall include chemical toilets or water closets and shall be located at appropriate locations at the site of the Work.
   3. All sanitary conveniences shall conform to the regulations of the public authority having jurisdiction over such matters.
4. At the completion of the Work, all such sanitary conveniences shall be removed and the site left in a clean and sanitary condition.

E. Telephone
1. The Contractor shall arrange, at its own cost, with the local utility to provide adequate temporary telephone service for its use during construction.
2. Contractor shall pay for all telephone services required for its own use.

1.03 Construction Facilities
A. Parking and Laydown/Staging Area
1. All stockpiled materials and parked equipment at the job site shall be located to avoid interference with private property and to prevent hazards to the public.
2. Onsite locations of stockpiles, parking areas, and equipment storage must be approved by the District's Representative.
3. Contractor shall utilize the area indicated on the Drawings for storage of all construction materials, and no other area at or adjacent to the site. This area shall be fenced and locked by Contractor for security purposes. Contractor shall construct an “all weather” staging area as noted on the drawings. Muddy conditions within the staging area, or between the staging area and the site, will not be cause for weather delay claims.
4. Contractor shall provide and maintain suitable parking areas for the use of all construction 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, District’s operations, or construction activities.

B. Construction hoists, elevators, scaffolds, stages, shoring, and similar temporary facilities shall be of ample size and capacity to adequately support and move the loads to which they will be subjected. Railings, enclosures, safety devices, and controls required by law or for adequate protection of life and property shall be provided.

C. Staging and Falsework
1. Temporary supports shall be designed by a professional registered engineer with an adequate safety factor to assure adequate load bearing capability. If requested by the District's Representative, the Contractor shall submit design calculations for staging and shoring prior to application of loads.
2. Excavation support and shoring shall be in accordance with applicable codes and regulations.

D. Temporary Enclosures
1. When sandblasting, spray painting, spraying of insulation, or other activities inconveniencing or dangerous to property or the health of employees or the public are in progress, the area of activity shall be enclosed adequately to contain the dust, over-spray, or other hazard.
2. In the event there are no permanent enclosures of the area, or such enclosures are incomplete or inadequate, the Contractor shall provide suitable temporary enclosures.

E. Warning Devices and Barricades
1. The Contractor shall adequately identify and guard all hazardous areas and conditions by visual warning devices and, where necessary, physical barriers.
2. Such devices shall, as a minimum, conform to the requirements of Cal/OSHA.
1.04 Protection and Restoration of Existing Improvements

A. The Contractor shall be responsible for the protection of public and private property at and adjacent to the Work and shall exercise due caution to avoid damage to such property.

B. The Contractor shall repair or replace all existing improvements which are not designated for removal (e.g., curbs, sidewalks, survey points, fences, walls, signs, utility installations, pavements, structures, etc.) and are damaged or removed as a result of its operations. Repairs and replacements shall be at least equal to existing improvements and shall match them in finish and dimension.

C. Trees, lawns, and shrubbery that are not to be removed shall be protected from damage or injury. If damaged or removed because of the Contractor's operations, they shall be restored or replaced in as nearly the original conditions and location as is reasonably possible. Lawns shall be reseeded and covered with suitable mulch.

D. The Contractor shall give reasonable notice to occupants or Districts of adjacent property to permit them to salvage or relocate plants, trees, fences, sprinklers, and other improvements within the right-of-way which are designated for removal or would be destroyed because of the Work.

1.05 Construction Access

A. Access roads shall be maintained to all storage areas and other areas to which frequent access is required. Similar roads shall be maintained to all existing facilities on the site of the Work to provide access for delivery of material and for maintenance and operation. Where such temporary roads cross buried utilities that might be injured by the loads likely to be imposed, such utilities shall be adequately protected by steel plates or wood planking, or bridges shall be provided so that no loads shall discharge on such buried utilities.

B. Contractor shall at all times limit access to the Site to necessary personnel only. All personnel associated with construction of the Project shall enter the site at the location indicated on the Drawings. Access for construction personnel shall be limited to working hours. All mail and deliveries (Federal Express, equipment, etc.) shall be sent to a separate address, specifically arranged by Contractor for the Project.

1.06 Air Pollution and Dust Control

A. The Contractor at its expense shall take whatever steps, procedures, or means as are required to prevent abnormal dust conditions being caused by its operations in connection with the execution of the Work; and on any unpaved road which the Contractor or any of its subcontractors are using, excavation or fill areas, demolition operations, or other activities.

1. Control shall be by sprinkling, use of dust palliatives, modification of operations, or any other means acceptable to agencies having jurisdiction.

2. Haul routes shall be kept visibly wet during excavation and hauling operations.

3. Exposed stockpiles of soil and other backfill material shall be enclosed, have silt fencing, be covered, be watered regularly or have soil binders added to minimize erosion.

4. Dust-producing activities shall be suspended when high winds create construction-induced visible dust plumes moving beyond the project site, in spite of dust control measures.

B. Unless the construction dictates otherwise, and unless otherwise approved by the District's Representative, the Contractor shall furnish and operate a self-loading motor sweeper with spray nozzle at least once each working day to keep paved areas acceptably clean whenever construction, including restoration, is incomplete.

1. If visible soil material is carried onto adjacent public streets, such streets shall be swept with water sweepers.
1.07 Noise Abatement
A. Operations at the Worksite shall be performed so as to minimize unnecessary noise.
B. Special measures shall be taken to suppress noise during night hours.
C. Noise levels due to construction activity shall not exceed the levels specified by local ordinance.
D. Internal combustion engines used on the Work shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated without said muffler.

1.08 Drainage Control
A. Particular care shall be taken not to direct drainage water onto private property. Drainage water shall not be diverted to streets or drainage ways inadequate for the increased flow.
B. Drainage means shall be provided to protect the Work and adjacent facilities from damage due to water from the site or due to altered drainage patterns from construction operations.

1.09 Sediment and Erosion Control.
A. To reduce potential water-borne erosion impacts, the Contractor shall provide a sediment and erosion control plan prior to construction and incorporate the following best management practices into the project:
1. Erosion control measures to reduce post-construction erosion, such as installation of appropriate slope protection.
2. Provide and maintain all necessary erosion and sediment control measures throughout the construction period as required to minimize stormwater pollution control from the Contractor's work area. Erosion and sediment control measures may include, but are not limited to, straw bale dikes, sand bag dikes, silt fences, drainage swales, pipe drains, sediment traps, protective sheets, jute matting, hydro-seeding, and appropriate surface contouring. The Contractor shall notify the District’s Representative if erosion and sediment control measures do not operate properly and shall take all necessary protective action.
3. The Contractor shall secure erosion control devices at the end of each work shift during the period from November 1 to April 30, or when rain is forecast prior to the next work day.
4. Grading activities shall be prohibited during the period when rain is falling and runoff is observed at the site. The Contractor shall immediately secure the site for erosion control and storm water runoff.
5. Prepare drainage ways that handle concentrated or increased runoff from disturbed areas by using riprap or other lining materials to control erosion.
6. Reduce erosion by limiting the area and time of exposure, and by the provision of diversion channels.
7. Use temporary plant cover, mulching, and/or structures to control runoff and protect areas subject to erosion during construction.
8. Minimize soil exposure during the rainy season by proper timing of grading and construction and be prepared to shut down all earthwork if heavy precipitation occurs.
9. Have erosion control equipment and materials on site if needed in an emergency to quickly construct temporary collectors, diversion channels, intercept drains, berms, dikes or filters.
10. Grading and permits and the appropriate environmental clearances shall be obtained by the Contractor prior to any export of materials off site.
1.10 Construction Cleaning
A. The Contractor shall, at all times, keep property on which work is in progress and the adjacent property free from accumulations of waste material or rubbish caused by employees or by the Work. All surplus material shall be removed from the site immediately after completion of the work causing the surplus materials. Upon completion of the construction, the Contractor shall remove all temporary structures, rubbish, and waste materials resulting from its operations.

1.11 Disposal of Material
A. The Contractor shall make arrangements for disposing of materials outside the Site and the Contractor shall pay all costs involved.
   1. The Contractor shall first obtain permission from the property District on whose property the disposal is to be made and absolve the District from any and all responsibility in connection with the disposal of material on said property.
   2. When material is disposed of as above provided, the Contractor shall conform to all required codes pertaining to grading, hauling, and filling of earth.

1.12 Traffic Regulation
A. General
   1. The Contractor shall be responsible for maintenance of public safety and traffic control.
   2. The Contractor shall take all necessary steps to minimize inconvenience to the general public throughout all work under this Contract.
      a. No driveways or private roads shall be blocked without notifying the property District and access must be restored during all non-working hours.
      b. Safe access must be maintained for pedestrian traffic throughout the work area at all times.
   3. At least one lane of traffic in each direction must be kept open at all times unless prior approval is provided by the District and any affected agency.
   4. No roads shall be blocked or made inaccessible, due to the Contractor's work, without prior written approval of the District and the affected agencies.
   5. The Contractor shall not block or obstruct fire lanes at any time.

B. Haul Routes
   1. Prior to the pre-construction conference, the Contractor shall submit for approval the proposed route(s) for all construction traffic on the project. This shall include any designated routes, if any, shown on the Contract Drawings. Upon approval, the Contractor shall strictly adhere to that route(s) only, unless written permission is obtained to change the route(s).

C. Traffic Control
   1. Traffic control shall be in accordance with the California Department of Transportation Traffic Manual. The Contractor shall submit for approval, by the District and any other applicable agency, its traffic control plans prior to work on public streets.
   2. Traffic control shall include signs, warning lights, reflectors, barriers, and other necessary safety devices and measures, including sufficient flaggers to direct vehicular traffic through the construction areas.
   3. No material or equipment shall be stored/parked where it will interfere with the free and safe passage of public traffic, and at the end of each day's work, and at other times when
construction operations are suspended for any reason, the Contractor shall remove all equipment and other obstructions from the public right-of-way.

4. Should the Contractor appear to be negligent in furnishing warning and protective measures, as above provided, the District’s Representative may direct attention to the existence of a hazard, and the necessary warning and protective measures shall be furnished and installed by the Contractor at its expense.

1.13 Cultural Resources Protection
A. If historical, archeological or paleontological artifacts are discovered, all work must stop in the immediate vicinity. The Contractor shall protect the discovered items, immediately notify County of Placer at (530) 889-7878, and comply with applicable law.

B. If human remains are discovered, all work must stop in the immediate vicinity of the find, and the County Coroner must be notified, according to Section 5097.98 of the State Public Resources Code and Section 7050.5 of California’s Health and Safety Code.

C. If the remains are determined to be Native American, the coroner will notify the Native American Heritage Commission, and the procedures outlined in CEQA Section 15064.5(d) and (e) shall be followed.

1.14 Project Sign
A. None

1.15 Project Office
A. None

1.16 District’s Representative’s Office
A. None

1.17 Hydrant Meters
A. The Contractor may purchase water from the water treatment plant site by obtaining the necessary permits and taking water from the nearest available hydrant. The Contractor shall post a deposit for the meter and pay for all the water taken in accordance with the District’s standard provisions and rates.

**END OF SECTION**
PART 1 - GENERAL

1.01 General

A. The Contractor shall safely guard all work, materials, equipment and property from loss, theft, damage and vandalism. Contractor’s duty to safely guard property shall include the District’s property and other private property from injury or loss in connection with the performance of the Contract.

B. The Contractor may make no claim against the District for damage resulting from trespass.

C. The party responsible for security shall make good all damage to property of District and others arising from failure to provide adequate security.

D. Security measures taken by the Contractor shall be at least equal to those usually provided by the District to protect the existing facilities during normal operation.

E. A security program shall be maintained throughout construction until final acceptance and occupancy precludes need for Contractor’s security program.

F. Fire Extinguishers

1. Sufficient number of fire extinguishers of the type and capacity required to protect the Work and ancillary facilities, shall be provided and maintained in readily accessible locations.

1.02 Contractor’s Access to the Site

A. Access to the project site for Contractor’s employees, material, tools, and equipment shall be via roads designated by the District’s Representative and as shown on the Drawings.

B. The Contractor shall ensure that each of its employees, representatives, material men, suppliers and others acting for the Contractor shall be subject to the following:

1. No Contractor employee’s personal vehicle shall be allowed to park anywhere other than the Contractor Employee’s Parking Area.

2. The Area shall be designated by the District’s Representative.

3. The Contractor shall prepare and maintain this area as required.

C. The Contractor shall obtain and follow all security measures and procedures as outlined by the District and Police Departments.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**END OF SECTION**
SECTION 01600
MATERIAL AND EQUIPMENT SUBSTITUTION

PART 1 - GENERAL

1.01 Section Includes
A. Procedures for substitution of material and equipment from named products specified elsewhere in these specifications.

1.02 Submittals
A. Submit information described in Part 2 of this specification.

PART 2 - PRODUCTS

2.01 Material and Equipment Substitutions
A. In preparing these Specifications, the Engineer has named those products which to its knowledge meet the Specifications and are equivalent in construction, functional efficiency, and durability.

B. Wherever catalog numbers and specific brands or trade names preceded by "similar and equal" or followed by the designation "or equal" are used in conjunction with a designated material, product, thing, installation, or service mentioned in these Specifications, they are used to establish the standards of quality and utility required.

C. The first-named manufacturer is the basis for the project design and the use of alternative-named or unnamed manufacturer's products proposed by the Contractor may require modifications in the project design and construction. Where only one product has been named by brand, it is the only brand, trade name, or manufactured product known to the Engineer that meets these Specifications.

D. Wherever catalog numbers and specific brands or trade names not preceded by designation "similar and equal" nor followed by the designation "or equal", are used in conjunction with a designated material, product, thing, installation, or service mentioned in these Specifications, to ensure compatibility with existing facilities, no substitutions will be favorably reviewed.

2.02 Substitutions
A. Substitutions which are equal in quality and utility to those specified will be permitted, subject to the following provisions.

1. For this purpose, the Contractor shall submit to the District's Representative, no later than thirty five (35) days after the Notice of Award, a typewritten list containing a description of each proposed substitute item or material.

2. Sufficient data, drawings, samples, literature, calculations, or other detailed information as will demonstrate to the Engineer that the proposed substitute is equal in quality and utility to the material specified shall be appended to this list.

3. The Engineer will favorably review in writing such proposed substitutions as are, in its opinion, equal in quality to the items or materials specified.

B. Failure of the Contractor to submit proposed substitutions for review in the manner described above and within the time prescribed shall be sufficient cause for rejection by the District's Representative of any substitutions otherwise proposed.
2.03 Modifications and Costs

A. If alternative named or substitutions are proposed by the Contractor and favorably reviewed by the Engineer, the Contractor is responsible for providing, at no additional cost to the District, any electrical, mechanical, structural, or other related changes or testing that may be required to accommodate or provide the particular material or equipment the Contractor desires to use.

B. Any deviation from the Specifications or the Drawings resulting from the type of material or equipment to be used shall not be the basis for any "extra charges" above and in excess of the original bid price of the work.

C. In addition, the Contractor is responsible for all additional costs to the District, and its agents and representatives, for evaluation of data submitted by the Contractor for alternative named or substitutions and any redesign necessary. The District shall deduct said costs from the Contract monies due the Contractor.

PART 3 - EXECUTION (NOT USED)

**END OF SECTION**
SECTION 01605
SHIPMENT, PROTECTION AND STORAGE

PART 1 - GENERAL

1.01 General
A. Materials and equipment shall be shipped, handled, stored, and installed by methods that will prevent damage to the items. Damaged items will not be permitted as part of the Work except in cases of minor damage that have been satisfactorily repaired and are acceptable to the District’s Representative.
B. Materials shall be stored in such a manner as to ensure the preservation of their quality and fitness for the Work. When considered necessary by the District’s Representative, materials shall be placed on platforms or other hard, clean surfaces, and covered when directed.
C. Materials shall be stored so as to facilitate inspection. Storage areas shall be suitably fenced, if necessary to protect the public or the material.
D. Unless otherwise designated in the General Requirements, locations and arrangements for storage sites for materials and equipment outside the limits of work, shall be selected and maintained by the Contractor at its expense. Full compensation for furnishing such storage sites as may be necessary or required by the Contractor shall be considered as included in the price bid and no additional compensation will be allowed therefor. The District shall be specifically exempted in any agreement from any liability incurred from the use of private property for construction purposes. Use of portions of the District's area at the site for materials and equipment storage shall be permitted only upon the approval of the District's Representative.

1.02 Pipe
A. Pipe and appurtenances shall be handled, stored, and installed as recommended by the manufacturer. Pipes with soft coatings, such as coal tar enamel or the like, or pipes of materials which are subject to deterioration by sunlight or heat, such as PVC pipe, shall be stored to protect the coating or pipe from physical damage or other deterioration and shall only be handled with padded, wide slings. Pipes shipped with interior bracing shall have the bracing removed only when recommended by the pipe manufacturer.

1.03 Equipment
A. Definition:
   1. For the purpose of this section, equipment means any mechanical, electrical, or instrumentation devices, and other items with one or more moving parts that requires an electrical, pneumatic, electronic or hydraulic connection.
B. Packing and Marking:
   1. All equipment shall be adequately and effectively protected against damage from moisture, dust, handling, or other cause during transport from manufacturer's premises to the Work site.
   2. Each item or package shall be clearly marked with the number unique to the specification reference covering the item.
   3. Each piece of equipment shall receive, as far as practicable, a distinguishing mark that shall be shown on the packing lists.
C. Stiffeners shall be used where necessary to maintain shapes and to give rigidity. Parts of equipment shall be delivered in assembled or sub-assembled units where possible.
D. Identification of Equipment:

1. All pieces of equipment with an assigned equipment number shall have affixed to them, in a prominent location, a label or tag displaying the assigned equipment number.

2. Equipment lacking a number shall have a similar tag providing a unique description of the item.

3. Markers shall be of stainless steel or aluminum, affixed to the item in question with stainless steel fasteners or as otherwise approved by the District's Representative. Plastic tape labels will not be acceptable.

1.04 Delivery and Acceptance of Equipment

A. Contractor is responsible for shipment, delivery, off-loading, and acceptance of all material and equipment required for the Work.

B. The District's personnel or District's Representative will not accept materials or equipment deliveries for the Contractor.

C. The source quality control tests and delivery inspections shall be at the Contractor's expense for any materials or equipment specified herein and shall include the following:

1. Test items at the place of manufacture during and/or on completion of manufacture, comprising material tests, hydraulic pressure tests, electric and instrumentation subsystem tests, performance and operating tests and inspections in accordance with the relevant standards of the industry and more particularly as detailed in individual clauses of these specifications to satisfy the District's Representative that the items tested and inspected comply with the requirements of this contract.

2. All items delivered at the site or to any authorized place of storage may be inspected to satisfy the District’s Representative that such items are of the specified quality and workmanship and are in good order and condition at the time of delivery.

   a. To that end, the Contractor shall be prepared to remove all coverings, containers or crates to permit the District's Representative to conduct an inspection.

D. Should the District’s Representative find indication of damage or deficient quality of workmanship, the Contractor shall provide the necessary documentation or conduct such tests deemed necessary by the District’s Representative to demonstrate compliance.

1.05 Storage of Equipment:

A. During the interval between delivery and installation, all equipment to be incorporated into the project shall be stored to prevent damage or deterioration. Long term storage requirements shall be in strict accordance with the Manufacturer’s requirements as well as requirements stated herein.

1. Environmental controls such as heaters or protective encapsulation shall be provided to ensure against condensation and moisture damage.

2. In the event prolonged (more than 90 days or per manufacturer’s recommendation) storage is required for any item of rotating equipment, the Contractor shall institute a preventive maintenance program which shall include grease protection of bare metal surfaces, periodic indexing of rotating parts, renewal of grease in bearings and any procedures recommended by the manufacturer.

   a. The Contractor shall maintain adequate records to demonstrate full compliance with these requirements.

   b. All equipment shall be available for inspection by the District's Representative.
B. Electrical and Control Panels
   1. To insure adequate protection of all electrical and instrumentation equipment and panels and electric motors, all such equipment shall be stored in a suitable enclosure designed to protect the equipment from dust and moisture.
   2. The Contractor shall be responsible for maintaining the storage facilities and equipment stored therein and shall make provision for all utilities required.
   3. Continuous access shall be provided to the District’s Representative for all equipment so stored.
C. Protection of Equipment After Installation:
   1. After installation, all equipment shall be protected from damage, including but not limited to, moisture, condensation, dust, abrasive particles, debris and dirt generated by the placement, chipping, sandblasting, cutting, finishing and grinding of new or existing concrete, terrazzo and metal; and the fumes, particulate matter, and splatter from welding, brazing, and painting of new or existing piping and equipment.
   2. Contractor shall lubricate and rotate by hand, all rotating equipment per the manufacturer’s recommendations.
   3. Contractor shall provide temporary heat to control panels to prevent condensation buildup on the inside of un-energized panels. Provide temporary electrical connection to equipment and panels equipped with space heaters or internal heating elements.
   4. The Contractor is advised that as minimum, vacuum cleaning, blowers with filters, protective shielding, and other dust suppression methods will be required at all times to adequately protect all equipment.
   5. During concreting, including finishing, all equipment that may be affected by cement dust must be completely covered.
   6. During painting operations, all grease fittings and similar openings shall be covered to prevent the entry of paint.
   7. Electrical switchgear, unit substation, and motor load centers shall not be installed until after all concrete work and sandblasting in those areas have been completed and accepted.

1.06 Hazardous Materials
A. The storage and handling of potential pollution causing and hazardous materials, including but not necessarily limited to, gasoline, oil and paint shall be in accordance with all local, state and federal requirements.
B. All hazardous materials shall be stored and handled in strict accordance with the Material Safety Data Sheets for the products.
C. Material Safety Data Sheets, shall be submitted to the District’s Representative prior to the delivery of materials to the project.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**END OF SECTION**
PART 1 - GENERAL

1.01 Description
A. This Section provides specifications for the installation and testing of all mechanical and electrical systems; and processes. Additional testing requirements for equipment, piping, structures, instrumentation, control, and electrical system, instrumentation, and SCADA communications are included in other Sections. All commissioning work for the equipment installed under this Contract shall be performed by the Contractor.

1.02 Definitions
A. Facility: Entire project, or agreed upon portion including all unit processes.
B. Unit Process: A portion of the facility that performs a specific process function.
C. Functional Checkout: Tests to demonstrate that installed equipment meet's manufacturer’s installation, calibration, and adjustment requirements; electrical and control system requirements; and other requirements as specified.
D. Performance Test: Clean water test of a unit process or group of unit processes to demonstrate that the system(s), including equipment, instrumentation, controls, electrical, and auxiliary components function to meet the requirements of the Contract Documents.
   1. Duration of Performance Test: Continuous, uninterrupted period of not less than 2 days.

1.03 Submittals
A. Startup and Testing Plans:
   1. Submit the following plans:
      a. Functional Checkout Plan
      b. Performance Test Plan
   2. Describe all procedures and schedule for project testing, commissioning and startup.
   3. Once the Test Plans have been reviewed and accepted by the District’s Representative, the Contractor shall produce checkout, alignment, adjustment and calibration sign-off forms for each item of equipment.
      a. The forms will be used in the field by the Contractor and the District’s Representative jointly to ensure that each item of electrical and mechanical equipment has been properly installed and tested.
   4. Submit at least 30 days prior to beginning startup activities.
   5. Provide testing plan with test logs for each item of equipment or each system to be tested.
   6. Provide regular updates of testing and commissioning schedule. Submit on a weekly basis a 14 day look-ahead schedule at the time of testing.

B. Test Reports:
   1. Submit reports of:
      a. Functional Checkout
      b. Performance Test
2. Results in a tabular format acceptable to the Engineer.
3. Submit certification of calibration of all instrumentation, including testing equipment before the Performance Test.

1.04 Quality Assurance

A. Installation:
1. All mechanical and electrical equipment furnished under this contract shall be installed in conformity with the details shown and specified and to the manufacturer's requirements.
2. Should a manufacturer's installation requirements conflict with specific requirements of the contract documents, the Contractor shall bring the matter to the attention of the District's Representative.
3. Any additional costs incurred arising out of changes authorized by the District's Representative to accommodate manufacturer's installation requirements will not be considered extra work.
4. Any costs, or time, incurred by the Contractor through failure to timely notify the District’s Representative of a difference between contract documents and manufacturer's installation requirements shall be borne by the Contractor.

B. Testing:
1. General Requirements:
   a. All materials, equipment, and work included in this contract shall be tested and inspected to insure compliance with the contract requirements.
   b. Unless otherwise specified, all costs of testing, including temporary facilities and connections, shall be borne by the Contractor.
   c. For the purpose of this section, equipment shall mean any mechanical, electrical, instrumentation, or other device with one or more moving parts or devices requiring an electrical, pneumatic or hydraulic connection. Installed tests for equipment, piping, structures, instrumentation, control, and electrical systems are also included in other Sections.
2. No tests specified herein shall be applied until the item to be tested has been inspected and approval by the District and the District has been given approval for the application of such tests.
3. Tests and inspections, unless otherwise specified or accepted, shall be in accordance with the recognized standards of the industry.
4. The form of evidence of satisfactory fulfillment of all test and inspection requirements shall be, at the discretion of the District, either by tests and inspections carried out in the District's Representative's presence or by certificates or reports of tests and inspections carried out by approved persons or organizations.
5. The Contractor shall provide and use forms which include all test information, including specified operational parameters, and which shall be acceptable in content to the District's Representative.

1.05 Tests and Inspection:

A. General:
1. All equipment shall be tested by the Contractor and the equipment manufacturers’ representatives to the satisfaction of the District before any facility is put into operation.
2. Tests shall be as specified herein and as recommended by the manufacturer to determine whether the equipment has been properly assembled, aligned, adjusted and connected.

3. Any changes, adjustments or replacements required to make the equipment operate as specified shall be carried out by the Contractor as part of the Work.

B. Procedures:

1. Prior to receipt of any progress payments in excess of 60 percent of the Contractor's lump sum bid for the work, the Contractor shall submit to the District's Representative, details of the procedures for testing and start-up of all equipment to be operated singly and together, excepting when such procedures have been covered in the specifications.

2. The procedures shall be divided into distinct stages; Functional Checkout and Performance Tests Period.

3. Testing procedures shall be designed to duplicate, as nearly as possible, all conditions of operation and shall be carefully selected to ensure that the equipment is not damaged.

4. Failure to observe these procedures may result in the non-acceptance of the subject equipment in question.

C. Test results shall be within the tolerances set forth in the detailed specification sections of the contract documents and any manufacturer's required specifications.

1. If no tolerances have been specified, test results shall conform to tolerances established by recognized industry practice.

2. Where, in the case of an otherwise satisfactory installed test, any doubt, dispute, or difference should arise between the District and the Contractor regarding the test results or the methods or equipment used in the performance of such test, then the District's Representative may order the test to be repeated.

3. If the repeat test, using such modified methods or equipment as the District's Representative may require, substantially confirms the previous test, then all costs in connection with the repeat test will be paid by the District; otherwise the costs shall be borne by the Contractor.

4. Where the results of any installed test fail to comply with the contract requirements for such test, then such repeat tests as may be necessary to achieve the contract requirements shall be made by and at the expense of the Contractor

D. At a minimum the following test data shall be collected:

1. Operating voltages and amperages per phase.


3. Operating pressures. (contractor provided temporary pressure gauge)

4. Operating flows.

5. Operating temperature.

6. Automatic Electrical Transferring.

7. SCADA Confirmations at City Local Operator Interface and Remote SCADA System Interface for alarms and operational conditions.

8. Analog inputs and outputs during test.


10. Alarm conditions.

E. Records and Forms:
1. The Contractor shall provide signoff forms for all testing to be accomplished under this contract.

2. Sign off forms shall be provided for each item of mechanical, electrical and instrumentation equipment provided or installed under this contract and shall contain provisions for recording relevant performance data for original testing and not less than three retests.

3. Separate sections shall be provided to record values for the Functional Checkout, Performance Test, initials of representatives of the equipment manufacturers, the Contractor and the District’s Representative.

4. Upon completion of testing, the Contractor shall furnish the District’s Representative with the original of the sign off sheet for each equipment item.

1.06 Functional Checkout:

A. The procedures shall incorporate all requirements of these specifications and shall proceed in a logical, step-wise sequence to ensure that all equipment has been properly serviced, aligned, connected, calibrated, and adjusted prior to operation.

B. Functional Checkout procedures shall include, but not necessarily be limited to:

1. Electrical system testing.
2. Instrumentation and controls testing.
3. Piping system pressure testing and cleaning.
4. Alignment of equipment.
5. Initial lubrication of equipment.
6. Cleaning of tanks, channels, basins, and all structures.
7. Written certification by the manufacturer that the equipment has been installed in accordance with the manufacturer’s instructions, requirements and recommendations; that the equipment is ready for operation and that the District’s staff is suitably instructed in operation and maintenance of the equipment.

1.07 Manufacturer’s Field Services and Certification:

A. Field Services:

1. The manufacturer shall perform field services on each equipment item.
2. Inspect system before initial start-up and certify that system has been correctly installed and prepared for start-up.
3. After the installation of the units and all appurtenances, each unit shall be subjected to a field running test under actual operating conditions. The field tests shall be made by the Contractor in the presence of and as directed by the District. The field tests shall demonstrate that under all conditions of operation each unit:
   a. Has not been damaged by transportation or installation
   b. Has been properly installed
   c. Has no mechanical defects
   d. Is in proper alignment
   e. Has been properly connected
   f. Is free of overheating of any parts
g. Is free of all objectionable vibration
h. Is free of excessive noise
i. Is free of overloading of any parts
j. Shall operate as specified with the control system
k. Meets the performance requirements indicated

4. Any defects in the equipment or failure to meet the requirements of the Specifications shall be promptly corrected by the Contractor.

B. Manufacturer’s Certification:

1. The Contractor shall submit certification letters for all equipment per requirements of Contract Documents.

2. Each letter shall be submitted on the manufacturer’s letterhead and shall include the following statements that:
   a. The signer has visited the site, inspected the equipment and installation, and certifies that the equipment is ready for operation.
   b. The equipment has been installed in accordance with the manufacturer’s requirements and is properly aligned and ready for operation.
   c. The equipment has been serviced, lubricated and properly prepared to perform in accordance with the intent of the Contract Documents.
   d. The controls, protective devices, instrumentation, and control panels furnished, as part of the equipment package, are properly installed, calibrated, and are ready for full time operation.
   e. The control logic for startup, shutdown, sequencing, interlocks, remote operation, and emergency shutdown have been tested and are functioning properly.
   f. The training of the District’s operations and maintenance personnel has been completed and note the date and time of that training.
   g. The manufacturer certifies that the equipment is approved for operation.

1.08 Performance Test:

A. Performance Test Requirements:

1. The Performance Test shall demonstrate the entire process system including, piping, valves, gates, controls, instrumentation, and auxiliary systems function as intended.

2. All systems and components shall be operated as a complete facility at various flow conditions, as directed by the District’s Representative.

3. All equipment and systems shall be operated, to the greatest extent practicable, at conditions which represent the full range of operating parameters as defined by the Contract Documents.

4. The equipment shall be operated to determine equipment operating characteristics, including temperatures and vibration; to observe performance characteristics; and to permit initial adjustment of operating controls.

5. Performance Test shall include remote PLC modes of operation, alarms, and shutdowns as required in the electrical, instrumentation and controls portions of the Contract Documents.

6. Install gratings, safety chains, handrails, shaft guards, walkways and sidewalks prior to Performance Test.
7. Install all required lighting, heating, ventilation, and air conditioning for areas and processes to be included in the Performance Test.

B. Performance Test Sequencing:

1. After completion of Functional Checkout and Manufacturer’s Certification.

2. Contractor shall schedule and notify the District and Engineer 15 days prior to the start date of the performance test.

3. Contractor shall inspect and clean debris and dirt from all piping and structures.

4. Contractor shall fill all process units and liquid process systems, except those employing oil or chemicals, with either potable or recycled water, as directed by the District.
   a. Unless otherwise specified, the Contractor shall provide at no expense to the District, all power, fuel, water, utilities, supplies, consumables, chemicals, testing media, labor and all other necessary items and work required to complete all tests specified in this section.
   b. Coordinate with District’s Representative for supply of test water.
   c. Cost for testing water shall be per the Contract Documents.
   d. All fuel and oil systems shall be filled with the specified fluid.
   e. Test media for chemical systems shall be either the intended fluid or compatible substitute, as directed by the District.
   f. Disposal methods for test media shall be subject to review by the District.
   g. Contractor shall be responsible for costs for disposal of test media.

5. Upon completion of the filling operations, the Contractor shall circulate potable or recycled water, as designated by the District, through the completed facility for the duration of the Performance Test.
   a. Contractor shall provide temporary pumping or piping required to recirculate water through the process units.
   b. Remove temporary facilities after the completion of Performance Testing.

C. Performance Test Criteria

1. Should the Performance Test period be halted for any reason related to the facilities constructed or the equipment furnished under this contract, or the Contractor's temporary testing systems, the Performance Test program shall be repeated until the specified continuous period has been accomplished without interruption.

2. If, under test, any portion of the work should fail to fulfill the contract requirements and is adjusted, altered, renewed or replaced; tests on that portion when so adjusted, altered, removed or replaced, together with all other portions of the work as are affected thereby, shall, if so required by the District, be repeated within reasonable time and in accordance with the specified conditions.
   a. The Contractor shall pay to the District all reasonable expenses incurred by the District as a result of repeating such tests.

3. At the conclusion of the Performance Test, the Contractor shall recheck all equipment for proper alignment, and if necessary, realign the equipment to manufacturer’s standards or Contract requirements.
   a. All equipment shall be checked for loose connections, unusual movement or other indications of improper operating characteristics.
   b. Any deficiencies shall be corrected to the satisfaction of the District’s Representative.
c. All equipment or devices which exhibit unusual or unacceptable operating characteristics shall be disassembled and inspected.

d. Unacceptable equipment shall then be repaired or removed from the site and replaced at no cost to the District.

PART 2 - PRODUCTS

2.01 Materials

A. Gages, Meters, Recorders and Monitors:
   1. Gages, meters, recorders and monitors shall be provided by the Contractor as required to supplement or augment the instrumentation system provided under this contract to properly demonstrate that all equipment fully satisfies the requirements of the contract documents.
   2. All devices employed for the purpose of measuring the performance of the facility's equipment and systems shall be specifically selected to provide a level of certainty consistent with the variables to be monitored.
   3. All instruments shall be recently calibrated, and the Contractor shall be prepared at all times to demonstrate, through recalibration, the certainty of all instruments employed for testing purposes.
   4. Calibration procedures shall in accordance with applicable standards of ASTM, ISA and IEEE.
   5. The adequacy of all gages, meters, recorders and monitors shall be subject to review of the District.

PART 3 - EXECUTION

3.01 Preparation

A. Inspect and clean the equipment, connected piping and structures and remove debris and foreign material.
   1. Flush piping. Sweep or vacuum clean all channels and structures to remove fine material.
B. Turn rotating equipment by hand to check for binding or other improper operation.
C. Perform cold and hot alignment to the manufacturer's recommended tolerances.
D. Remove rust preventatives, oils or temporary protective coatings used to protect the equipment during construction.
E. Open and close adjacent valves by hand to check for proper seating and range of motion.
F. Electrical systems:
   1. Complete insulation resistance tests on wiring.
   2. Perform grounding tests as required.
   3. Complete motor insulation resistance tests.
   4. Verify correct rotation of motors and equipment.
   5. Complete other requirements per electrical specifications.
G. Instrumentation systems:
   1. Complete instrument calibration.
2. Complete instrument loop tests.
3. Test pneumatic systems for leaks.
4. Verify all control signals, operation, ranges and settings.
5. Complete other requirements per instrumentation and controls specifications.

3.02 Installation:
A. All materials and equipment shall be installed by specialists properly skilled in the trades and professions required to assure first-class workmanship.
B. Where required by detailed specifications, the Contractor shall cause the installation of specific equipment items to be accomplished under the supervision of factory-trained installation specialists furnished by the equipment manufacturers.
C. The Contractor shall be prepared to document the skills and training of all workers engaged in the installation of all equipment furnished either by the Contractor or the District.

3.03 Testing
A. Testing shall proceed on a step-by-step basis in accordance with the Contractor's written testing procedures.
B. The Contractor's testing work shall be accomplished by a skilled team of specialists under the direction of a coordinator whose sole responsibility shall be the orderly, systematic testing of all equipment, systems, structures and the complete facility as a unit.
C. Each individual step in the procedures shall be witnessed by the District's Representative.

**END**
SECTION 01700
RESTORATION OF IMPROVEMENTS

PART 1 - GENERAL

1.01 Structures
A. The Contractor shall remove existing structures, including paving, sidewalks, curbs, gutters, pipelines, rocklined access, and rip rap, as may be necessary for the performance of the work and shall rebuild the structures thus removed in as good a condition as found with the requirements specified. Concrete structures such as curbs and gutters shall be replaced from joint to joint or as directed by the District’s Representative. The Contractor shall also repair existing structures that may be damaged as a result of the work under this contract.

1.02 Roads
A. Unless otherwise specified, roads or other paved surfaces in which the surface is removed, broken, or damaged, or in which the ground has caved or settled during the work under this contract, shall be resurfaced and brought to the original grade and section. Requirements for paving restoration are covered in
1. Section 03300 – Cast in Place Concrete.

1.03 Cultivated Areas and Other Improvements
A. Cultivated or planted areas and other surface or subsurface improvements, including irrigation systems, which are damaged by actions of the Contractor shall be restored as nearly as possible to their original condition at the Contractor’s expense. Existing guard posts, barricades, and fences shall be protected and replaced if damaged. Contractor shall protect street lighting, traffic signals, telephone or other existing facilities from damage. Not all existing facilities are shown on the Drawings. Contractor shall restore all existing facilities damaged due to construction.

1.04 Restoration of Existing Installations
A. The Contractor shall, at no cost to the District, immediately correct or replace existing equipment, controls or systems that are damaged as a result of construction or Contractor operations.

1.05 Warranty of Restoration Work
A. The Contractor shall include all restoration work under the one (1) year guarantee included in the General Conditions.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**END OF SECTION**
PART 1 - GENERAL

1.01 Requirements

A. As a condition precedent to final acceptance or release of a structure, space or process unit for use by the District, the Contractor shall thoroughly clean all floors and walls to leave same in first-class condition.

B. All pits and sumps shall be cleared of silt, sand, debris and construction materials. Ductwork, air intakes and exhaust grilles shall be inspected and cleared of extraneous material, and all grounds shall be cleared of all debris.

C. At the completion of the project, the Contractor shall perform the following:
   1. Remove and dispose of all excess or waste materials, debris, rubbish, and temporary facilities from the site, structures and all facilities.
   2. Repair pavement, roads, sod, and all other areas affected by construction operations and restore them to original condition or to minimum condition specified.
   3. Remove spatter, grease, stains, fingerprints, debris, dust, labels, tags, packing materials and other foreign items or substances from interior and exterior surfaces, equipment, signs and lettering.
   4. Repair, patch and touch up chipped, scratched, dented or otherwise marred surfaces to match specified finish.
   5. Remove paint, clean and restore all equipment and material nameplates, labels and other identification markings.
   6. Wash and shine glazing and polished surfaces.
   7. Clean all floors, slabs, pavements, and ground surfaces.
   8. Maintain cleaning until acceptance by the District.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**END OF SECTION**
PART 1 - GENERAL

1.01 General

A. The Contractor shall furnish spare parts and maintenance materials as specified in the individual Sections.

B. Parts and materials shall be furnished in manufacturer’s unopened cartons, boxes, crates or other protective covering suitable for preventing corrosion or deterioration for the maximum length of storage that may be normally anticipated. They shall be clearly marked and identified.

C. During construction, parts shall be stored in buildings or trailers with floor, roof and closed sides and in accordance with manufacturer’s recommendations. They shall be protected from weather, condensation and humidity.

D. Parts and materials shall be delivered to the District upon completion of the Work or when the District assumes beneficial occupancy. Contractor shall then place them in permanent storage rooms or areas approved by the Construction Manager.

E. A letter of transmittal shall accompany the spare parts and shall include the following:
   1. Date of letter and transfer of parts and material
   2. Contract title and number
   3. Contractor’s name and address
   4. A complete inventory of the parts and material, listing the applicable Specification Section for each
   5. A place for the District to sign and signify receipt of the parts and materials

F. Contractor shall be fully responsible for loss or damage to parts and material until they are transmitted to the District.

**END OF SECTION**
PART 1 - GENERAL

1.01 General
A. The Contractor shall provide the District’s Representative neatly and legibly marked contract drawings showing the final horizontal and vertical location of piping, equipment, electrical conduits, outlet boxes and cables. Marking of the drawings shall be kept current and shall be done at the time the material and equipment are installed. These drawings shall be available to the District’s Representative throughout the construction period. Final payment shall not be made until the marked up record drawings are delivered to and approved by the District’s Representative.

1.02 Maintenance of Documents
A. The following shall be maintained in the Contractor’s field office in clean, dry, legible condition: Contract Drawings, Specifications, Addenda, approved Shop Drawings, Samples, photographs, Change Orders, other Modifications of Contract, test records, survey data, Field Orders, and all other documents pertinent to Contractor’s Work.

B. Two, full-sized sets of the Contract Drawings will be furnished to the Contractor by the District. These Drawings shall be updated with record information and one copy of the updated record drawings shall be submitted for review to the District’s Representative every month. The Record Drawing shall be up-to-date and its completeness shall be a precondition of the next month’s partial payment request approval.

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 schedules, lists, layout drawings, and wiring diagrams.
6. Make annotations with erasable colored pencil conforming to the following color code:

<table>
<thead>
<tr>
<th>Annotations</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additions</td>
<td>Red</td>
</tr>
<tr>
<td>Deletions</td>
<td>Green</td>
</tr>
<tr>
<td>Comments</td>
<td>Blue</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Graphite</td>
</tr>
</tbody>
</table>
C. Documents shall be available at all times for inspection by the District’s Representative.

D. Record documents shall not be used for any other purpose and shall not be removed from the office without approval of the District’s Representative.

E. The Contractor may submit additional 24 X 36 sheets detailing record work as approved by the District’s Representative for the Engineer’s review and approval.

F. The Contractor shall not conceal or bury any construction related work until the required record drawing information has been recorded.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**END OF SECTION**
SECTION 02055
DEMOLITION AND SITE PREPARATION

PART 1 - GENERAL

1.01 Summary
A. Demolition and site preparation includes all clearing, grubbing and demolition Work.

1.02 Job Conditions
A. The Contractor shall determine the actual condition of the site as it affects the Work.
B. The solids stabilization basin shall not remain in operations during construction.
   1. The District is responsible for removing all solids waste prior to construction.
C. The Backwash Equalization basin will continue to be an active operational process while construction is taking place. Contractor to take measures necessary to ensure unscheduled interruptions to the process do not occur.
D. The Contractor shall allow unrestricted vehicle (Dump truck) access to the gate on the East side of Hinkle Reservoir for possible temporary sludge drying area.
E. All electrical tie-ins will be scheduled 48hrs. in advance.
   1. Shutdowns of the Spent Backwash Water MCC shall not exceed 8 hrs. within a 24-hour period.

1.03 Quality Assurance
A. General: All work shall be performed in accordance with the local building codes, State Industrial Safety Orders and requirements of the Occupational Safety and Health Act requirements.
B. Schedule: Demolition must be scheduled to allow all existing services and utilities to remain in continuous operation. No interruption in operation will be permitted without previous authorization from the District’s Representative.
C. Protection
   1. Demolition shall be performed in such a manner as to not harm adjacent structures, equipment, existing landscaping or natural vegetation.
      a. The Contractor shall assume full responsibility for such disturbance.
      b. All costs of any such repair, rehabilitation, or modifications shall be borne by the Contractor.
   2. The Contractor shall provide such protection as may be required to transfer material to the ground.
      a. Throwing, dropping or permitting the free fall of material and debris from heights which would cause damage to other work, existing structures, or equipment; undue noise or nuisance; or excessive dust will be expressly prohibited.
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 General
A. The Contractor shall notify the District’s Representative when demolition is complete.

3.02 Performance
A. Clearing and Grubbing
   1. Unless otherwise stated, clearing and grubbing shall conform to the requirements of Caltrans Standard Specifications Section 16.
   2. The site of all open-cut excavations and areas to be cleared as indicated on the Plans shall be cleared and grubbed prior to excavation.
      a. Unless otherwise specified, the Contractor shall remove obstructions such as brush, trees, logs, roots, root balls, heavy sod, vegetation, rock, stones larger than 6 inches by any dimension, broken or old concrete and pavement, debris, and structures.
   3. Clearing and grubbing in areas of structural improvement such as concrete structures shall be cleared and grubbed as above except that obstructions larger than 2 inches in any dimension shall be removed.
B. Equipment and Piping Removal
   1. All equipment and piping to be removed shall be properly disconnected from structures, piping, electrical, and instrumentation systems.
   2. The Contractor shall do all resurfacing and other work as necessary to comply with the above requirements.
C. Pavement Removal
   1. All pavements and concrete pads shall be saw-cut on a neat line at right angles to the curb or concrete face.
D. Utility Interference
   1. Where existing utilities interfere with the prosecution of the work, the Contractor shall relocate the utilities.

3.03 Removed Material and Debris
A. Where Contractor is directed on the Drawings to “Demolish” or “Remove” material or facilities it is understood that the material will be removed and disposed of offsite unless specifically stated otherwise or directed by the District’s Representative.
B. All removed material not designated for salvage and all debris shall become the property of the Contractor and shall be removed from the site.
C. Materials and debris generated by demolition activities shall not be allowed to accumulate. Debris shall be removed daily and disposed of in a manner allowed by law.

3.04 Backfill
A. Holes or depressions in the ground remaining after demolition of structures, pipelines, or equipment shall be filled with compacted backfill materials as specified in Section 02200 - Earthwork.
3.05 Restoration

A. Restore adjacent structures and facilities damaged during demolition or other construction to original or better condition.

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. Scope: The work of this Section includes dewatering necessary to lower and control groundwater levels and hydrostatic pressures to permit excavation and construction to be performed properly under dry conditions.

B. Contractors Responsibility: Dewatering operations shall be adequate to assure the integrity of the finished project. The responsibility for conducting the dewatering operation in a manner that 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. Contractor shall secure all necessary permits to complete the requirements of this Section of the Specifications.

1. Contractor will work under the District's NPDES permit and will be responsible for complying with all permit requirements. NPDES Permit for Drinking Water System Discharges can be found here: https://www.waterboards.ca.gov/water_issues/programs/npdes/docs/drinkingwater/final_statewide_wqo2014_0194_dwq.pdf.

C. WTP Site: At the WTP site, the test pit dug in June 2001 for a geotechnical investigation conducted for the Backwash and Solids Handling Project did not encounter free groundwater. This may vary at the time of construction for this project.

1.02 References
A. None

1.03 Submittals
A. The following shall be submitted in compliance with Section 01330 – Submittals Procedures:

1. Prior to commencement of excavation, a detailed plan and schedule for dewatering activities of excavations.

2. Demonstration of proposed dewatering system and verification that adequate personnel, materials and equipment are readily available for all dewatering activities.

3. Copy of any permit or discharge requirements.

4. Compliance with SWPPP requirements.

1.04 Control and Observation
A. Adequate control shall be maintained to ensure that the stability of excavated and constructed slopes are not adversely affected by water, that erosion is controlled and that flooding of excavation or damage to structures do not occur.

B. 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.

C. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement that may develop.
D. A daily report shall be maintained. The following shall be recorded:
   1. Elevation of ground water and piezometric water levels in observation wells (if any).
   2. Change in elevation of reference points established.

PART 2 - PRODUCTS

2.01 Equipment
A. Dewatering system shall include well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means including standby pumping equipment maintained on the job site continuously.

PART 3 - EXECUTION

3.01 General Requirements
A. An adequate dewatering system shall be maintained to lower and control the groundwater to permit excavation, construction of structures, placement of piping, and placement of fill materials to be performed under dry conditions.
B. Sufficient dewatering equipment shall be installed to predrain the water-bearing strata below the bottom of foundations, drains, sewers, pipelines and other excavations.
C. The Contractor shall maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation construction, backfilling, and up to acceptance.
D. The hydrostatic head in water-bearing strata below foundations, drains, sewers, pipelines and other excavations shall be reduced to ensure that the water level and piezometric water levels are below the excavation surface at all times.
   1. The piezometric water level shall be maintained a minimum of 3-feet below the excavation surface all times.
E. The dewatering system shall be placed into operation prior to excavation below ground water level to lower the ground water level and shall be operated continuously 24 hours a day, 7 days a week until drains, sewers, pipelines and structures have been constructed and leak tested and fill materials have been placed and dewatering is no longer required.
F. The site shall be graded to facilitate 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 away from the excavation.
G. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
H. 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 drain rock at no additional cost to the District.
I. 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.
J. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means shall be used to prevent pumping of fine
sands or silts from the subsurface. A continual check shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

K. Water and debris shall be disposed of in a suitable manner in compliance with local and State regulations and without damage to adjacent property. No water shall be drained into the installed or under construction facilities. Water shall be filtered to remove sand and fine-sized soil particles and further treated if required by regulatory agencies before disposal into any drainage system. Necessary permits for disposal of water, if applicable, shall be obtained by the Contractor from the appropriate regulatory agencies.

L. The release of groundwater to its original level shall be performed in such manner to prevent disturbance of natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.

M. Dewatering of trenches and other excavations shall be considered as incidental to the construction of the Work and all costs thereof shall be included in the various contract prices in the Bid Forms, unless a separate bid item has been established for dewatering.

N. Contractor shall comply with all discharge permit and Site Erosions and Sediment BMPs.

**END OF SECTION**
SECTION 02200
EARTHWORK

PART 1 - GENERAL

1.01 Summary
A. This section specifies earthwork activities consisting of excavation, filling, grading, and excess material control. This section also includes the definition of rock excavation.

1.02 References
A. The following documents are a part of this section insofar as they are specified and modified herein. In case of conflict between the requirements of this Section, and the following documents, the requirements of this section shall prevail.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>California Test Method 217</td>
<td>Method of Test for Sand Equivalent</td>
</tr>
<tr>
<td>ASTM C136</td>
<td>Method of Test for Sieve or Screen Analysis of Fine and Coarse Aggregates</td>
</tr>
<tr>
<td>ASTM D420</td>
<td>Standard Recommended Practice for Investigating and Sampling Soil and Rock for Construction Purposes</td>
</tr>
<tr>
<td>ASTM D1556</td>
<td>Method of Test for Density of Soil in Place by the Sand-Cone Method</td>
</tr>
<tr>
<td>ASTM D1557</td>
<td>Method of Test for Moisture-Density Relations of Soils, Using 10 lb. (4.5 kg) Hammer and 18 in. (457 mm) Drop</td>
</tr>
<tr>
<td>ASTM D2922</td>
<td>Standard Test Method for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)</td>
</tr>
<tr>
<td>ASTM D3017</td>
<td>Method of Test for Moisture Content of Soil and Soil Aggregates in Place by Nuclear Methods (Shallow Depth)</td>
</tr>
<tr>
<td>Caltrans</td>
<td>Standard Specifications 2010 (or 2015 as referenced)</td>
</tr>
</tbody>
</table>

1.03 Definitions
A. Compaction: The degree of compaction is specified as percent of relative compaction. The relative compactions refer to the maximum relative densities of dry soil obtainable at optimum moisture content.
B. Excavation Slope: Excavation slope shall be defined as an inclined surface formed by removing material from below existing grade.
C. Embankment Slope: Embankment slope shall be defined as an inclined surface formed by placement of material above existing grade.
1.04 System Description
A. Soils Report
   1. No geotechnical investigation for this project was prepared.

1.05 Submittals
A. Submit current technical data for each type of material specified to prove compliance with the specifications in accordance with the requirements of Section 01340 – Submittals Procedures.
B. Samples of fill materials to be used shall be submitted 60 days in advance of use. Samples shall consist of 1.0 cubic foot of each type of material proposed.

1.06 Quality Assurance
A. All soils testing will be done by a testing laboratory of the District’s choice and expense except as otherwise noted.
B. The District’s Representative will take samples and perform tests for compliance with the specifications including Atterburg limits, specific gravity, sand equivalent, R-value, durability, moisture content, gradation, compaction, and density tests during placement of backfill materials to check compliance with these specifications.
C. The Contractor shall remove surface material at locations designated by the District’s Representative and provide such assistance as necessary for sampling and testing.
D. The District’s Representative may direct the Contractor to construct inspection trenches in compacted or consolidated backfill to determine that the Contractor has complied with these specifications.
E. The District will bear the costs for sampling and testing specified in this Paragraph. The Contractor shall pay costs associated with retesting due to the Contractor’s failure to comply with the specifications.

PART 2 - PRODUCTS

2.01 Fill Materials
A. Classification of Excavated Materials:
   1. Rock:
      a. Earth encountered during the course of excavation which is sufficiently hard to cause refusal to equipment specified below shall be deemed inexcavatable and therefore classified as ‘rock’. Earth deemed inexcavatable shall be removed by substantial means such as reciprocating hydraulic hammers and shall conform to this specification.
      b. Refusal to be considered as the inability of the following equipment to excavate material as caused by the hardness of the earth: Tractor mounted excavator, with minimum operating weight of 85,000 lbs. and using a single ripper tooth. Refusal shall be demonstrated to Engineer prior to earth being deemed inexcavatable and therefore defined as rock subject to this rock clause and unit price compensation.
      c. All rock excavation shall be under one classification. This classification shall include solid ledge rock in its natural location that requires systematic quarrying or drilling, and also boulders that exceed 0.25 CY in volume.
      d. When rock is encountered, strip free of earth. After verification by a representative of the District and/or Engineer that the material encountered is rock (as defined above), employ
an independent surveyor to determine rock quantities before removal operation begins. In computing the volumetric content of rock excavation for payment, the pay lines shall be taken as follows:

1) For structures (including foundations, manholes wet well, emergency storage vaults, etc.): 2 feet outside the exterior limits of foundations and from rock surface to 6 inches below bottom of foundations.

2) For piping and utilities: A width 18 inches wider than the outside diameter of the pipe or conduit and from rock surface to 6 inches below bottom exterior surface of the pipe or conduit.

3) Rock removed for benching, sloping excavations and other activities that are subject to the Contractor’s means and methods shall not be included in the pay quantity.

e. Hydraulic Hammer: Hydraulic hammering or alternative means approved by the Engineer shall be employed where refusal has been demonstrated and normal excavation procedures are not feasible.

f. Remove and handle excavated materials regardless of its type, character, composition, condition, or depth.

g. No blasting will be allowed.

B. Engineered Fill: Engineered Fill material shall be a select nonexpansive, granular material free from organic matter and of such size and gradation that the specified compaction can be readily obtained. Material “Atterberg” cohesive range will be defined by a liquid limit of less than 20 (% of water content) and a plasticity index of less than 12 (% of water content) and shall conform to the following gradation:

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Size</th>
<th>Percent by Weight Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 inch</td>
<td>100</td>
</tr>
<tr>
<td>3/4 inch</td>
<td>80-100</td>
</tr>
<tr>
<td>No. 4</td>
<td>50-100</td>
</tr>
<tr>
<td>No. 10</td>
<td>35-95</td>
</tr>
<tr>
<td>No. 40</td>
<td>15-75</td>
</tr>
<tr>
<td>No. 200</td>
<td>5-35</td>
</tr>
</tbody>
</table>

C. Select Fill: Select Fill material shall be unclassified material and may be obtained from excavation on the Work site.

1. The material shall be free from peat, wood, roots, bark, debris, garbage, rubbish or other extraneous material.

2. The maximum size of stone shall not exceed 3 inches.

3. The percent of rock greater than 1 ½ inches shall not exceed 15 percent.

4. The Expansion Index shall be less than 35 percent.

5. The amount of fines passing a No. 200 sieve shall not exceed 20 percent.

D. Compactible 3/8” Concrete Mix Design for Intermediate Backfill:

1. The mix shall consist of the following materials (per cubic yard):
77% of 3/8" aggregate (crushed rock)
23% of sand
188# of cement (2 sack)
12 gallons of water

2. 3/8” aggregate shall consist of clean crushed rock per the following gradation:

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Size</th>
<th>Percent by Weight Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 inch</td>
<td>100</td>
</tr>
<tr>
<td>3/8 inch</td>
<td>0 - 20</td>
</tr>
<tr>
<td>No. 100</td>
<td>2 - 3</td>
</tr>
</tbody>
</table>

3. Compaction shall be limited to 1-foot maximum lifts using a vibraplate or a whacker.

E. Rip Rap Protection: Shall be No. 3 Backing placed per Method B placement per Caltrans Section 72-2:
1. Rock must have the values for the material properties shown as follows

<table>
<thead>
<tr>
<th>Property</th>
<th>California Test</th>
<th>Percent by Weight Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent specific gravity</td>
<td>206</td>
<td>2.5 minimum</td>
</tr>
<tr>
<td>Absorption</td>
<td>206</td>
<td>4.2% maximum</td>
</tr>
<tr>
<td>Durability index</td>
<td>229</td>
<td>52 minimum</td>
</tr>
</tbody>
</table>

2. Complies with the following rock gradation:

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Size</th>
<th>Percentage larger than</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 lb</td>
<td>100</td>
</tr>
<tr>
<td>5 lb</td>
<td>0 - 20</td>
</tr>
<tr>
<td>1 lb</td>
<td>2 - 3</td>
</tr>
</tbody>
</table>

3. The percentage of rock smaller than the smallest rock size must be determined on the basis of weight. For all other rock sizes with a class, the percentage must be determined on the basis of the ratio of the number of individual rocks larger than the smallest size shown for that class compared to the total number of rocks.

4. This material shall be free of clay, dirt, organic matter and other deleterious materials.

5. Any unsuitable materials that must be removed shall be disposed of at no cost to the District. No additional payments will be made for materials that must be replaced.

F. Sand: Sand shall be pervious backfill conforming to the following gradation per Caltrans Section 90-1.02C(4)(c):

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Size</th>
<th>Percent by Weight Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8 inch</td>
<td>100</td>
</tr>
<tr>
<td>No. 4</td>
<td>95 - 100</td>
</tr>
<tr>
<td>No. 8</td>
<td>65 - 95</td>
</tr>
</tbody>
</table>
U.S. Standard Sieve Size | Percent by Weight Passing
--- | ---
No. 50 | 0 - 100
No. 100 | 2 - 12
No. 200 | 0 - 8

G. 3/4” Aggregate Grading Requirements: Aggregate Base shall be Class 2, ¾-inch maximum size free from organic or other deleterious substances, in conformance with Caltrans Section 26.

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Size</th>
<th>Percent by Weight 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>No. 4</td>
<td>35 - 60</td>
</tr>
<tr>
<td>No. 30</td>
<td>10 - 30</td>
</tr>
<tr>
<td>No. 200</td>
<td>2 - 5</td>
</tr>
</tbody>
</table>

Test | Minimum Value
--- | ---
Resistance (R Value) | 78
Sand Equivalent | 22
Durability Index | 35

2.02 Controlled Density Fill (CDF)
A. Provide hand tool excavatable controlled density fill (CDF) as shown on the Drawings. Use hand tool excavatable CDF in all roadways or in areas required by the Engineer.
B. Mix Design
1. Hand tool excavatable CDF shall have a compressive strength of between 50 and 100 psi.
2. Total air content shall be between 8.0 and 12.0 percent.
C. Materials
1. Cement: Type II low alkali Portland cement.
2. Coarse Aggregate: Pea gravel, 3/8-inch or less.
3. Fine Aggregate: Concrete sand.
D. Suggested mix design for hand excavatable CDF:

<table>
<thead>
<tr>
<th>Material</th>
<th>Weight, lbs.</th>
<th>Volume, cuft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement</td>
<td>94</td>
<td>0.48</td>
</tr>
<tr>
<td>Coarse Aggregate</td>
<td>2883</td>
<td>16.74</td>
</tr>
<tr>
<td>Material</td>
<td>Weight, lbs.</td>
<td>Volume, cuft.</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Fine Aggregate</td>
<td>931</td>
<td>5.61</td>
</tr>
<tr>
<td>Air</td>
<td>2.70</td>
<td></td>
</tr>
<tr>
<td>Water: 11 gallons</td>
<td>92</td>
<td>1.47</td>
</tr>
<tr>
<td>Total</td>
<td>4000</td>
<td>27.00</td>
</tr>
</tbody>
</table>

2.03 Geotextiles

A. Filter Fabric

1. Where specified or shown on the Drawings, filter fabric shall be RG10N Nonwoven Geotextile Class 10 or equal.
2. Filter fabric shall be 10 oz/yd² nonwoven geotextile material.
3. Fabric shall be stretched out as tight and as flat as possible.
4. Adjacent fabric shall be overlapped a minimum of 2 feet each way.
5. Secure the fabric with staples, pins, soil or other suitable material along overlapped edges and at pipe penetration.

B. Geotextile Reinforcement

1. Where specified or shown on the Drawings, soil stabilization or reinforcement woven geotextiles shall be Mirafi Geolon HP370, or equal.

C. Erosion Control Mat

1. Where specified or shown on the Drawings, erosion control mat shall be Contech CFB2 Temporary Degradable Erosion Blanket, or equal.
2. Anchor and install erosion control blanket per manufacturer’s requirements.

PART 3 - EXECUTION

3.01 General

A. Overexcavation

1. At the direction of the District's Representative: Where the undisturbed condition of natural soils is inadequate for support of planned construction, the District's Representative will direct the Contractor to overexcavate to adequate supporting soils. The excavated space shall be backfilled and compacted to the specified elevation with soil materials in accordance with the fill.

2. Due to Contractor's Operations: Should the excavation be carried below the lines and grades specified on the drawings or should the bottom of the excavation be disturbed because of the Contractor's operations and require overexcavation and backfill, the Contractor shall backfill such excavated space with a compacted material in accordance with fill requirements of this Section. Backfill and compaction shall be at Contractor's expense.

3. As an alternative to overexcavation, the District's Representative may direct the Contractor to reinforce the soil with woven geotextiles equivalent to Mirafi Geolon HP370.

B. Removal of Obstructions
1. The Contractor shall remove all brush, trees, logs, stumps, roots, heavy sods, heavy growth of grass, all decayed vegetative matter, fences, and all structures where the proper construction and completion of the Work require their removal. The Contractor shall also remove all rocks, stones, broken concrete and pavement, debris and all obstructions of whatsoever kind or character, whether natural or artificial, encountered in the Work.

2. Material that is removed as hereinbefore specified, and is not to be incorporated in the Work, shall be properly disposed of off the site.

C. Surplus Material

1. Unless otherwise specified, surplus excavated material shall be disposed of in accordance with applicable ordinances and environmental requirements.

2. No excavated material shall be deposited on private property unless written permission from the District thereof is secured by the Contractor. Before the County will accept the work as being completed, the Contractor shall file a written release signed by all property Districts with whom the Contractor has entered into agreements for disposal of excess excavated material absolving the County from any liability connected therewith.

3. The Contractor shall satisfy himself that there is sufficient material available for the completion of the required earthwork before disposing of any material inside or outside the site. The Contractor shall replace shortage of material, caused by premature disposal of any material by the Contractor.

4. Material shall not be stockpiled to a depth greater than 5 feet above finished grade within 25 feet of any excavation or structure except for those areas designated to be preconsolidated. For these areas, the depth of stockpiled material shall be as specified. The Contractor shall maintain stability of the soil adjacent to any excavation.

D. Borrow Material

1. If the quantity of acceptable material from excavation is not sufficient to construct the embankments required by the work, the quantity of material needed to complete the embankments shall consist of imported borrow conforming to specified requirements.

E. Hauling

1. When hauling is done over highways and/or private streets, the loads shall be trimmed and the vehicle shelf areas shall be cleaned after each loading. The loads shall be watered after trimming to eliminate dust.

F. Haul Roads

1. If required, Contractor shall construct haul roads required to transport materials on the Work site. Alignment of haul roads shall be selected to avoid interference with concurrent construction operations and facility operations. Haul roads shall be removed after completion of embankment construction.

G. Finish Grading

1. Finish surfaces shall be smooth, compacted and free from irregularities. The degree of finish shall be that normally obtainable with a blade-grader.

2. Finished grade will be as specified by the contours, plus or minus 0.10 foot, except where a local change in elevation is required to match sidewalks, curbs, manholes and catch basins, or to ensure proper drainage. Allowance for topsoil and grass cover, and subbase and pavement thickness shall be made so that the specified thickness of topsoil can be applied to attain the finished grade.
3. When the Work is at an intermediate stage of completion, the lines and grades shall be as specified plus or minus 0.5 foot to provide adequate drainage.

4. If the soil is to be cultivated or straw is to be incorporated into the surface, rocks larger than 2-1/2 inches in maximum dimension, roots and other debris on the surface of the slope shall be removed and disposed of prior to cultivation or placement of straw.

H. Control of Erosion

1. The Contractor shall maintain earthwork surface true and smooth and protected from erosion. Where erosion occurs, the Contractor shall provide fill or shall excavate as necessary to return earthwork surfaces to the grade and finish specified.

3.02 Fill

A. Fill material shall be placed in horizontal layers and compacted with power-operated tampers, rollers, idlers, or vibratory equipment. Material type, maximum layer depth, relative compaction, and general application are specified in the following table:

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Maximum Loose Layer Depth, Inches</th>
<th>Minimum Relative Compaction, Percent</th>
<th>General Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 2 Aggregate Base</td>
<td>8</td>
<td>90</td>
<td>Slabs on grade</td>
</tr>
<tr>
<td>Sand or 1” x No. 4 Drain Rock</td>
<td>6</td>
<td>90</td>
<td>Bedding and initial backfill for ductile iron, C900, and C905 pipe</td>
</tr>
<tr>
<td>Compactible 3/8” Concrete Mix</td>
<td>12</td>
<td>95</td>
<td>Intermediate Backfill</td>
</tr>
<tr>
<td>Sand</td>
<td>6</td>
<td>90</td>
<td>Bedding and initial backfill for plastic pipe</td>
</tr>
<tr>
<td>Engineered Fill or Select Fill</td>
<td>8</td>
<td>90</td>
<td>Subsequent and final pipeline backfill</td>
</tr>
<tr>
<td>Class 2 Aggregate Base</td>
<td>8</td>
<td>95</td>
<td>Upper 1 foot of pipeline backfill in all roadways of asphalt concrete pavement</td>
</tr>
<tr>
<td>Engineered Fill or Class 2 Aggregate Base</td>
<td>8</td>
<td>95</td>
<td>Below structures except as shown on the Drawings</td>
</tr>
<tr>
<td>Engineered Fill or Class 2 Aggregate Base</td>
<td>6</td>
<td>90 95</td>
<td>Structural backfill adjacent to structures Upper 1 foot of structural backfill</td>
</tr>
<tr>
<td>Class 2 Aggregate Base</td>
<td>8</td>
<td>95</td>
<td>Aggregate base coarse for areas receiving asphalt paving</td>
</tr>
<tr>
<td>Select Fill or Engineered Fill</td>
<td>8</td>
<td>90</td>
<td>General fill</td>
</tr>
<tr>
<td>Select Fill</td>
<td>8</td>
<td>85</td>
<td>Areas to receive landscaping</td>
</tr>
</tbody>
</table>

3.03 Earthwork for Structures

A. Structure Excavation
1. The bottom shall not be more than 0.15 foot above or below the lines and grades specified. If the elevation or structure excavation is not specified, the excavation shall be not more than 0.15 foot above or below the elevation specified for fill material below the structure. Slopes shall vary no more than 0.5 foot from specified grade unless the excavation is in rock where the maximum variation shall be 2 feet.

2. Unless otherwise specified, excavations shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, installation of services, and for inspection, except where concrete is specified to be placed directly against excavated surfaces.

B. Foundation Treatment

1. The foundation of the new structures shall be excavated, backfilled and compacted as specified herein. The Contractor shall make the necessary provisions to protect the foundations of existing structures adjacent to the new structures against disturbance during the new foundation installation activities.

2. At the completion of the excavation, the District’s Representative shall inspect the bottom of the excavation. No further earthwork shall be performed prior to this inspection. Where unsuitable material is found, the Contractor shall overexcavate as directed by the District’s Representative.

3. Upon the District’s Representative’s approval, the bottom of the excavation shall be scarified to a depth of 8 inches, then moisture conditioned to within two percentage points of optimum moisture content, and then shall be re-compacted to a minimum of 90 percent of maximum relative compaction.

C. Structure Fill and Backfill

1. Structural Fill and Backfill shall conform to the requirements of this Section or as shown on the Drawings. In the case of a conflict the more restrictive requirement shall govern.

2. After completion of construction below the elevation of the final grade, and prior to backfilling, forms shall be removed and the excavation shall be cleaned of debris.

3. Structure backfill shall not be placed until the subgrade portions of the structure have been inspected. No backfill material shall be deposited against concrete structures until the concrete has developed a compressive strength of not less than the specified 28 day concrete strength is reached.

4. Backfill material shall be placed in uniform layers with uncompacted thickness of not more than 6 inches and shall be brought up uniformly on all sides of the structure. Each layer of backfill shall be compacted to a relative compaction of not less than 90 percent. The top 12 inches shall be compacted to at least 95 percent relative compaction. Where the backfill is under roadway or traffic area, the material within 12 inches below the roadbase shall be compacted to a relative compaction of not less than 95 percent. Compaction by means of water jetting or water ponding shall not be permitted.

5. Unless otherwise specified, backfill around and above pipelines within the excavation line of any structure shall be the same as that specified for structures.

6. Controlled Density Fill may be used for structural backfill as shown on the Drawings.

3.04 Excavation and Backfill for Pipelines and Conduits

A. Excavation

1. Unless otherwise specified or indicated, excavation for pipelines and conduits shall be open cut. Trenching machines may be used except where their use will result in damage to existing facilities.
2. Where, in the opinion of the District’s Representative, the undisturbed condition of the natural soils below the excavation grades indicated or specified is inadequate for the support of the planned pipeline, the District’s Representative will direct the Contractor to overexcavate a minimum of 12 inches to adequate supporting soils and backfill the excavated space to the proper elevation.

3. Unless otherwise shown, trenches shall be excavated at least 6 inches below the final elevation of the barrel of the pipe.

B. Trench Width

1. The maximum and minimum allowable width of trench shall be as shown on the contract drawings. The maximum width shall be inclusive of all sheeting, lagging and bracing.

2. Wherever the maximum allowable trench width is exceeded for any reason, the Contractor shall provide improved bedding and/or extra strength pipe, as directed by the District’s Representative.

3. All pipelines shall have minimum of 6 inches bedding material below the barrel of the pipe. Bedding shall be placed and compacted as specified for initial trench backfill and shall be placed to provide uniform support for the pipe.

4. Where, in the opinion of the District’s Representative, stabilization of the undisturbed foundation below the 6-inch bedding of the overexcavated depth as shown is required because of the soft, spongy or unstable condition, backfill selected by the District’s Representative shall be placed in the trench bottom.

C. Initial Backfill

1. After the pipe has been properly laid and inspected, initial backfill shall be placed around the pipe to a depth over the pipe as shown in the Drawings. The backfill material shall be placed in horizontal layers and compacted by power-operated tampers, rollers, or vibratory equipment to the relative compaction in accordance with Fill Requirements. Jetting of bedding or initial backfill is not allowed.

2. Each layer shall be compacted to the specified relative compaction prior to placing subsequent layers. The thickness of the loose layer may be increased when in-place compaction tests satisfactory to the District’s Representative show that the specified relative compaction can be obtained. No further backfilling will be permitted until the District’s Representative has accepted the initial backfill.

D. Subsequent Backfill

1. Above the level of initial backfill, the trench shall be filled with material as specified unless otherwise indicated on the Drawings. The backfill material shall be placed in horizontal layers and shall have a moisture content such that the required degree of compaction may be obtained. Each layer shall be compacted by power-operated tampers, rollers or other suitable equipment to the relative compaction as indicated in same table. Each layer shall be compacted to the specified relative compaction prior to placing subsequent layers.

3.05 Paving Subgrade Preparation

A. The prepared subgrade shall be scarified to a depth of at least 12 inches, moisture conditioned as necessary, and recompacted to at least 95 percent of the maximum relative compaction based on the ASTM D1557 test method.

B. Any localized zones of soft or pumping soils observed within the excavation base should either be scarified and recompacted as discussed above or be overexcavated and replaced with suitable material.
C. Aggregate base course shall be compacted to at least 95 percent of the maximum relative compaction based on the ASTM D1557 test method.

3.06 Site Fill

A. Unless otherwise specified general site fill material shall be Select Fill or Engineered Fill compacted to a relative compaction of at least 90 percent. If the existing slope in an area to be filled is steeper than 5:1, the Contractor shall bench the area prior to filling.

**END OF SECTION**
SECTION 02350
SHEETING, SHORING, AND BRACING

PART 1 - GENERAL

1.01 Summary
A. This section provides specifications for sheeting, shoring, bracing, or other excavation supports.

1.02 References
A. This section references the following documents. They are part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the most stringent requirement shall prevail.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA</td>
<td>Occupation Safety and Health Act, US Department of Health</td>
</tr>
<tr>
<td>CAL OSHA</td>
<td>State of California Construction Safety Orders – California State Labor Code</td>
</tr>
</tbody>
</table>

1.03 Quality Assurance
A. Design Requirements
  1. Protection and trench safety
     a. Pursuant to Section 6705 of the State Labor Code, all open excavations greater than 5 feet in depth shall be constructed with bracing, sheeting, shoring, or other equivalent method designed for the protection of life and limb.
     b. The trench excavation and support system shall comply in all respects with the requirements of Article 6, of the Construction Safety Orders of the Division of Industrial Safety.
     c. The Contractor's attention is directed to the provisions of Subarticle 1540 (4), Article 6 of the California Construction Safety Orders for alternative shoring and sloping system. It shall be the Contractor's responsibility to provide the additional strength required to support the sides of the excavation against loads which may exceed those employed to derive the criteria set forth in the Industrial Safety Orders.
     d. The Contractor shall submit to the District’s Representative a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system referenced standards, the plan shall be prepared and stamped by a California registered Civil Engineer. Plans must be accepted by the District’s Representative.
     e. It shall be understood that the above stipulated requirements are considered to be the minimum to be provided. The Contractor shall be solely responsible for any and all liabilities which may arise from the Contractor's failure to provide adequate shoring, bracing or sheeting as necessary to support the excavation under any or all of the conditions of loading which may exist, or which may arise during the construction of the project.
  2. Excavation for structures
     a. All excavations shall be properly shored, sheeted and braced or cut back to the proper slope to furnish safe working conditions, to prevent shifting of material, to prevent damage
to structures or other work, and to avoid delay to the Work, all in accordance with applicable safety and health regulations.

b. Before starting excavation for structures, the Contractor shall submit, for record purposes, complete design calculations and working drawings of proposed sheeting and bracing arrangements which have been prepared, signed and sealed by a California registered Civil Engineer.

c. Bracing shall be arranged so as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength. If the District’s Representative is of the opinion that, at any point, the sheeting or supports are inadequate or unsuited for the purpose, the District’s Representative may order the Contractor to resubmit design calculations and working drawings for that point, taking into consideration the observed field conditions.

d. If the new calculations show the need for additional sheeting and bracing, the Contractor shall immediately install it. The sole responsibility for the design, methods of installation, and adequacy of the sheeting and supports shall be and shall remain that of the Contractor. The working drawings for shoring, sheeting and bracing will not be checked by the District’s Representative.

3. Sequencing

a. The Contractor shall not start excavation until the trench support drawings have been returned to the Contractor.

b. When the construction sequence of structures requires the transfer of bracing to the completed portions of any structure, the Contractor shall secure the written acceptance of the District’s Representative prior to the installation of such bracing.

1.04 Submittals

A. The following shall be submitted in compliance with Section 01340 – Submittals Procedures:

1. Trench Support Drawings

a. In accordance with the requirements of Section 6705 of the Labor Code of the State of California, the Contractor shall submit detailed drawings to the District’s Representative before excavation, showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any trench or trenches 5 feet or more in depth.

b. The design shall be signed and stamped by a California registered Civil Engineer. The drawings will not be checked by the District’s Representative.

2. Permit and notification form for excavations 5 feet or more in depth as required by Cal-OSHA, including any trench excavation or shoring plans.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

A. The design, planning, installation and removal of all lagging, sheeting, shoring, sheet piling, and bracing shall be accomplished in such a manner as to maintain the undisturbed state of the soils adjacent to the trench and at and below the excavation bottom.

B. The use of horizontal strutting below the barrel of a pipe or the use of a pipe as a support will not be permitted.
C. Sheet piling and timbers in trench excavations shall be withdrawn in a manner so as to prevent subsequent settlement of the pipe or additional backfill loadings that might overload the pipe.

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. The work of this Section includes providing concrete formwork, bracing, shoring, and supports.
B. Related Sections
   03200  Reinforcement Steel
   03300  Cast-in-Place Concrete
   03315  Grout

1.02 References
A. Except as otherwise indicated, the current editions of the following apply to the work of this Section:
   PS 1    U.S. Product Standard for Concrete Forms, Class I
   ACI 117  Standard Tolerances for Concrete Construction and Materials
   ACI 318  Building Code Requirements for Reinforcing Concrete
   ACI 347  Recommended Practice for Concrete Formwork

1.03 Submittals
A. The following shall be submitted in compliance with Section 01340 – Submittals Procedures:
   1. Falsework Calculations and Drawings: The Contractor's attention is directed to the provisions of the California Division of Industrial Safety, Construction Safety Orders, which requires that all falsework or vertical shoring installations where the height of the falsework or vertical shoring, as measured from the top of the sills to the soffit of the superstructure, exceeds 14 feet, or where individual horizontal span lengths exceed 16 feet, or provision for vehicular or railroad traffic through falsework or vertical shoring is made, shall be approved and signed by a civil engineer, registered in the State of California; provided further, that a copy of the falsework plan or shoring layout shall be available on the job site at all times.
   2. Catalog information on:
      a. Form ties and all related accessories, including taper tie plugs, if taper ties are used
      b. Form gaskets
      c. Form release (“bond breaker”).

PART 2 - PRODUCTS

2.01 General
A. Materials for concrete forms and falsework shall be new or in new condition.
B. Except as otherwise expressly accepted, all lumber brought on the job site for use as forms, shoring, or bracing shall be new material or in new condition. All forms shall be smooth surface forms except as specified on contract drawings.
2.02 Form and Falsework Materials

A. Materials for concrete forms, formwork, and falsework shall conform to the following requirements:

1. Lumber shall be Douglas Fir or Southern Pine, construction grade or better, in conformance with U.S. Product Standard PS20.

2. Plywood for concrete formwork shall be waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Pine plywood manufactured especially for concrete formwork and shall conform to the requirements of PS 1 for Concrete Forms, Class I, and shall be edge sealed.

3. Form materials shall be metal, wood, plywood, or other approved material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line, and grade shown.

4. Unless otherwise indicated, all exterior corners in concrete members shall be provided with 3/4-inch or 5/8-inch chamfers. Re-entrant corners in concrete members shall not have fillets unless otherwise indicated.

B. Materials for formwork hardware and reinforcing spacers:

1. All formwork hardware left inside the concrete shall have at least 2" clear cover.

2. Concrete dobies are not permitted on the interior surface of fluid-containing structures.

PART 3 - EXECUTION

3.01 General

A. Tolerances: The variation from established grade or lines shall not exceed the tolerances of ACI 117.

B. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The Contractor shall assume full responsibility for the adequate design of all forms, and any forms which are unsafe or inadequate in any respect shall promptly be removed from the work and replaced at the Contractor's expense. A sufficient number of forms of each kind shall be provided to permit the required rate of progress to be maintained. The design and inspection of concrete forms, falsework, and shoring shall comply with applicable local, state and Federal regulations. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by Contractor's personnel and by the Engineer and shall be in sufficient number and properly installed. During concrete placement, the Contractor shall continually monitor plumb and string line form positions and immediately correct deficiencies.

C. Concrete forms shall conform to the shape, lines, and dimensions of members as called for on the Drawings, and shall be substantial, free from surface defects, and sufficiently tight to prevent leakage. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly-placed concrete within 1/8” at exposed surfaces and ¼” elsewhere.

D. At exposed surfaces, plywood, grain, or other formwork irregularities shall not imprint concrete surface.

3.02 Form Design

A. All forms shall be true in every respect to the required shape and size, shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends.
of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete.

B. The forms shall be tight so as to prevent the loss of water, cement and fines during placing and vibrating of the concrete. Adequate clean-out holes shall be provided at the bottom of each lift of forms. The size, number, and location of such clean-outs shall be as acceptable to the Engineer. Whenever concrete cannot be placed from the top of a wall form in a manner that meets the requirements of the Contract Documents, form windows shall be provided in the size and spacing needed to allow placement of concrete to the requirements of Section 03300 – Cast-in-Place Concrete. The size, number, and location of such form windows shall be acceptable to the Engineer.

C. Form windows are required for wall pour depths greater than 25 feet tall. At least one window shall be provided for each pour, but no less than one per 60 linear feet of horizontal wall length.

D. Forming systems for walls taller than 14 feet or horizontal spans greater than 16 feet require a formal and site-specific design and submittal, stamped by a licensed civil engineer.

E. Forms and falsework to support the roof and floor slabs shall be designed based on nationally recognized standards, but in no circumstance be less than the total dead load, plus a live load of 50 psf for horizontal surfaces, and a lateral load of 100 lbs per foot at top of forms.

F. Lateral pressures used for form design shall conform to ACI 347-latest edition, but in no case be less than 60 lbs per cubic foot multiplied by the depth of the forms for continuous pours.

3.03 Construction

A. Vertical Surfaces: All vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is shown. Not less than 1-inch of concrete shall be added to the thickness of the concrete member as shown where concrete is permitted to be placed against trimmed ground in lieu of forms. Where soil slope or face cannot hold its shape during concrete operations, formwork shall be used.

B. Construction Joints: Concrete construction joints will not be permitted at locations other than those shown or specified, except as may be acceptable to the Engineer. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete.

C. Pipe stubs and anchor bolts shall be set in the forms where required.

D. Form Ties

1. Embedded Ties: Holes left by the removal of form tie cones shall be reamed with suitable toothed reamers so as to leave the surface of the holes clean and rough before being filled with mortar as indicated in Section 03300 – Cast-in-Place Concrete. Wire ties for holding forms will not be permitted. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete members. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 1.5 inches back from the formed face or faces of the concrete.

2. Removable Ties: The larger end of the taper tie shall be on the wet side of walls in water retaining structures. After the taper tie is removed, the hole shall be thoroughly cleaned and roughened for bond. A precast neoprene or polyurethane tapered plug shall be located at the wall centerline. The hole shall be completely filled with non-shrink grout for water bearing and
below-grade walls. The hole shall be completely filled with non-shrink or regular cement grout for above-grade walls that are dry on both sides. Exposed faces of walls shall have the outer 2 inches of the exposed face filled with a polymer-modified cement grout that shall match the color and texture of the surrounding wall surface.

3. Factor of safety = 2.0 against tensile failure

3.04 Reuse of Forms
A. Forms may be reused only if in good condition and only if acceptable to the Engineer. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on all exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces that are permanently exposed to view. In the case of forms for the inside wall surfaces of hydraulic/water retaining structures, unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the Engineer.

3.05 Removal of Forms
A. Careful procedures for the removal of forms shall be strictly followed, and this work shall be done with care so as to avoid injury to the concrete. No heavy loading on green concrete will be permitted. In the case of roof slabs and above-ground floor slabs, forms shall remain in place until test cylinders for the roof concrete attain a minimum compressive strength of 75 percent of the 28-day strength specified in Section 03300 – Cast-in-Place Concrete; provided, that no forms shall be disturbed or removed under an individual panel or unit before the concrete in the adjacent panel or unit has attained 75 percent of the specified 28-day strength and has been in place for a minimum of 7 days. The time required to establish said strength shall be as determined by test cylinder results from concrete used in the first pour. If the time so determined is more than the 7-day minimum, then that time shall be used as the minimum length of time. Forms for all vertical walls and columns shall remain in place at least 1 day after the concrete has been placed, provided that average air temperature is between 10 degrees F and 115 degrees F and concrete has sufficient strength to maintain form.
B. Apply curing as required after form removal.

3.06 Maintenance of Forms
A. Forms shall be cleaned, treated with a releasing agent, and maintained in accordance with ACI 347 and the following. The form surfaces shall be treated with a nonstaining mineral oil or other lubricant acceptable to the Engineer. Any excess lubricant shall be satisfactorily removed before placing the concrete. Care shall be exercised to keep oil off the surfaces of steel reinforcement and other metal items to be embedded in concrete.

3.07 Falsework
A. Falsework, including staging, walkways, forms, ladders, and similar appurtenances, shall be designed, engineered, constructed, and maintained according to the applicable requirements of the provisions of the OSHA Safety and Health Standards for Construction, and the requirements of the Construction Safety Orders of the California Division of Industrial Safety.

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. The work of this Section includes providing all concrete reinforcement steel, welded wire fabric, couplers, and concrete inserts for use in reinforced concrete and masonry construction, including all the wires, clips, supports, chairs, spacers, and other accessories.

1.02 Related Sections
03100 Concrete Formwork
03300 Cast-in-Place Concrete

1.03 References
ACI 315 Details and Detailing of Concrete Reinforcement
ACI 318 Building Code Requirements for Reinforced Concrete
CRSI MSP-1 Concrete Reinforcing Steel Institute Manual of Standard Practice
WRI Manual of Standard Practice for Welded Wire Fabric
AWS D1.4 Structural Welding Code - Reinforcing Steel
ASTM A82 Specification for Steel Wire, Plain, for Concrete Reinforcement
ASTM A185 Specification for Welded Steel Wire Fabric For Concrete Reinforcement
ASTM A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 706 Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
ASTM A775 Specification for Epoxy-Coated Reinforcing Steel Bars

1.04 Submittals
A. The following shall be submitted in accordance with Section 01340 – Submittals Procedures:
   1. Reinforcing Shop Drawings
      1) Bill of Materials
      2) Placing Drawing
      3) Splices
      4) Mechanical Splices
      5) Shop Bending Diagrams
      6) Embeds
      7) Anchor Bolts
      8) Sleeves
      9) Gates
     10) Conduits
     11) Dowels
2. General contractor shall coordinate all of the various discipline and subcontractor submittal prior to submitting for review by the engineer of record.

3. Mill certificates for all reinforcing at time of site delivery

4. Proof of CRSI membership, or equivalent trade membership

B. Details of the concrete reinforcement steel and concrete inserts shall be submitted by the Contractor at the earliest possible date. Details of reinforcement steel for fabrication and erection shall conform to ACI 315 and the requirements indicated. The shop bending diagrams shall show the actual lengths of bars, to the nearest inch measured to the intersection of the extensions (tangents for bars of circular cross section) of the outside surface. The shop drawings shall include bar placement diagrams that clearly indicate the dimensions of each bar splice.

C. Where mechanical couplers are required or permitted to be used to splice reinforcement steel, manufacturer's literature shall be submitted which contains instructions and recommendations for installation for each type of coupler used; furnish current research reports by ICC.

D. If reinforcement steel is spliced by welding at any location, the Contractor shall use A 706 reinforcing. All welding shall comply with AWS D1.4. The Contractor shall submit a written welding procedure ("WPS") for each type of weld for each size of bar which is to be spliced by welding.

1.05 Storage

A. Reinforcing, embeds and accessories shall be kept clean and free from dirt or grease.

PART 2 - PRODUCTS

2.01 Reinforcement Steel

A. Reinforcement steel for all cast-in-place reinforced concrete construction shall conform to the following requirements:

1. Bar reinforcement shall conform to the requirements of ASTM A 615 or A 706 for Grade 60 Billet Steel Reinforcement.

2. Welded wire fabric reinforcement shall conform to the requirements of ASTM A185 or deformed ASTM A497 and as indicated; provided, that welded wire fabric with longitudinal wire of W4 size wire and smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches; and provided further, that welded wire fabric with longitudinal wires larger than W4 size shall be furnished in flat sheets only.

B. Accessories

1. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcement during concrete placement. All bar supports shall meet the requirements of the CRSI Manual of Standard Practice including special requirements for supporting epoxy coated reinforcing bars. Wire bar supports shall be CRSI Class 1 for maximum protection with a 1/8-inch minimum thickness of plastic coating. Plastic shall be gray in color.

2. Concrete blocks (dobies), used to support and position reinforcement steel, shall have the same or higher compressive strength as specified for the concrete in which it is located, and be used for horizontal bars at grade only. Wire ties shall be embedded in concrete block bar supports. Concrete blocks shall not be used on the inside face of hydraulic structures.

3. Epoxy coating for reinforcing and accessories, where specified or shown, shall conform to ASTM A775.
2.02 Mechanical Couplers
A. Mechanical couplers shall be provided where shown and where approved. The couplers shall be Type 2, as determined by ACI 318.
B. Where the type of coupler used is composed of more than one component, all components required for a complete splice shall be supplied. This shall apply to all mechanical splices, including those splices intended for future connections.
C. Approved couplers are Bar-Lock (Dayton) or Xtender (HRC) or equal.

PART 3 - EXECUTION

3.01 General
A. All reinforcement steel, welded wire fabric and other reinforcement shall be free of materials deleterious to bond. Minor rust that is not scaling or loose is acceptable.

3.02 Fabrication
A. Reinforcement steel shall be accurately formed to the dimensions and shapes shown, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318, except as indicated. Bars shall be bent cold.
B. Fabricating Tolerances: Bars used for concrete reinforcement shall meet the fabricating tolerances defined in ACI 315.

3.03 Placing
A. Reinforcement steel shall be accurately positioned and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcement steel shall be supported by concrete, plastic or metal supports, spacers or metal hangers that are strong and rigid enough to prevent any displacement of the reinforcement steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used, in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. All concrete blocks used to support reinforcement steel shall be tied to the steel with wire ties that are embedded in the blocks. For concrete over formwork, the Contractor shall furnish concrete, metal, plastic, or other acceptable bar chairs and spacers.
B. Limitations on the use of bar support materials shall be as follows.
   1. Concrete Dobies: permitted at all locations except where architectural finish is required, or at interior side of fluid-containing wall.
   2. Wire Bar Supports: permitted only at slabs over dry areas, interior dry wall surfaces, and exterior wall surfaces.
   3. Plastic Bar Supports: permitted at all locations except on grade.
C. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.
D. Unless otherwise specified, reinforcement placing tolerances shall be within the limits specified in ACI 318 and ACI 117.
E. Bars may be moved as necessary to avoid interference with other reinforcement steel, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be subject to the approval of the Engineer.
F. Welded wire fabric reinforcement placed over horizontal forms shall be supported on slab bolsters. Slab bolsters shall be spaced not more than 30 inches on centers, shall extend continuously
across the entire width of the reinforcement mat, and shall support the reinforcement mat in the
plane indicated.

G. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies)
spaced not more than 3 feet on centers in any direction.

H. Epoxy coated reinforcing bars shall be stored, transported, and placed in such a manner as to
avoid chipping of the epoxy coating. Non-abrasive slings made of nylon and similar materials
shall be used. Specially coated bar supports shall be used. All chips or cracks in the epoxy
coating shall be repaired with a compatible epoxy repair material prior to placing concrete.

I. Accessories supporting reinforcing bars shall be spaced such that there is no deflection of the
accessory from the weight of the supported bars. When used to space the reinforcing bars from
wall forms, the forms and bars shall be located so that there is no deflection of the accessory
when the forms are tightened into position.

J. Tack welding of reinforcing bar is prohibited.

3.04 Splicing

A. General: Reinforcement bar splices shall only be used at locations indicated. When it is
necessary to splice reinforcement at points other than where shown, locations and details shall be
included on shop drawings.

B. Bending or Straightening: Reinforcement shall not be straightened or rebent in a manner that will
injure the material. Bars with kinks or bends not shown shall not be used. All bars shall be bent
cold, unless otherwise permitted by the Engineer. Bars partially embedded in concrete may be
field-bent one time at an angle up to 30 degrees, and bent back to its original position. Rebending
more than once will render the bar unacceptable.

C. Couplers that are located at a joint face shall be a type that can be set either flush or recessed
from the face as shown. The couplers shall be sealed during concrete placement to completely
eliminate concrete or cement paste from entering. Couplers intended for future connections shall
be recessed a minimum of 1/2 inch from the concrete surface. After the concrete is placed, the
coupler shall be plugged with plastic plugs that have an O-ring seal and the recess filled with
sealant to prevent any contact with water or other corrosive materials. Threaded couplers shall be
plugged. Maintain minimum edge distance and concrete cover. Couplers shall be installed as
required by manufacturer.

3.05 Cleaning and Protecting

A. Reinforcement steel shall at all times be protected from conditions conducive to corrosion until
concrete is placed around it. Mild non-flaking surface rust is acceptable.

B. The surfaces of all reinforcement steel and other metalwork to be in contact with concrete shall be
thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign
substances immediately before the concrete is placed. Where there is delay in depositing
concrete, reinforcement shall be reinspected and, if necessary recleaned.

3.06 Inspection

A. Testing Agency shall be provided at least 24 hours advance notice to schedule inspections as
required by the contract drawings and building code.

**END OF SECTION**
SECTION 03280
JOINTS IN CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 Description
A. The work of this Section includes providing expansion joints, contact joints, and shrinkage contraction (weakened plane) joints in concrete pavement, sidewalk, curb and gutter.
B. Related Sections
   03100 Concrete Formwork
   03300 Cast-in-Place Concrete

1.02 References
   ASTM D1751  Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
   ASTM D994  Preformed Expansion Joint Filler for Concrete (Bituminous Type)

1.03 Submittals
A. The following shall be submitted in compliance with Section 01340-Submittals:
   1. Placement shop drawings showing the location and type of all joints
   2. Catalog cuts and samples of the preformed expansion joint filler material including complete product data

PART 2 - PRODUCTS

2.01 Pre-molded Joint Filler
A. Pre-molded joint filler shall be either Preformed Expansion Joint Filler (ASTM D994) or Non-extruding and Resilient Filler (ASTM D1751) as indicated.

PART 3 - EXECUTION

3.01 Expansion Joints
A. Expansion joints in concrete pavement shall be constructed in accordance with the configuration of the joint as indicated on the drawings.
   1. Expansion joint filler: min. 1/2 inch; max. 3/4 inch
   2. After concrete has been finished, a tooled edge shall be formed on each side of the expansion joint.
   3. Clean all concrete from the expansion joint filler.

3.02 Shrinkage Control Joints (Weakened Plane Joints)
A. Shrinkage control joints in concrete pavement shall be a tooled or sawcut joint and comply with the configuration of the joint as indicated on the drawings.
SECTION 03290
JOINTS IN CONCRETE STRUCTURES

PART 1 - GENERAL

1.01 Summary
A. The work of this section includes providing the construction joints, contraction joints, expansion joints, and control joints in structural concrete, including waterstops, joint fillers, and joint sealants.
B. Related Sections

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>03100</td>
<td>Concrete Formwork</td>
</tr>
<tr>
<td>03200</td>
<td>Reinforcement Steel</td>
</tr>
<tr>
<td>03300</td>
<td>Cast-in-Place Concrete</td>
</tr>
<tr>
<td>07900</td>
<td>Sealants</td>
</tr>
</tbody>
</table>

1.02 References
A. Except as otherwise indicated, the current editions of the following apply to the work of this Section.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACI 224.3</td>
<td>Joints in Concrete Construction.</td>
</tr>
<tr>
<td>ASTM D 746</td>
<td>Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.</td>
</tr>
<tr>
<td>ASTM D1751</td>
<td>Preformed Expansion Joint Fillers for concrete paving and Structural Construction (non extruding and resilient bituminous types)</td>
</tr>
<tr>
<td>TT-S-0227E(3)</td>
<td>Sealing Compound, Elastomeric Type, Multi-component for Caulking, Sealing, and Glazing Buildings and Other Structures</td>
</tr>
<tr>
<td>ASTM D624</td>
<td>Test Method for Rubber Property - Tear Resistance</td>
</tr>
<tr>
<td>ASTM D1056</td>
<td>Specification for Flexible Cellular Materials - Sponge or Expanded Rubber</td>
</tr>
<tr>
<td>ASTM D1752</td>
<td>Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction</td>
</tr>
<tr>
<td>ASTM D2240</td>
<td>Test Method for Rubber Property - Durometer Hardness</td>
</tr>
<tr>
<td>CRD-C572</td>
<td>PVC Waterstop</td>
</tr>
<tr>
<td>TT-S-0227E(3)</td>
<td>Sealing Compound, elastomeric type, Multi-component for Caulking, Sealing, and Glazing Buildings and Other Structures</td>
</tr>
</tbody>
</table>
1.03 Definitions

A. Construction Joints: When fresh concrete is placed against a concrete surface, with or without reinforcement, the joint between the two pours is called a construction joint. Unless noted by contract drawings, construction joints transfer full stresses across joint.

B. Contraction Joints: Contraction joints are similar to construction joints except that the fresh concrete shall not bond to the hardened surface of the first pour, which shall be coated with a bond breaker applied to a smooth, non-keyed surface. A portion of the slab on-grade reinforcement may be stopped 3 inches from the joint to allow shrinkage of the concrete of the second pour. Waterstop and/or sealant groove shall also be provided when specified or shown.

C. Expansion Joints: To allow the concrete to expand freely, a space is provided between the two pours, the joint shall be formed as shown. This space is obtained by placing a filler joint material against the first pour, which acts as a form for the second pour. Unless otherwise specified, all expansion joint shall be provided with a center-bulb type waterstop.
   1. Premolded expansion joint material shall be installed with the edge at the indicated distance below or back from finished concrete surface, and shall have a slightly tapered, dressed, and oiled wood strip secured to or placed at the edge thereof during concrete placement, which shall later be removed to form space for sealing material.
   2. The space so formed shall be filled with a joint sealant material. In order to keep the two wall or slab elements in line the joint shall also be provided with a sleeve-type dowel as shown on the contract drawings.

1.04 Submittals

A. The following shall be submitted in compliance with Section 01330 – Submittals Procedures:

B. Waterstops: Prior to production of the material required under this contract, qualification samples shall be submitted. Such samples shall consist of extruded or molded sections of each size or shape to be used, and shall be accomplished so that the material and workmanship represents in all respects the material to be furnished under this contract. The balance of the material to be used under this contract shall not be produced until after the Engineer has reviewed the qualification samples.

C. Waterstop Samples: Prior to use of the waterstop material in the field, a sample of a fabricated mitered cross and a tee constructed of each size or shape of material to be used shall be submitted. These samples shall be fabricated so that the material and workmanship represent in all respects the fittings to be furnished under this contract.

D. Joint Sealant: Prior to ordering the sealant material, the Contractor shall submit sufficient data to show general compliance with the requirements of the Contract Documents.

E. Joint Location: The Contractor shall submit placement shop drawings showing the location and type of all joints for each structure where not shown on the Contract Documents.

F. Certified test reports from the sealant manufacturer on the actual batch of material being supplied indicating compliance with the above requirements shall be furnished before the sealant is used on the job.

G. Shipping Certification: The Contractor shall provide written certification from the manufacturer as an integral part of the shipping form, to show that all of the material shipped to this project meets or exceeds the physical property requirements of the Contract Documents.
1.05 Services of Manufacturer
A. Before work is commenced, the Contractor shall arrange for a representative of the sealant manufacturer to instruct the crew doing the work on the proper methods of mixing and applying the sealant.

1.06 Inspection and Testing
A. Waterstop Inspection: It is required that all waterstop field joints shall be subject to inspection, and no such work shall be scheduled or started without having made prior arrangements schedule required inspections.
B. All field joints in waterstops shall be subject to rigid inspection for misalignment, bubbles, inadequate bond, porosity, cracks, offsets, and other defects that would reduce the potential resistance of the material to water pressure at any point. All defective joints shall be replaced with material which shall pass said inspection, and all faulty material shall be removed from the site and disposed of by the Contractor at its own expense.
C. Construction Joint Sealant: The Contractor shall prepare adhesion and cohesion test specimens as specified herein, at intervals of 5 working days while sealants are being installed.
D. The sealant material shall show no signs of adhesive or cohesive failure when tested in accordance with the following procedure in laboratory and field tests:
   1. Sealant specimen shall be prepared between 2 concrete blocks (1-inch by 2-inch by 3-inch). Spacing between the blocks shall be 1-inch. Coated spacers (2-inch by 1-1/2-inch by 1/2-inch) shall be used to insure sealant cross-sections of 1/2-inch by 2 inches with a width of 1-inch.
   2. Sealant shall be cast and cured according to manufacturer's recommendations except that curing period shall not exceed 24 hours.
   3. Following curing period, the gap between blocks shall be widened to 1-1/2-inch. Spacers shall be used to maintain this gap for 24 hours prior to inspection for failure.

1.07 Guarantee and Maintenance
A. The Contractor shall provide a 5-year written guarantee of the entire sealant installation against faulty and/or incompatible materials and workmanship, together with a statement that it agrees to repair or replace, to the satisfaction of the District, at no additional cost to the District, any such defective areas which become evident within said 5-year guarantee period.

PART 2 - PRODUCTS
2.01 General
A. All joint materials specified herein shall be classified as acceptable for potable water use by EPA or NSF.

2.02 PVC Waterstops
A. General: Waterstops shall be extruded from an elastomeric polyvinyl chloride compound containing the plasticizers, resins, stabilizers, and other materials necessary to meet the requirements of these Specifications. No reclaimed or scrap material shall be used.
B. Flatstrip and Center-Bulb Waterstops: Flatstrip and center-bulb waterstops shall be as indicated; provided, that at no place shall the thickness of flat strip waterstops, including the center bulb type, be less than 3/8-inch.
C. Multi-Rib Waterstops: Multi-rib waterstops, where required, shall be as indicated. Prefabricated joint fittings shall be used at all intersections of the ribbed-type waterstops.

D. Waterstop Testing Requirements: When tested in accordance with the specified test standards, the waterstop material shall meet or exceed the following requirements:

<table>
<thead>
<tr>
<th>Physical Property, Sheet Material</th>
<th>Value</th>
<th>ASTM Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength-min (psi)</td>
<td>1750</td>
<td>D638, Type IV</td>
</tr>
<tr>
<td>Ultimate Elongation-min (percent)</td>
<td>350</td>
<td>D638, Type IV</td>
</tr>
<tr>
<td>Low Temperature Brittleness-Maximum (between 10 degrees F and 115 degrees F)</td>
<td>-35</td>
<td>D746</td>
</tr>
<tr>
<td>Stiffness in Flexure-min (psi)</td>
<td>400</td>
<td>D747</td>
</tr>
<tr>
<td>Accelerated Extraction (CRD-C572)</td>
<td>1500</td>
<td>D638, Type IV</td>
</tr>
<tr>
<td>Effect of Alkalies (CRD-C572)</td>
<td>+0.25/-0.10</td>
<td>-</td>
</tr>
<tr>
<td>Hardness, Shore A</td>
<td></td>
<td>D2240</td>
</tr>
</tbody>
</table>

2.03 Joint Sealant

A. Joint sealant shall be polyurethane polymer designed for bonding to concrete that is continuously submerged in water. No material will be acceptable which has an unsatisfactory history as to bond or durability when used in the joints of water retaining structures.

B. Joint sealant material shall meet the following requirements (between 10 degrees F and 115 degrees F and 50 percent Relative Humidity):

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Life</td>
<td>45 - 180 minutes</td>
</tr>
<tr>
<td>Time to Reach 20 Shore &quot;A&quot; Hardness (between 10 degrees F and 115 degrees F, 200 gr quantity)</td>
<td>24 hours, maximum</td>
</tr>
<tr>
<td>Ultimate Hardness (ASTM D 2240)</td>
<td>20 - 45 Shore &quot;A&quot;</td>
</tr>
<tr>
<td>Tensile Strength (ASTM D 412)</td>
<td>200 psi, minimum</td>
</tr>
<tr>
<td>Ultimate Elongation (ASTM D 412)</td>
<td>400 percent, minimum</td>
</tr>
<tr>
<td>Tear Resistance (Die C ASTM D 624)</td>
<td>75 pounds per inch of thickness, minimum</td>
</tr>
<tr>
<td>Color</td>
<td>Light Gray</td>
</tr>
</tbody>
</table>

C. All polyurethane sealants for waterstop joints in concrete shall conform to the following requirements:

1. Sealant shall be 2-part polyurethane with the physical properties of the cured sealant conforming to or exceeding the requirements of ANSI/ASTM C920 Type M or Federal Specification TT-S-00227 E(3) for 2-part material, as applicable.
2. For vertical joints and overhead horizontal joints, only "non-sag" compounds shall be used; all such compounds shall conform to the requirements of ANSI/ASTM C920 Class 25, Grade NS, or Federal Specification TT-S-0027 E(3), Type II, Class A.

3. For plane horizontal joints, the self-leveling compounds which meet the requirements of ANSI/ASTM C920 Class 25, Grade P, or Federal Specification TT-S-0027 E(3), Type I shall be used. For joints subject to either pedestrian or vehicular traffic, a compound providing non-tracking characteristics, and having a Shore "A" hardness range of 35 to 45, shall be used.

D. Primer materials, if recommended by the sealant manufacturer, shall conform to the printed recommendations of the sealant manufacturer.

E. Sealants for non-waterstop joints in concrete shall conform to the requirements of Section 07900 - Sealants.

2.04 Joint Materials

A. Bearing Pad: Bearing pad to be neoprene conforming to ASTM D1752 Type I, 40 Durometer hardness unless otherwise noted.

B. Neoprene Sponge: Sponge to be neoprene, closed-cell, expanded, conforming to ASTM D1056, type RE-45-E1, with a compression deflection, 25 percent deflection (limits), 119 to 168 kPa (17 to 24 psi) minimum.

C. Preformed Joint Filler: Preformed joint filler material shall be of the preformed non-extruding type joint filler constructed of cellular neoprene sponge rubber or polyurethane of firm texture. Bituminous fiber type will not be permitted. All non-extruding and resilient-type preformed expansion joint fillers shall conform to the requirements and tests set forth in ASTM D1752 for Type I, except as otherwise specified herein.

2.05 Backing Rod

A. Backing rod shall be an extruded closed-cell, polyethylene foam rod. The material shall be compatible with the joint sealant material used and shall have a tensile strength of not less than 40 psi and a compression deflection of approximately 25 percent at 8 psi. The rod shall be 1/8-inch larger in diameter than the joint width except that a one-inch diameter rod shall be used for a 3/4-inch wide joint.

2.06 Bond Breaker

A. Bond breaker shall not be used except as detailed. Brush-on application shall not be substituted for bond-breaker tape.

2.07 Bentonite Waterstop

A. Where called for, bentonite type waterstop, which shall expand in the presence of water to form a watertight joint seal without damaging the concrete in which it is cast, shall be provided.

B. The bentonite waterstop shall be composed of 75 percent bentonite. The balance of the material shall be butyl rubber-hydrocarbon with less than 1.0 percent volatile matter. The waterstop shall contain no asbestos fibers or asphaltics.

C. The manufacturer's rated application temperature range shall be from between 10 degrees F and 115 degrees F. The service temperature range shall be from between 10 degrees F and 115 degrees F.

D. The waterstop shall be provided with an adhesive backing which will provide adhesion to concrete surfaces.
2.08 Slip Dowels
A. Slip dowels in joints shall be smooth hot-dip galvanized steel (A36).

2.09 Manufacturers
A. Products shall be manufactured by one of the following (or equal):
   1. Flatstrip and Center-Bulb Waterstops
      a. Kirkhill Rubber Company
      b. Water Seals, Incorporated
      c. Greenstreak Plastic Products Company
      d. Sika Corporation
   2. Multi-Rib Waterstops
      a. Water Seals, Incorporated
      b. Greenstreak Plastic Products Company
      c. Sika Corporation
   3. Sealants
      a. Elastothane 227R by Pacific Polymers
      b. Sikaflex 2C by Sika Corporation
   4. Bond Breaker
      a. Super Bond Breaker by Burke Company
      b. 3M Bond Breaker tape

PART 3 - EXECUTION

3.01 Waterstops - General
A. Waterstops of the type specified herein shall be embedded in the concrete across joints as shown. All waterstops shall be fully continuous for the extent of the joint. Splices necessary to provide such continuity shall be accomplished in conformance to printed instructions of manufacturer of the waterstops. The Contractor shall take suitable precautions and means to support and protect the waterstops during the progress of the work and shall repair or replace at its own expense any waterstops damaged during the progress of the work. All waterstops shall be stored so as to permit free circulation of air around the waterstop material.

B. When any waterstop is installed in the concrete on one side of a joint, while the other half or portion of the waterstop remains exposed to the atmosphere for more than 2 days, suitable precautions shall be taken to shade and protect the exposed waterstop from direct rays of the sun during the entire exposure and until the exposed portion of the waterstop is embedded in concrete.

3.02 Splices in Waterstops
A. Splices in waterstops shall be performed by heat sealing the adjacent waterstop sections in accordance with the manufacturer's printed recommendations. It is essential that:
   1. The material not be damaged by heat sealing.
2. The splices have a tensile strength of not less than 60 percent of the unspliced materials tensile strength.

3. The continuity of the waterstop ribs and of its tubular center axis be maintained.

B. Butt joints of the ends of 2 identical waterstop sections may be made while the material is in the forms.

C. All joints with waterstops involving more than 2 ends to be jointed together, and all joints which involve an angle cut, alignment change, or the joining of 2 dissimilar waterstop sections shall be prefabricated by the Contractor prior to placement in the forms, allowing not less than 24-inch long strips of waterstop material beyond the joint. Upon being inspected and approved, such prefabricated waterstop joint assemblies shall be installed in the forms and the ends of the 24-inch strips shall be butt welded to the straight run portions of waterstop in place in the forms.

D. Where a centerbulb waterstop intersects and is jointed with a non-centerbulb waterstop, care shall be taken to seal the end of the centerbulb, using additional PVC material if needed.

3.03 Joint Construction

A. Setting Waterstops

1. To eliminate faulty installation that may result in joint leakage, particular care shall be taken of the correct positioning of the waterstops during installation. Adequate provisions must be made to support and anchor the waterstops during the progress of the work and to insure the proper embedment in the concrete. The symmetrical halves of the waterstops shall be equally divided between the concrete pours at the joints. The center axis of the waterstops shall be coincident with the joint openings. Maximum density and imperviousness of the concrete shall be insured by thoroughly working it in the vicinity of all joints.

2. In placing flat-strip waterstops in the forms, means shall be provided to prevent them from being folded over by the concrete as it is placed. Unless otherwise shown, all waterstops shall be held in place with continuous wood formwork. Horizontal waterstops, with their flat face in a vertical plane, shall be held in place with continuous supports to which the top edge of the waterstop shall be tacked. In placing concrete around horizontal waterstops, with their flat face in a horizontal plane, concrete shall be worked under the waterstops by hand so as to avoid the formation of air and rock pockets.

3. In placing centerbulb waterstops in expansion joints, the centerbulb shall be centered on the joint filler material.

4. Waterstop in vertical wall joints shall stop 6 inches from the top of the wall where such waterstop does not connect with any other waterstop and is not to be connected to for a future concrete placement.

B. The following waterstop defects represent a partial list of defects which shall be grounds for rejection:

1. Offsets at joints greater than 1/4-inch or 15 percent of material thickness, at any point, whichever is less.

2. Exterior crack at joint, due to incomplete bond, which is deeper than 1/16-inch or 15 percent of material thickness, at any point, whichever is less.

3. Any combination of offset or exterior crack which will result in a net reduction in the cross section of the waterstop in excess of 1/16-inch or 15 percent of material thickness at any point, whichever is less.

4. Misalignment of joint that results in misalignment of the waterstop in excess of 1/2-inch in 10 feet.
5. Porosity in the welded joint as evidenced by visual inspection.

6. Bubbles or inadequate bonding that can be detected with a penknife test. (If, while prodding the entire joint with the point of a pen knife, the knife breaks through the outer portion of the weld into a bubble, the joint shall be considered defective.)

C. Joint Location: Construction joints, and other types of joints, shall be provided where shown. When not shown, construction joints shall be provided at 25-foot maximum spacing for all concrete construction, unless noted otherwise. Where joints are shown spaced greater than 40 feet apart, additional joints shall be provided to maintain the 25-foot maximum spacing. The location of all joints, of any type, shall be submitted to the Engineer for acceptance.

D. Joint Preparation: Special care shall be used in preparing concrete surfaces at joints where bonding between 2 sections of concrete is required. Unless otherwise shown, such bonding will be required at all horizontal joints in walls. Surfaces shall be prepared as required.

E. Construction Joint Sealant

1. Where groove and sealant is noted on the Drawings, construction joint shall be provided with tapered grooves that shall be filled with a construction joint sealant. The material used for forming the tapered grooves shall be left in the grooves until just before the grooves are cleaned and filled with joint sealant. After removing the forms from the grooves, all laitance and fins shall be removed, and the grooves shall be sand-blasted. The grooves shall be allowed to become thoroughly dry, after which they shall be blown out; immediately thereafter, they shall be primed, bond breaker tape placed in the bottom of the groove, and filled with the construction joint sealant. The primer used shall be supplied by the same manufacturer supplying the sealant. No sealant will be permitted to be used without a primer. Care shall be used to completely fill the sealant grooves. Areas designated to receive a sealant fillet shall be thoroughly cleaned, as outlined for the tapered grooves, prior to application of the sealant.

2. The primer and sealant shall be placed strictly in accordance with the printed recommendations of the manufacturer, taking special care to properly mix the sealant prior to application. The sides of the sealant groove shall not be coated with bond breaker, curing compound, or any other substance that would interfere with proper bonding of the sealant. All sealant shall achieve final cure at least 7 days before the structure is filled with water.

3. All sealant shall be installed by a competent waterproofing specialty Contractor who has a successful record of performance in similar installations.

4. Thorough, uniform mixing of 2-part, catalyst-cured materials is essential; special care shall be taken to properly mix the sealer before its application.

5. Any joint sealant which, after the manufacturer's recommended curing time for the job conditions of the work hereunder, fails to fully and properly cure shall be completely removed; the groove shall be thoroughly sandblasted to remove all traces of the uncured or partially cured sealant and primer, and shall be re-sealed with the specified joint sealant. All costs of such removal, joint treatment, re-sealing, and appurtenant work shall be at the expense of the Contractor.

F. Bentonite Waterstop:

1. Where a bentonite waterstop is called for, it shall be installed with the manufacturer's instructions and recommendations; except, as modified herein.

2. Bentonite waterstop shall only be used where complete confinement by concrete is provided. Bentonite waterstop shall not be used in expansion or contraction joints nor in the first 6 inches of any intersecting joint.
3. The bentonite waterstop shall be located as near as possible to the center of the joint and it shall be continuous around the entire joint. The minimum distance from the edge of the waterstop to the face of the member shall be 5 inches.

4. Where the thickness of the concrete member to be placed on the bentonite waterstop is less than 12 inches, the waterstop shall be placed in grooves formed or ground into the concrete. The groove shall be at least 3/4 inch deep and 1-1/4 inches wide. When placed in the groove, the minimum distance from the edge of the waterstop to the face of the member shall be 2.5 inches.

5. Where a bentonite waterstop is used in combination with PVC waterstop, the bentonite waterstop shall overlap the PVC waterstop for a minimum of 6 inches and shall be placed in contact with the PVC waterstop.

6. The bentonite waterstop shall not be placed when the temperature of the waterstop material is below 40 degrees F. The waterstop material may be warmed so that it shall remain between 10 degrees F and 115 degrees F during placement; however, means used to warm the material shall in no way harm the material or its properties. The waterstop shall not be installed where the air temperature falls outside the manufacturer's recommended range.

7. The concrete surface under the bentonite waterstop shall be smooth and uniform. The concrete shall be ground smooth if needed. Alternately, the bentonite waterstop shall be bonded to the surface using an epoxy grout that completely fills all voids and irregularities beneath the waterstop material. Prior to installation, the concrete surface shall be wire brushed to remove any laitance or other materials that may interfere with the bonding of epoxy.

8. The bentonite waterstop shall be secured in place with concrete nails and washers at 12-inch maximum spacing. This shall be in addition to the adhesive backing provided with the waterstop.

**END OF SECTION**
SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 Summary

A. The work of this Section includes providing finished cast-in-place concrete, sitework concrete, air placed concrete, including formwork, steel reinforcement, mixing, placing curing, and repairing.

B. Sitework concrete includes curbs, gutters, catch basins, sidewalks, steps on grade, pavements, fence and guard post embedment, underground duct bank encasement, and all concrete work indicated to be sitework concrete.

C. Related Sections

- 03100 Concrete Formwork
- 03200 Reinforcement Steel
- 03280 Joints in Concrete Pavement
- 03315 Grout
- 03400 Precast Concrete
- 07900 Sealants
- 09900 Protective Coating Systems

1.02 References

A. American Concrete Institute (ACI)

- ACI 117 Standard Tolerances for Concrete Construction and Materials
- ACI 301 Specifications for Structural Concrete for Buildings
- ACI 304 Guide for Measuring, Mixing, Transporting, and Placing Concrete
- ACI 305 Hot Weather Concreting
- ACI 306 Cold Weather Concreting
- ACI 308 Guide to Curing Concrete
- ACI 309 Consolidation of Concrete
- ACI 318 Building Code Requirements for Structural Concrete
- ACI 350 Environmental Engineering Concrete Structures

B. American Society for Testing and Materials (ASTM)

- ASTM C31 Practices for Making and Curing Concrete Test Specimens in the Field
- ASTM C33 Specification for Concrete Aggregates
- ASTM C39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
- ASTM C94 Specification for Ready-Mixed Concrete
- ASTM C143 Test Method for Slump of Portland Cement Concrete
- ASTM C150 Specification for Portland Cement
1.03 Definitions
A. “Contractor” includes the general contractor in direct contract with the District, subcontractor, or any tradesman responsible for construction.

B. “District’s Representative” includes the Inspector, Engineer of Record, or Construction Manager representing the District’s interests, and not directly compensated by the Contractor.

C. “Cold Weather” is defined as a period when, for more than 3 consecutive days, the following conditions exist:
   1. Average daily air temperature is less than 40 F degrees (5 C) and
   2. Air temperature is not greater than 50 F degrees (10 C) for more than one-half of any 24-hour period.

D. “Hot weather” is defined by any one of the following conditions:
   1. Ambient air temperature above 90 F degrees (32 C).

E. “Mass Concrete” refers to single pour cast-in-place concrete that is greater than 2’-10” thick, or an area larger than 500 square feet.

1.04 Submittals
A. General: All submittals must be provided for Engineer of Record approval at least 3 weeks prior to construction.

B. Submit concrete mix design for each concrete type per ACI 301:
   1. Mix proportions
   2. Concrete materials
   3. Admixtures
   4. Water test results
   5. Waterstop samples for hydraulic structures

C. Shrinkage test results from prior test mixes per ASTM C157 for hydraulic structures.

D. Curing methods and product data per ACI 301.

E. Repair procedures for repair per ACI 224.1 and ACI 301.
F. Special procedures for hot weather concreting.
G. Special procedures for cold weather concreting.
H. Special procedures for mass concrete.

1.05 Quality Assurance
A. Qualifications: All foremen supervising construction shall have a minimum of 3 years experience in similar work, and at least 3 previous projects of similar type, and shall be familiar with ACI 301.
B. Field Testing
   1. Daily inspection written reports shall be provided to the District’s Representative and engineer of record providing detailed information of work completed within 24 hours.
   2. During concrete placement, the following duties shall be performed by the special inspector to be designated by the District:
      a. Ambient air temperature test
      b. Concrete temperature test
      c. Concrete slump test
      d. Collection of samples for lab testing
      e. Confirm accuracy of batch ticket
   3. Pre-pour conference: after submittals have been provided and before construction has been commenced, a concrete conference shall be coordinated between the Inspector, Engineer of Record, and Contractor.
C. Lab Testing
   1. Compression testing per ACI 318 chapter 5.
   2. Shrinkage testing per ASTM C157 for hydraulic structures.
      a. One shrinkage test is required for the first batch of concrete, and every 500 cubic yards of fresh concrete thereafter.
      b. Acceptance criteria is 0.035% (0.00035) shrinkage at 28 days.

1.06 Project Conditions
A. Soil subgrade
   1. Prior to setting reinforcing and pouring concrete on soil, the geotechnical engineer of record shall approve of the soil.
B. Environmental Requirements:
   1. Concrete placement shall be limited to temperature ranges per ACI 301.
   2. Concrete placement shall be limited to weather conditions per ACI 301.
C. Wet weather construction. Between the months of October and April, the contractor shall provide a 2" thick minimum mud-mat and sump pit at the bottom of foundation excavations that will be open for more than 72 hours prior to structural concrete placement. In all cases, where rainwater has saturated the bottom of foundation excavation grade prior to structural concrete placement, the grade shall be recompacted prior to concrete placement.
PART 2 - PRODUCTS

2.01 General
A. Except as noted below, all products and materials used in proportioning, mixing, transport, placement, consolidation, curing, and repair shall satisfy ACI 301 and the Construction Drawings.

2.02 Materials
A. Concrete materials
   1. Aggregate per ACI 301
   2. Cementious materials per ACI 301
      a. Cement shall be portland cement.
      b. Fly ash shall be provided at 15% minimum, 25% maximum of cementious materials.
   3. Admixtures
      a. Provide as necessary to meet design and workability requirements
      b. Mixes for hydraulic structures require shrinkage-reducing admixture, such as Eclipse by W.R. Grace.
   4. Concrete shall be 5 sack (minimum) and shall have developed a minimum compressive strength of 2,500 pounds per square inch at 28 days.

B. Water shall be potable, and have the following limitations:
   1. Chlorides (as Cl) no more than 250 mg/L per EPA method 300.
   2. Sulfates (as S04) no more than 250 mg/L per EPA method 300.
   3. Total dissolved solids no more than 500 mg/L per EPA method 160.
   4. Water quality shall be analyzed by EPA methods. Test results shall be provided to the Engineer of Record for the first batch of concrete, and every 500 cubic yards of fresh concrete thereafter.

C. Curing compounds per ACI 301.

D. Concrete Sealer and Densifier
   1. Water based, colorless, VOC compliant.
   2. Product containing silicate and siliconate.
   3. Dayton Superior, Sure Hard Densifier J17; Euclid Chemical Company, Euco Diamond Hard; Master Builders, HD 200WB; or equal.

E. Miscellaneous Materials
   1. Waterstops are Greenstreak PVC 6" tall flat ribbed.
   2. Plugs for formwork wall tie holes are Dayton Sureplug A-58.
   3. For formwork ties that are left in place, provide plastic cone spacers for 1.5 inch breakback.

2.03 Equipment
   1. Equipment shall conform to ACI 301.
PART 3 - EXECUTION

3.01 General
A. Proportioning and mixing, preparation of surfaces for concreting, handling, transporting and placing concrete, finishing and curing concrete surfaces and related procedures shall be performed in accordance with Section 03300 – Cast-in-Place Structural Concrete.
B. Concrete shall not be cast in a line longer than 70 feet in a single day.
C. Delays between adjacent pours shall be at least 48 hours.
D. Sitework concrete cast against structural concrete shall be separated by building paper or other barrier to prevent bond, except as explicitly shown on the Drawings.
E. For non-structural paving, no single placement shall exceed 200 square feet or 14 feet in any direction without a shrinkage contraction joint.

3.02 Preparation
A. Construction shall not be commenced until the applicable submittals have been approved by the Engineer of Record, and the Inspector has been scheduled.
B. Reinforcing, embedded items, sleeves, and inserts shall be set and secured prior to fresh concrete placement. Interconnect anchor bolt groups with steel templates.
C. Construction Joints:
   1. Construction joints shall be water-blasted prior to casting fresh concrete against existing concrete.
   2. New concrete shall not be placed adjacent to existing concrete younger than 3 days old for hydraulic structures; 2 days otherwise.
D. Bonding agent shall not be used except where specially required on the Construction Drawings.
E. Formwork temperature is verified per ACI 301.
F. Subgrade or hardened concrete to be cast against conforms to ACI 301.

3.03 Installation
A. Placement of fresh concrete in forms per ACI 301.
B. Placement of fresh concrete on soil per ACI 301.
C. Placement of fresh concrete shall be limited to weather constraints per ACI 301.
D. Depositing fresh concrete per ACI 301 with the following requirements:
   1. For hot weather conditions, maximum time from batching to discharge shall not exceed 45 minutes.
   2. For normal weather conditions, maximum time from batching to discharge shall not exceed 60 minutes.
   3. Time between lift placement shall not exceed 30 minutes for hot weather placement; 60 minutes otherwise.
E. Consolidate fresh concrete per ACI 301.
F. Construction joints: Contractor shall not move construction joints from locations shown on Construction Drawings without approval by Engineer of Record.
G. Concrete Sealer and Densifier
1. Apply concrete sealer to all interior floor slabs.
2. Apply per manufacturer’s recommended procedures.
   a. Apply to freshly finished concrete or hardened concrete.
   b. Apply at recommended rates.
3. For hardened concrete thoroughly clean prior to application.
   a. Remove curing compound prior to application.

H. Finishing formed surfaces
1. Exposed edges shall have 5/8 inch chamfers.
2. Filling Tie Holes:
   a. No sooner than 14 days after formwork removal, clean and roughen the entire tie hole, and cone taper zone where exists, using an aggressive wire brush.
   b. Use Dayton Sure Plug A-58 to plug round tie holes on both wall faces.
   c. Recess plug back 1.0 inches deeper than face of wall or recess cone taper.
   d. Use Sikatop 123 Plus mortar or approved equal to fill and patch hole.

I. Finishing Unformed Surfaces:
1. Fresh concrete placement per ACI 301.
2. Finishes definitions per ACI 301 with the following requirements:
   a. Broom finish coarseness shall not exceed 1/16 inch amplitude, and shall be applied perpendicular to the predominate slope of the finished concrete.
   b. Scratch Finish may also be termed “Roughened Surface” on the Construction Drawings.
3. Finish schedule
   a. Scratch Finish shall be applied to:
      1) Construction joints.
      2) Surfaces intended to receive bonded cementious mixtures.
   b. Float Finish shall be applied to:
      1) Walks, drives, steps, ramps, and for surfaces intended to receive waterproofing, roofing, insulation, or tiling.
   c. Trowel Finish shall be applied to:
      1) Floor intended as interior walking surfaces.
      2) Exterior walking surfaces with less than 2 percent slope.
   d. Boom Finish shall be applied to:
      1) Exterior walking surfaces with more than 2 percent slope.
      2) Elevated slabs, overhangs, bridges where guardrailing is required.

J. Curing shall conform to ACI 301 with the following additional requirements
1. Where a protective coating will be applied to the concrete after curing, liquid (“membrane”) curing compounds shall not be used.
2. Where a liquid curing compound is used, the compound shall be pigmented. Pigmentation shall be removable without special chemicals.
K. Tolerances per ACI 117.

3.04 Protection
A. Protection shall be per ACI 301.

3.05 Repair
A. Repair shall be per ACI 301 with the following requirements:
   1. Patching mortar shall be Sikatop 123 Plus or approved equal.
   2. Use Sikadur 32 HiMod bonding agent or approved equal.
   3. Honeycombs and defects deeper than 38 mm (1.5 inches) shall require approval by Engineer of Record prior to commencing repair work.
   4. Cracks wider than 0.5 mm (0.02 inches) for hydraulic structures shall be repaired prior to leak testing.
   5. Cracks wider than 1 mm (0.04 inches) shall be repaired.

**END OF SECTION**
SECTION 03315
GROUT

PART 1 - GENERAL

1.01 Summary
A. The work of this Section includes providing grout other than that required for masonry work.
B. The following types of grout are included in the work of this Section:
   1. Non-Shrink Grout: This type of grout shall be used wherever grout is required, unless another type is specifically indicated.
   2. Cement Grout
   3. Topping Grout and Concrete Fill
C. Related Sections

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>03300</td>
<td>Cast-in-Place Concrete</td>
</tr>
</tbody>
</table>

D. Except as otherwise indicated, the current versions of the following apply to the work of this Section:

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRD-C 621</td>
<td>Corps of Engineers Specification for Non-shrink Grout</td>
</tr>
<tr>
<td>ASTM C109</td>
<td>Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in or 50-mm Cube Specimens)</td>
</tr>
<tr>
<td>ASTM C531</td>
<td>Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacings</td>
</tr>
<tr>
<td>ASTM C579</td>
<td>Test Methods for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacings</td>
</tr>
<tr>
<td>ASTM C827</td>
<td>Test Method for Early Volume Change of Cementitious Mixtures</td>
</tr>
<tr>
<td>ASTM D696</td>
<td>Test Method for Coefficient of Linear Thermal Expansion of Plastics</td>
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1.02 Submittals
A. The following shall be submitted in compliance with Section 01340 – Submittals Procedures:
   1. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, and appropriate uses for each type of non-shrink and epoxy grouts proposed for use in the work.
   2. Certified test results verifying the compressive strength, shrinkage, and expansion properties.

1.03 Quality Control
A. Field Tests
   1. When a project is used without documentation, compression test specimens will be taken during construction from the first placement of each type of grout, and at intervals thereafter as selected by the Engineer to insure continued compliance with these specifications.
2. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C 109. A set of three specimens will be made for testing at 7 days, 28 days, and each additional time period as appropriate.

3. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the District's representative. A set of three specimens will be made for testing at 7 days, and each earlier time period as appropriate.

B. The cost of all laboratory tests on grout will be borne by the District, but the Contractor shall assist the District’s representative in obtaining specimens for testing. However, the Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications. The Contractor shall supply all materials necessary for fabricating the test specimens.

PART 2 - PRODUCTS

2.01 Cement Grout
A. Cement grout mix design shall satisfy the same requirement as structural concrete, except that cement grout has no large aggregate requirement when the grout thickness is less than 3”.

2.02 Prepackaged Grouts
A. Non-Shrink Grout
   1. Non-shrink grout shall be a prepackaged, inorganic, non-gas-liberating, non-metallic, cement-based grout requiring the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout indicated herein shall be that recommended by the manufacturer for the particular application.

   2. Class A non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi; shall have no shrinkage (0.0 percent) and a maximum 4.0 percent expansion in the plastic state when tested in accordance with ASTM C827; and shall have no shrinkage (0.0 percent) and a maximum of 0.2 percent expansion in the hardened state when tested in accordance with CRD C 621.

   3. Class B non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi and shall meet the requirements of CRD C 621.

B. Application
   1. Class A non-shrink grout shall be used for the repair of all holes and defects in concrete members which are water bearing or in contact with soil or other fill material, grouting under all equipment base plates, and at all locations where grout is specified in the contract documents; except, for those applications for Class B non-shrink grout and epoxy grout indicated herein. Class A non-shrink grout may be used in place of Class B non-shrink grout for all applications.

   2. Class B non-shrink grout shall be used for the repair of all holes and defects in concrete members which are not water-bearing and not in contact with soil or other fill material, grouting under all base plates for structural steel members, and grouting railing posts in place.

2.03 Topping Grout and Concrete Fill
A. Grout for topping of slabs and concrete fill for built-up surfaces of tank, channel, and basin bottoms shall be composed of cement grout. All materials and procedures specified for concrete in Section 03300 – Cast-in-Place Concrete shall apply except as indicated otherwise herein.
B. Topping grout and concrete fill shall contain a minimum of 564 pound of cement per cubic yard with a maximum water cement ratio of 0.45. Where concrete fill is thicker than 3 inches, structural concrete as indicated in Section 03300 – Cast-in-Place Concrete may be used.

C. **Strength**: Minimum compressive strength of topping grout and concrete fill at the end of 28 days shall be 4000 psi.

### 2.04 Curing Materials

A. Curing materials shall be as indicated in Section 03300 – Cast-in-Place Concrete for cement grout and as recommended by the manufacturer of prepackaged grouts.

### 2.05 Consistency

A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow.

B. Unless otherwise noted on contract dwgs, grout for base plates and equipment leveling shall have flowable, semi-flowable, and packable viscosities. Flowable and semi-flowable consistencies require formwork.

### 2.06 Measurement of Ingredients

A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement is not an acceptable method of measurement.

## PART 3 - EXECUTION

### 3.01 General

A. All surface preparation, curing, and protection of cement grout shall be as required. The finish of the grout surface shall be troweled smooth unless noted otherwise.

B. Where pre-packaged product is used, the manufacturer’s representative shall provide on-site technical assistance upon request.

C. Base concrete or masonry must have attained its design strength before grout is placed. When bonding to an existing cementious material is expected, waterblasting or sandblasting to roughen the substrate is required.

### 3.02 Grouting Procedures

A. Base Plate Grouting

1. For base plates, the original concrete shall be blocked out or finished off a sufficient distance below the plate to provide for a grout thickness not exceeding 2x the anchor bolt diameter.

2. After the base plate has been set in position at the proper elevation double nutted on the anchor bolts, the space between the bottom of the plate and the original pour of concrete shall be filled with non-shrink-type grout. The grout shall be placed so there are no voids between the bottom of the base plate and the concrete.

B. Topping Grout

1. All mechanical, electrical, and finish work shall be completed prior to placement of topping or concrete fill. The base slab shall be given a roughened textured surface by sandblasting or waterblasting to ensure bonding to the base slab.
2. The minimum thickness of grout topping and concrete fill shall be one inch. Where the finished surface of concrete fill is to form an intersecting angle of less than 45 degrees with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3-1/2-inches wide by 1-1/2-inches deep.

3. The base slab shall be thoroughly cleaned and wetted prior to placing topping and fill. No topping concrete shall be placed until the slab is complete free from standing pools or ponds of water. The topping and fill shall be compacted by rolling or tamping, brought to established grade, and floated. Grouted fill for tank and basin bottoms where scraping mechanisms are to be installed shall be screeded by blades attached to the revolving mechanism of the equipment in accordance with the procedures outlined by the equipment manufacturer after the grout is brought to the established grade.

4. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.

5. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping and fill has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement or mixture of dry cement and sand shall be applied to the surface.

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. The Contractor shall provide and install all pre-cast items as required including all appurtenances necessary to make a complete installation.

B. References
- AASHTO M198 Joints for Concrete Pipe, Manholes Precast Box Sections
- AASHTO M199 Precast Reinforced Concrete Manhole Sections
- ACI 318 Building Code Requirements for Structural Concrete
- ACI 350 Code Requirements for Environmental Engineering Concrete Structures and Commentary
- ACPA Concrete Pipe Handbook
- ACPA Design Manual
- ASTM C478 Circular Precast Reinforced Concrete Manhole Sections
- ASTM C990-09 Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
- ASTM C1244 Concrete Sewer Negative Air Pressure Vacuum Test Method
- AWS D1.1 Structural Welding Code – Steel
- AWS D1.4 Structural Welding Code – Reinforcing Steel
- NPCA QC Manual Quality Control Manual for Precast Concrete Plants
- PCI Design Handbook
- Caltrans Caltrans Standard Specifications, 2010

1.02 General Requirements
A. Precast concrete units shall be designed and fabricated by an experienced and acceptable precast concrete manufacturer. The manufacturer shall have been regularly and continuously engaged in the manufacture of precast concrete units similar to that indicated in the project specifications or drawings for at least 5 years.

1.03 Submittals
A. The following items shall be submitted in compliance with Section 01340-Submittals:
   1. Quality control procedures established by the precast manufacturer in accordance with the latest NPCA Quality Control Manual for Precast Concrete Plants.
   2. Shop Drawings
      a. The drawings for precast concrete units shall be shop drawings furnished by the precast concrete producer for approval by the District’s Representative and engineer of record. These drawings shall demonstrate that the applicable industry design standards have been met. These drawings shall show complete design, exact dimensions, installation, and
construction information in such detail as to enable the District’s Representative and Engineer of record to determine the adequacy of the proposed units for the intended purpose. Deviations from the primary construction documents shall be clouded. The precast concrete units shall be produced in accordance with the approved drawings.

3. Precast Concrete Unit Data

a. The precast concrete producer shall supply data sheets showing conformance to project drawings and requirements and to applicable industry design standards listed in this specification. The precast concrete producer shall provide sufficient information as to demonstrate that such products will perform the intended task.

4. Anchorage, Lifting Inserts and Devices

a. Precast Concrete section anchors, lifting/hoisting inserts and other devices, shall be temporary and removable. The precast concrete producer shall provide product data sheets clearly demonstrating necessary installation for use by the Contractor. The precast concrete unit dimensions and safe working load shall be clearly indicated.

5. Accessory Items

a. For items including, but not limited to sealants, gaskets, pipe entry connectors, steps, racks and other items installed before or after delivery, the precast concrete producer shall submit proper installation instructions and relevant product data for Approval by the Engineer.

B. Design Data

1. The precast concrete producer shall supply precast concrete unit design calculations and concrete mix design proportions and appropriate mix design test data. Structural design calculations shall be signed by a licensed professional engineer.

C. Test Reports

1. The precast concrete producer shall supply copies of material certifications and/or laboratory test reports, including mill tests and all other test data, for portland cement, blended cement, pozzolans, ground granulated blast-furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this project.

2. The precast concrete producer shall submit copies of test reports showing that the mix has been successfully tested to produce concrete with the properties specified and will be suitable for the project conditions. Such tests may include compressive strength, flexural strength, plastic or hardened air content, freeze-thaw durability, abrasion and absorption.

3. Upon request, the precast concrete producer will supply copies of in-plant QA/QC inspection reports.

D. Certificates

1. Submit quality control procedures established in accordance with NPCA Quality Control Manual for Precast Concrete Plants or verification of current NPCA Plant Certification.

1.04 Design

A. Precast Concrete Unit Design

1. Design standard precast concrete units to withstand indicated design load conditions in accordance with applicable industry design standards ACI 318, ACI 350, ACPA Design Manual, PCI MNL-120, and AASHTO. Design must also consider stresses induced during handling, shipping and installation in order to avoid product cracking or other handling
damage. Design loads for precast concrete units shall be indicated on the shop drawings. All calculations shall be prepared by a registered engineer.

2. Minimum design loading for soil: As defined by the geotechnical report, but not less than 100 psf / foot depth, with 2'-0" soil surcharge.

3. For buried fluid-containing structures, walls must carry hydrostatic loading without the lateral support of backfill soils. Considerations shall be given to unbalanced loading due to uneven backfill loading; 2'-0" soil height difference between opposing sides shall be a design load case.

B. Curing
1. Curing of precast concrete members shall be in accordance with Section 90-4.03 of the Caltrans Standard Specifications.

C. Joints and Sealants
1. Joints shall be water tight, industry standard, tongue and groove style. Sealants between adjacent units shall be preformed mastic or butyl gasket of the type and configuration indicated on shop drawings or as specified herein. Rubber gaskets shall be utilized at the sole discretion of the Engineer and subject to Approval.

D. Durability and performance requirements
1. Concrete Compressive Strength-
   a. Precast members shall have a cementitious content of 590 lbs/CY Minimum and 927 lbs/CY Maximum. Precast members shall have a 28-day compressive strength (f’c) of 4,000 psi, except where otherwise noted on the approved drawings.

E. Water-Cement Ratio
1. Concrete that will be exposed to freezing and thawing shall contain entrained air and shall have water-cement ratios of 0.45 or less. Concrete which will not be exposed to freezing, but which is required to be watertight, shall have a water-cement ratio of 0.48 or less if the concrete is exposed to fresh water, or 0.45 or less if exposed to brackish water or sea water. For corrosion protection, reinforced concrete exposed to deicer salts, brackish water or seawater shall have a water-cement ratio of 0.42 or less.

F. Air Content
1. The air content of concrete that will be exposed to freezing conditions shall be within the limits given below.

<table>
<thead>
<tr>
<th>Nominal Maximum Aggregate Size (in)</th>
<th>Air Content %</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Severe Exposure</td>
<td>Moderate Exposure</td>
</tr>
<tr>
<td>3/8</td>
<td>6.0 to 9.0</td>
<td>4.5 to 7.5</td>
</tr>
<tr>
<td>½</td>
<td>5.5 to 8.5</td>
<td>4.0 to 7.0</td>
</tr>
<tr>
<td>¾</td>
<td>4.5 to 7.5</td>
<td>3.5 to 6.5</td>
</tr>
<tr>
<td>1</td>
<td>4.5 to 7.5</td>
<td>3.0 to 6.0</td>
</tr>
<tr>
<td>* For specified compressive strengths greater then 5000 psi, air content may be reduced 1%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.05 Quality Assurance
A. Precast concrete producer shall demonstrate adherence to the latest standards set forth in the NPCA Quality Control Manual for Precast Concrete Plants. The precast concrete producer shall
be certified by the NPCA Plant Certification Program prior to and during production of the products for this project.

1.06 Delivery, Storage, and Handling

A. Handling: Precast concrete units shall be handled and transported in a manner to minimize damage. Lifting devices or holes shall be consistent with industry standards. Lifting shall be accomplished with methods or devices intended for this purpose as indicated on shop drawings.

B. Storage: Precast concrete units shall be stored in a manner that will minimize potential damage.

C. Delivery: Precast concrete units shall be delivered to the site in accordance with the delivery schedule to avoid excessive build-up of units in storage at the site. Upon delivery to the jobsite all precast concrete units shall be inspected by the customer or customer’s agent for quality and final acceptance.

D. Acceptable crack dimensions: In addition to the criteria specified under ASTM 1433, the maximum crack length under service conditions is 1/64” wide x 2” long. Precast members with cracks wider and longer are subject to rejection and re-casting at the precaster’s expense.

PART 2 - MATERIALS

2.01 Concrete Wet Well

A. Design Loads: Design loads shall consist of live load, dead load, impact load, hydrostatic load, and other loads that may occur unless otherwise indicated on the drawings. Live loads shall be for H-20 per AASHO Standard Specifications for Highway Bridges-latest edition.

B. Forms: All forms used in placing concrete shall be sufficiently designed and braced to maintain alignment under pressures of concrete placement.

C. Concrete

1. Aggregates used in the concrete mix either coarse or fine, excluding light-weight aggregates, shall conform to specifications as outlined by ASTM C33.

2. All light-weight aggregates, fine or coarse, shall conform to specifications as outlined by ASTM C330.

3. Both types of aggregates shall be properly graded and free of any deleterious substances so as to produce a homogeneous concrete mix when blended with cement.

D. Cement: The cement shall be Type II low alkali Portland Cement and shall meet ASTM C150 Type V

E. Compressive Strength: Sufficient cement content shall be used per batch so as to produce a minimum strength of 4,000 psi at 28 days or other strength by design when required.

F. Placing: per ACI 301.

G. Curing: Concrete while still in the forms may be steam cured after an initial set has taken place. Steam temperature shall not exceed 160°F, nor raised from normal ambient temperature at a rate exceeding 40°F per hour. Steam curing shall be considered complete after sufficient time has elapsed to produce adequate strength to withstand any structural strain that may be subjected during the form stripping operation. Additional curing may be applied by means of water spraying or membrane curing compound to reach the ultimate strength requirements.

H. Reinforcing Steel: ASTM A615 grade 60 or A706.
Preformed Joint Sealant: The joint sealing compound shall be Quik-Seal, a preformed, cold applied, ready to use plastic joint sealing compound as supplied by Quikset Utility Vaults, Santa Ana, California; Ram-Neck by K.T. Snyder Company; or approved equal.

PART 3 - EXECUTION

3.01 General
A. The Contractor shall construct all new precast structures including the wet well in accordance to the Approved design provided in the Contract Drawings.

**END OF SECTION**
PART 1 - GENERAL

1.01 Description
A. Work Included
   1. Miscellaneous metal work, bolts, supports and brackets

1.02 Related Sections
A. The following list of related sections is provided for the convenience of the Contractor. It includes the commonly referenced sections that are in-general applicable to all equipment supplied. This list does not excuse the Contractor from any requirement given in sections not specifically listed below. Where there is a difference between this specification and any other specifications the conflict shall be resolved at the sole discretion of the Engineer.
   1. Section 09900 – Coating Systems
   2. Section 11010 – General Requirements for Equipment
   3. Section 11050 – Equipment Mounting

1.03 System Description
A. Manufacturer to provide mounts, supports, and anchorage hardware as called for in Section 11050 – Equipment Mounting.

1.04 Submittals
A. The Contractor shall provide the following submittals, in accordance with Section 01340 – Submittals Procedures, in addition to the submittals required by Section 11010 – General Requirements for Equipment.
   1. Material list and catalog information showing the details of construction.

PART 2 - PRODUCTS

2.01 Miscellaneous Metalwork
A. Materials: Except as otherwise indicated, products fabricated of structural steel shapes, plates and bars shall comply with the requirements of ASTM A 36 or ASTM A283.

B. Corrosion Protection: Miscellaneous metalwork of fabricated steel, which will be used in a corrosive environment or will be submerged in wastewater, shall be coated in accordance with Section 09900 – Coating Systems. Miscellaneous steel metalwork shall be hot-dip galvanized after fabrication except as otherwise indicated.

C. Stainless Steel: Stainless steel metalwork and bolts shall be of Type 316 stainless steel for all corrosive environments.

D. Welding:
1. Welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society’s "Welding Handbook" and supplemented by other standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards.

2. In assembly and during welding, the component parts shall be adequately clamped, supported and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall comply with the AWS Code. Upon completion of welding, weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. Sharp corners of material that is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

E. Galvanizing: Where galvanizing is indicated, structural steel plates, shapes, bars and fabricated assemblies shall be thoroughly cleaned of rust and scale and shall be galvanized in accordance with the requirements of ASTM A 123. Any galvanized part that becomes warped during the galvanizing operation shall be straightened. Bolts, anchor bolts, nuts and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the requirements of ASTM A 153.

2.02 Bolts

A. Bolt Requirements: Bolts shall comply with the following:

1. The nuts shall be capable of developing the full strength of the bolts. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads. Bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.

2. The length of all bolts shall be such that after joints are made up, each bolt shall extend through the entire nut, but in no case more than 3 threads beyond the nut.

B. Standard Service Bolts (Not Buried, Corrosive or Submerged): Except where otherwise indicated, bolts and nuts shall be steel and shall be hot-dip galvanized after fabrication. Threads on galvanized bolts and nuts shall be formed with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing. Except as otherwise indicated herein, steel for bolts, anchor bolts and cap screws shall be in accordance with the requirements of ASTM A 307 Grade A or B, or threaded parts of ASTM A 36.

C. Buried, Corrosive or Submerged Bolts: Unless otherwise indicated, bolts, anchor bolts, nuts and washers, which are buried, submerged, or below the top of the wall inside any hydraulic structure or as indicated on the Drawings shall be of Type 316 stainless steel.

D. Unless otherwise indicated, eyebolts shall conform to ASTM A 489.

2.03 Seat Angles, Supports and Brackets

A. Seat angles over slide gate guides shall be welded to the guides. Seat angles for supports for floor plates, clips for precast panels and brackets for piping shall be steel, hot-dip galvanized after fabrication unless otherwise indicated. For angles used in corrosive environments material shall be Type 316 stainless steel or aluminum.

B. Seat angles for grating shall be aluminum.
PART 3 - EXECUTION

3.01 General

A. Fabrication and Erection: Except as otherwise indicated, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction."

B. Fieldwork, including cutting and threading, shall not be permitted on galvanized items. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators. Grouting of anchor bolts with non-shrink or epoxy grouts, where indicated, shall be in accordance with Section 03315 - Grout.

C. Drilling of bolts or enlargement of holes to correct misalignment will not be allowed.

D. Metalwork to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed or, if indicated, recesses or blockouts shall be formed in the concrete. The surfaces of metalwork in contact with or embedded in concrete shall be thoroughly cleaned. Recesses may be neatly cored in the concrete after it has attained its design strength and the metalwork grouted in place. Embedments shall comply with Section 03300 – Cast-in-Place Concrete.

E. Holes shall be punched 1/16 inch larger than the nominal size of the bolts, unless otherwise indicated. Whenever needed, because of the thickness of the metal, holes shall be subpunched and reamed or shall be drilled.

F. Fabrication including cutting, drilling, punching, threading and tapping required for miscellaneous metal or adjacent work shall be performed prior to hot-dip galvanizing.

G. Field Repair of Galvanizing: Where zinc coating has been damaged, substrate surface shall be cleaned and repaired with zinc dust-zinc oxide coating in accordance with MILSPEC DOD-P-21035. Field repair of zinc coated surfaces, including Unistruts shall be accomplished with Z.R.C., as manufactured by Z.R.C. Chemical Products Co.; Galvicon as manufactured by Galvicon Co.; or equal. Application shall be as recommended by the manufacturer.

3.02 Installation of Seat Angles, Supports and Guides

A. Seat angles shall be set flush with the floor. Aluminum material in contact with concrete shall be coated per specification section 09900 – Coating Systems.

**END OF SECTION**
SECTION 05910
HOT-DIP ZINC COATING

PART 1 - GENERAL

1.01 Summary
A. This Section specifies hot-dip zinc coating. Unless otherwise specified, steel items not fully encased in a building envelope shall be hot-dip zinc coated. Also termed hot dip galvanized.

B. References

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM A90</td>
<td>Standard Test Methods for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles</td>
</tr>
<tr>
<td>ASTM A123</td>
<td>Zinc Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip</td>
</tr>
<tr>
<td>ASTM A153</td>
<td>Zinc Coating on Iron and Steel Hardware</td>
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<tr>
<td>ASTM A384</td>
<td>Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies</td>
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<tr>
<td>ASTM A385</td>
<td>Providing High Quality Zinc Coatings on Assembled Products</td>
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<tr>
<td>ASTM A386</td>
<td>Zinc Coating on Assembled Steel Products</td>
</tr>
<tr>
<td>MILSPEC</td>
<td>Paint, High Zinc Dust Content, Galvanizing</td>
</tr>
<tr>
<td>DOD-P-21035</td>
<td>Repair</td>
</tr>
</tbody>
</table>

PART 2 - PRODUCTS

2.01 Materials
A. The coating material shall be as specified in ASTM A153 or ASTM A123.

PART 3 - EXECUTION

3.01 Galvanizing
A. The thickness, chemistry, and all other engineering properties of galvanizing shall be defined by ASTM A153 and ASTM A123.

3.02 Field Repairs
A. Where zinc coating has been damaged, substrate surface shall be cleaned and repaired with zinc dust-zinc oxide coating in accordance with MILSPEC DOD-P-21035. Field repair of zinc coated surfaces, including Unistruts shall be accomplished with Z.R.C., as manufactured by Z.R.C. Chemical Products Co.; Galvicon as manufactured by Galvicon Co.; or equal.

3.03 Post-Galvanizing Coating
A. When paint is required over a hot-dip galvanized coating, the galvanized surface requires special preparation. Chemical or abrasive methods may be used, with care exercised to not remove too much of the galvanized coating.
**END OF SECTION**
SECTION 06610
FIBERGLASS REINFORCED PLASTICS (FRP) GRATING

PART 1 - GENERAL

1.01 Description
A. The Contractor shall furnish, fabricate (where necessary), and install all fiberglass reinforced plastic (FRP) items, with all appurtenances, accessories and incidentals necessary to produce a complete, operable and serviceable installation as shown on the Contract Drawings and as specified herein, and in accordance with the requirements of the Contract Documents.

1.02 Related Sections
A. The following list of related sections is provided for the convenience of the Contractor. It includes the commonly referenced sections that are in-general applicable to all equipment supplied. This list does not excuse the Contractor from any requirement given in sections not specifically listed below. Where there is a difference between this specification and any other specifications the conflict shall be resolved at the sole discretion of the Engineer.
   1. Section 11010 - General Requirements for Equipment
   2. Section 11050 - Equipment Mounting

1.03 References
A. The publications listed below (latest revision applicable) form a part of this specification to the extent referenced herein. The publications are referred to within the text by the designation only.
   1. ASTM Test Methods:
      a. ASTM D 635 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
      b. ASTM D 732 Shear Strength of Plastics by Punch Tool
      c. ASTM E 84 Surface Burning Characteristics of Building Materials
   B. Safety grating shall be in conformance with OSHA standard 1910.23.

1.04 Submittals
A. The Contractor shall provide the following submittals, in accordance with Section 01340 – Submittals Procedures, in addition to the submittals required by Section 11010 – General Requirements for Equipment.
   1. Shop drawings of gratings, grating supports and accessories.
      a. Shop drawings shall clearly show material sizes, types, styles, part or catalog numbers, complete details for the fabrication and erection of components including, but not limited to, location, lengths, type and sizes of fasteners, clip angles, member sizes, and connection details.
   2. Manufacturer’s published literature including structural design data, structural properties data, grating load/deflection tables, corrosion resistance tables, certificates of compliance, test reports as applicable, concrete anchor systems and their allowable load tables, and design calculations for systems not sized or designed in the contract documents.
1.05 **Quality Assurance**

A. All items to be provided under this Section shall be furnished only by manufacturers having a minimum of ten (10) years experience in the design and manufacture of similar products and systems. Additionally, if requested, a record of at least five (5) previous, separate, similar successful installations in the last five (5) years shall be provided.

B. Manufacturer shall offer a 3 year limited warranty on all FRP products against defects in materials and workmanship.

C. Manufacturer shall be certified to the ISO 9001-2008 standard.

D. Manufacturer shall provide proof, via independent testing, that materials proposed as a solution do not contain heavy metals in amounts greater than that allowed by current EPA requirements.

1.06 **Product Delivery and Storage**

A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken pallets, packages, containers, or bundles bearing the label of the manufacturer. Adhesives, resins and their catalysts and hardeners shall be crated or boxed separately and noted as such to facilitate their movement to a dry indoor storage facility.

B. Storage of Products: All materials shall be carefully handled to prevent them from abrasion, cracking, chipping, twisting, other deformations, and other types of damage. Adhesives, resins and their catalysts are to be stored in dry indoor storage facilities between 70 and 85 degrees Fahrenheit (21 to 29 degrees Celsius) until they are required.

C. Manufacturer to provide mounts, supports, and anchorage hardware as called for in Section 11050 – Equipment Mounting.

**PART 2 - PRODUCTS**

2.01 **Manufacturer**

A. Grating shall be manufactured by Fibergrate or equal

2.02 **General**

A. All FRP items furnished under this Section shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Contract Documents.

B. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.

C. Resins shall be vinyl ester with chemical formulations as necessary to provide the corrosion resistance, strength and other physical properties as required.

D. All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

E. All pultruded structural shapes shall be further protected from ultraviolet (UV) light with
   1. integral UV inhibitors in the resin and
   2. a synthetic surfacing veil to help produce a resin rich surface.
F. All FRP products shall have a tested flame spread rating of 25 or less per ASTM E-84 Tunnel Test. Gratings shall not burn past the 25 mm reference mark and will be classified HB per ASTM D635.

G. All grating clips shall be manufactured of Type 316 Stainless Steel.

2.03 Pultruded Grating

A. Grating components shall be high strength and high stiffness pultruded elements having a maximum of 70% and a minimum of 60% glass content (by weight) of continuous roving and continuous strand mat fiberglass reinforcements. The finished surface of the product shall be provided with a surfacing veil to provide a resin rich surface which improves corrosion resistance and resistance to ultraviolet degradation. Bearing bars shall be interlocked and epoxied in place with a two piece cross rod system to provide a mechanical and chemical lock. Cross rods should be below the walking surface of the grating. Gratings with cross rods that are flush with the walking surface are excluded.

B. Non-slip surfacing: Grating shall be provided with a quartz grit bonded and baked to the top surface of the finished grating product.

C. Fire rating: Grating shall be fire retardant with a tested flame spread rating of 25 or less when tested in accordance with ASTM E 84. Manufacturer may be required to provide certification of ASTM E84 test on grating panels from an independent testing laboratory. Test data shall be from full scale testing of actual production grating, of the same type and material supplied on the project. Test data performed only on the base resin shall not be acceptable.

D. Resin system: The resin system used in the manufacture of the grating shall be VEFR. Manufacturer may be required to submit corrosion data from tests performed on actual grating products in standard chemical environments. Corrosion resistance data of the base resin from the manufacturer is not a true indicator of grating corrosion resistance and shall not be accepted.

E. Color: Gray

F. Depth: 2" deep load bars with a tolerance of plus or minus 1/32".

Mesh Configuration: 1-1/2" load bar spacing, 6" tie bar spacing on centers. Grating shall be SAFE-T-SPAN® T3320V or equal.

G. Load/Deflection: Grating shall meet manufacturers published safe recommended loadings with deflection not to exceed the following:

H. Uniform distributed load over the span shown on the drawings: 100 pounds per square foot, with a maximum deflection of with deflection not exceeding 1/360 of the span.

I. Substitutions: Other products of equal strength, stiffness, corrosion resistance and overall quality may be submitted with the proper supporting data to the engineer for approval.

2.04 Grating Fabrication

A. Measurements: Grating supplied shall meet the minimum dimensional requirements as shown or specified. The Contractor shall provide and/or verify measurements in field for work fabricated to fit field conditions as required by grating manufacturer to complete the work. Determine correct size and locations of required holes or cutouts from field dimensions before grating fabrication.

B. Layout: Each grating section shall be readily removable, except where indicated on drawings. Manufacturer to provide openings and holes where located on the contract drawings. Grating supports shall be provided at openings in the grating by contractor where necessary to meet load/deflection requirements specified herein. Grating openings which fit around protrusions (pipes, cables, machinery, etc.) shall be discontinuous at approximately the centerline of opening so each section of grating is readily removable.
C. Sealing: All shop fabricated grating cuts shall be coated with vinyl ester resin to provide maximum corrosion resistance. All field fabricated grating cuts shall be coated similarly by the contractor in accordance with the manufacturer's instructions.

D. Hardware: Type 316 stainless steel hold-down clips shall be provided and spaced at a maximum of four feet apart with a minimum of four per piece of grating, or as recommended by the manufacturer.

E. Provide edge banding on access openings.

PART 3 - EXECUTION

3.01 Inspection

A. Shop inspection is authorized as required by the Owner and shall be at Owner's expense. The fabricator shall give ample notice to Contractor prior to the beginning of any fabrication work so that inspection may be provided. The grating shall be as free, as commercially possible, from visual defects such as foreign inclusions, delamination, blisters, resin burns, air bubbles and pits.

3.02 Installation

A. Contractor shall install gratings in accordance with manufacturer’s assembly drawings. Lock grating panels securely in place with hold-down fasteners as specified herein. Field cut and drill fiberglass reinforced plastic products with carbide or diamond tipped bits and blades. Seal cut or drilled surfaces in accordance with manufacturer's instructions. Follow manufacturer's instructions when cutting or drilling fiberglass products or using resin products; provide adequate ventilation.

**END OF SECTION**
PART 1 - GENERAL

1.01 Description
A. Work Included
   1. Clean and prepare joint surfaces.
   2. Sealant and backing materials.

1.02 References

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM C834</td>
<td>Specification for Latex Sealing Compounds</td>
</tr>
<tr>
<td>ASTM C920</td>
<td>Standard Specifications for Elastomeric Sealers</td>
</tr>
<tr>
<td>ASTM D1056</td>
<td>Flexible Cellular Materials Sponge or Expanded Rubber</td>
</tr>
</tbody>
</table>

1.03 Submittals
A. Product Data and Samples
   1. Submit product data and samples in accordance with Section 01330 – Submittals Procedures.
   2. Submit manufacturer’s written surface preparation and installation instructions.
   3. Submit samples of sealant colors.

1.04 Warranty
A. Provide one year warranty in accordance with Section 01750 – Starting and Adjusting.
B. Warranty: Replace sealants which fail because of loss of cohesion or adhesion, or do not cure.

PART 2 - PRODUCTS

2.01 Manufacturers
A. Manufacturers listed below are approved with regards to their specific products.

2.02 Materials
   5. Sika Corporation: Sikaflex 2c SL.
B. Two-Part Urethane: ASTM C920, Type M, Non-Sag.
3. Pecora Corporation: Dynatrol II.
5. Sika Corporation: Sikaflex 2c NS

C. **One-Part Urethane**: ASTM C920, Type S, Non-Sag, Class 25.
3. Pecora Corporation: Dynatrol I-XL.
6. Sika Corporation: Sikaflex 1a

D. **One-Part Silicone**: ASTM C920, Type S, Non-Sag, Class 25.
1. Dow-Corning Corporation: 795.
3. Pecora Corporation: 895
5. Sika Corporation: Sika Sil C-995.

E. **Latex-Acrylic Sealant**: ASTM C834, Non-Sag, Class 25.

F. **Immersed Service Sealant**:
1. Sika Corporation: Sikaflex 2c.
3. Pacific Polymers International: Elasto-Thane 227 R

### 2.03 Accessories

A. **Primer**: Non-staining type, recommended by sealant manufacturer to suit application.

B. **Joint Cleaner**: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. **Joint Filler**: ASTM D1056; round, closed cell foam rod; oversized 30 to 50 percent; Grey Flex manufactured by Emseal.

D. **Bond Breaker**: Pressure sensitive tape recommended by sealant manufacturer to suit application.
PART 3 - EXECUTION

3.01 Examination
A. Verify joint dimensions, physical and environmental conditions are acceptable to receive work of this Section.
B. Beginning of installation means acceptance.

3.02 Preparation
A. Clean, prepare, and size joints in accordance with manufacturer's instructions. Remove any loose materials and other foreign matter which might impair adhesion of sealant.
B. Verify that joint shaping materials and release tapes are compatible with sealant.
C. Examine joint dimensions and size materials to achieve required width / depth ratios.
D. Use joint filler to achieve required joint depths, to allow sealants to perform properly.
E. Use bond breaker where required.

3.03 Installation
A. Perform work in accordance with ASTM C834 for latex compounds and C920 for elastomeric sealants.
B. Install sealant in accordance with manufacturer's written instructions. Apply primer where recommended by manufacturer.
C. Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature ranges.
D. Tool joints as indicated.
E. Joints: Free of air pockets, foreign embedded matter, ridges, and sags.

3.04 Schedule
A. This schedule reflects sealant materials specified in 2.02 of this Section. This schedule denotes sealant generic type and use or location.

<table>
<thead>
<tr>
<th>Specification Paragraph Number</th>
<th>Sealant</th>
<th>Use or Location</th>
<th>Joint Tooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.02.A</td>
<td>2-part urethane self-leveling</td>
<td>Traffic areas, exterior paving, concrete and asphalt concrete, horizontal joints.</td>
<td>Self-leveling</td>
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<td>2.02.B</td>
<td>2-part urethane non-sag</td>
<td>Concrete vertical joints</td>
<td>Concave</td>
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<td>2.02.C</td>
<td>1-part urethane non-sag</td>
<td>Exterior cement plaster</td>
<td>As shown</td>
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<tr>
<td>2.02.D</td>
<td>1-part silicone non-sag</td>
<td>Glazing interior and exterior (excluding structural glazing) interior metal to metal surfaces.</td>
<td>As shown</td>
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<tr>
<td>Specification Paragraph Number</td>
<td>Sealant</td>
<td>Use or Location</td>
<td>Joint Tooling</td>
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<td>------------------------------------------------------------</td>
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<tr>
<td>2.02.E</td>
<td>latex-acrylic caulk, non-sag</td>
<td>Interior gypsum board surfaces; interior painted wood surfaces; acoustical panels</td>
<td>As shown</td>
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<tr>
<td>2.02.F</td>
<td>Immersed service</td>
<td>Submerged or partially submerged conditions</td>
<td>As shown</td>
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</table>
SECTION 09900
PROTECTIVE COATING SYSTEMS

PART 1 - GENERAL

1.01 Summary

A. Scope:

1. The Contractor shall furnish all labor, materials, equipment and incidentals required to provide painting as shown and specified. The work includes the coating and finishing of all interior and exterior items and surfaces throughout the project except as otherwise shown or specified. Surface preparation, priming and coatings may be in addition to shop priming and surface treatment specified under other Sections.

2. Where items are factory-coated, repair or touch-up the factory coating and/or apply additional field coatings to achieve a complete coating system complying with the type and thickness of the coatings specified in this Section.

3. The term “coating” as used herein means all coating systems materials, which includes but is not necessarily limited to pretreatments, primers, intermediate coats, finish coats, emulsions, enamels, varnishes, stains, sealers, fillers, and other applied materials whether used as prime, intermediate or finish coats.

4. The term “exposed” as used herein means all items not covered with concrete, plaster, fireproofing or similar material.

5. Where items or surfaces are not specifically mentioned, coat these items or surfaces the same as adjacent similar materials or surfaces.

6. “Typical Examples” of items to be coated are provided on each coating system description sheet. These examples are intended to show the general scope of items to be coated are not intended to be exhaustive of all items to be coated by that particular coating.

7. Items which must be coated under this section include but are not necessarily limited to the following:
   a. Pre-cast Concrete manhole interior and exterior
   b. Wetwell interior and exterior
   c. Emergency storage tank interior and exterior
   d. Piping
   e. Bollards
   f. Pipe supports
   g. All other surfaces not otherwise excluded herein.

B. Coordination

1. Review installation procedures under other Sections and coordinate the installation of items that must be field coated or painted.

2. Coordinate the coating of areas to be coated that will be inaccessible once equipment has been installed.

3. Provide finish coats that are compatible with the primers used. Contractor shall be responsible for the compatibility of all shop primed and field coated items in this Contract. Barrier coats
shall be provided over incompatible primers or primers shall be removed and re-primed as required.

C. Pre-Finished Items: Unless otherwise shown or specified, coating shall not be included when factory finishing such as baked-on enamel, porcelain, polyvinylidene fluoride, fusion bonded epoxy, or other similar finish is specified for such items.

1. Touch up factory-finished items only with coatings supplied by the item manufacturer per the requirements and instructions of the manufacturer.

2. If a factory-finished coating is applied to an item, which is not specified to receive a factory finish coat, acceptance of the factory finish coat shall be at the discretion of the Engineer. The color shall be noted with the equipment submittals.

D. Items Not to be coated: The following items are excluded from coating unless otherwise specified or show:

1. Ducts, conduits and other materials with corrosion resistant surfaces that are in chases or other inaccessible areas unless specified or shown on drawings.

2. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts unless otherwise specified.

3. Code-required labels, such as UL and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

4. Stainless steel.

5. Copper.

6. Aluminum.

7. Fiberglass.

8. Manhole covers.

9. HVAC equipment.

10. Instrumentation and galvanized instrument supports.

11. Electrical switchgear, motor control centers, panels, transformers and other similar equipment.

12. Exterior or interior concrete unless specified or shown on drawings.

13. Exterior concrete unit masonry unless specified or shown on drawings.

14. Interior concrete unit masonry unless specified or shown on drawings.

E. Related Work:

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
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<tbody>
<tr>
<td>07900</td>
<td>Sealants</td>
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1.02 References

A. Reference Standards: Applicable provisions and recommendations of the following shall be complied with, except where otherwise shown or specified:

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
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<tbody>
<tr>
<td>ANSI A13.1</td>
<td>Scheme for the Identification of Piping Systems</td>
</tr>
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</table>
1.03 Submittals
A. **Shop Drawings:** The following shall be submitted for approval:
   1. Manufacturer’s technical information, including coating label analysis and application instructions for each material proposed for use. Each material shall be listed and cross-referenced to the specific coating system and application, and shall be identified by manufacturer’s catalog number and general classification.
   2. Provide itemized schedule of all the surfaces to be coated. After approval of submittals and prior to beginning work, Owner’s Representative will note on the schedule the colors to be furnished.
   3. Manufacturer’s complete color charts for each coating system.
   4. Certifications from manufacturers shall be provided, verifying that the factory applied prime coats are compatible with specified finish coatings.

1.04 Delivery, Storage, and Handling
A. **Delivery of Materials:** All materials shall be delivered to the job site in original, new and unopened packages and containers bearing manufacturer’s name and label, and the following information.
   1. Name or title of material
   2. Manufacturer’s stock number and date of manufacture
   3. Manufacturer’s name
   4. Contents by volume, for major pigment and vehicle constituents
   5. Thinning instructions where recommended
   6. Application instructions
   7. Color name and number
B. **Storage of Materials**
   1. Only acceptable project materials shall be stored on project site.
   2. Store materials in compliance with manufacturer’s requirements in a location approved by the Owner’s Representative. Area shall be kept clean and accessible.
   3. Storage shall be restricted to coating materials and related equipment only.

**PART 2 - PRODUCTS**

2.01 Manufacturers:
A. Products manufactured by one of the following shall be provided:
1. Tnemec Company, Incorporated
2. International Coatings
3. Or equal

B. Substitutions
   1. No substitutions shall be considered that decrease the film thickness, the number of coats, the
      surface preparation or the generic type of coating specified. Approved manufacturers must
      furnish the same color selection as the manufacturers specified, including accent color in all
      coating systems.

2.02 Materials
   A. Only the best grade of the various types of coating suitable for use in water and wastewater
      treatment plants, as regularly manufactured by acceptable coating material manufacturers, shall
      be provided. Material not displaying the manufacturer’s identification as a best-grade product will
      not be acceptable.
   B. Primers shall be produced by the same manufacturer as the intermediate and finish coats. Use
      only thinners recommended by the manufacturer, and use only to recommended limits.
   C. Coatings and pipe markers of durable and washable quality shall be provided. Materials that will
      withstand normal washing as required to remove grease, oil, chemicals, etc., without showing
      discoloration, loss of gloss, staining, or other damage shall be used.

2.03 Colors and Finishes
   A. Surface treatments, and finishes, are shown under Coating Systems below. All substrates
      indicated shall be coated whether or not shown on the Drawings, or in Schedules, unless an item
      is specifically scheduled as not requiring coating.
   B. Color Selection
      1. The Owner reserves the right to select non-standard colors for all coating systems specified
         within the ability of the manufacturer to produce such non-standard colors. Selection of non-
         standard colors shall not be cause for the Contractor rejecting Owner’s color selections and
         the Contractor shall supply such colors at no additional expense to the Owner.
   C. Piping Color Code:
      1. To be selected by the Owner.
   D. Color Pigments: Pure, non-fading, applicable types to suit the substrates and service indicated.

2.04 Coating Systems
   A. Refer to the following Coating System Sheets.
   B. The Contractor shall coat all items, which fall into the categories described. The examples given
      on the coating system sheets are presented for the Contractor’s convenience, and may not
      include all items which require coating. In general all exposed ferrous materials shall be coated.
      This includes galvanized materials and shop primed material unless specifically excluded
      elsewhere.
Coating System 1

A. Service:
   1. Structural steel, miscellaneous metals, and steel, ductile iron, or cast iron piping
   2. Interior exposure
   3. Non-submerged applications (greater than 3’ above highest possible water level).

B. Typical Examples:
   1. All exposed structural steel including but not limited to columns, beams, roof joists, purlins and other supporting members.
   2. Equipment including but not limited to pumps, blowers, air compressors, valves, and other process equipment, motors, gear reducers, and equipment guards.
   3. Steel, ductile, or cast iron piping not otherwise coated as specified in piping sections.

C. Surface Preparation:
   1. Shop: SSPC-SP 6 Commercial Blast, as specified in herein.
   2. Field: Sandblasting of field welds and other imperfections. Owner’s Representative may require all areas to be blasted at his discretion, SSPC-SP 6, commercial blast as specified in herein.

D. Product and Manufacturer:
   One of the following shall be provided:
   1. Tnemec
      a. Primer: Series L69 Hi-Build Epoxoline II - one or more coats, 3.0 - 5.0 total dry mils thickness
      b. Finish: Series 435 Perma Glaze - one or more coats, 15.0 - 20.0 total dry mils thickness
   2. Or equal
Coating System 2

A. Service:
1. Structural steel, miscellaneous metals, and steel, ductile iron, or cast iron piping
2. Exterior exposure
3. Non-submerged applications (greater than 3’ above highest possible water level)

B. Typical Examples:
1. All exposed structural steel including but not limited to columns, beams, roof joists, purlins and other supporting members.
2. Equipment including but not limited to pumps, blowers, air compressors, valves, other process equipment, motors, gear reducers, and equipment guards.
3. Overhead coiling and man doors if not specified door elsewhere.
4. Steel, ductile, or cast iron piping not otherwise coated as specified in piping sections.

C. Shop Surface Preparation:
1. Shop: SSPC-SP 6 Commercial Blast as specified in herein
2. Field: Sandblasting of field welds and other imperfections. Owner’s Representative may require all areas to be blasted at his discretion, SSPC-SP 6, commercial blast as specified in herein. All oils, small deposits of asphalt paint, grease, and soluble deposits shall be removed in accordance with NAPF 500-03-01 Solvent Cleaning prior to abrasive blasting. Uniformly rotary-abrasive blast using angular abrasive to a NAPF 500-03-04. When viewed without magnification, the surfaces shall be free of all visible dirt, dust, annealing oxide, rust, mold coating and other foreign matter. Random staining shall be limited to no more than 5 percent and may consist of light shadows, rust stains, oxide stains, or stains of previously applied coating. Any area where rust reappears before application shall be reblasted. The surface shall contain a minimum angular anchor profile of 3.0 mils (76.2 microns) (Reference NACE RP0287 or ASTM D 4417, Method C).

D. Products and Manufacturer: One of the following shall be provided:
1. Tnemec
   a. Primer: Series L69 Hi-Build Epoxoline II - one or more coats, 4.0 - 6.0 total dry mil thickness
   b. Intermediate: Series L69 Hi-Build Epoxoline II - one or more coats, 4.0 - 6.0 total dry mil thickness
   c. Finish: Series 1075U Endura-Shield - one or more coats, 4.0 - 6.0 total dry mil thickness
      1) Note: Finish color for all non-buried piping to be gunmetal grey.
2. Or equal
Coating System 3

A. Service:
   1. Galvanized structural steel, galvanized miscellaneous metals, and galvanized steel pipe.
   2. Interior exposure
   3. Non-submerged applications (greater than 3’ above highest possible water level)

B. Typical Examples:
   1. All exposed galvanized structural steel including but not limited to columns, beams, roof joists, purlins and other supporting members.
   2. Flashing.
   3. Galvanized rigid conduit.

C. Surface Preparation:
   1. Solvent Cleaning, SSPC-SP 1 as specified in herein, followed by SSPC-AP16 brush off blast to provide an anchor profile of 1.5 to 2.0 mils minimum

D. Product and Manufacturer: One of the following shall be provided:
   1. Tnemec
      a. Primer: Series L69 Hi-Build Epoxoline II - one or more coats, 3.0 - 5.0 total dry mil thickness
      b. Finish: Series L69 Hi-Build Epoxoline II - one or more coats, 3.0 - 5.0 dry total dry mil thickness
   2. Or equal
Coating System 4

A. Service:
   1. Galvanized structural steel, galvanized miscellaneous metals, and galvanized steel pipe.
   2. Aluminum tube
   3. Exterior exposure
   4. Non-submerged applications (greater than 3’ above highest possible water level)

B. Typical Examples:
   1. All exposed galvanized structural steel including but not limited to columns, beams, roof joists, purlins and other supporting members.
   2. Flashing
   3. Galvanized rigid conduit
   4. Bollards
   5. All buried and exposed aluminum tubing in contact with dissimilar materials including but not limited to other metals, concrete, wastewater, and soil.

C. Surface Preparation:
   1. Solvent Cleaning, SSPC-SP 1 as specified in herein, followed by SSPC-SP 16 brush off blast to provide an anchor profile of 1.5 to 2.0 mils minimum

D. Product and Manufacturer: One of the following shall be provided:
   1. Tnemec
      a. Primer: Series 115 Uni-Bond DF - one or more coats, 2.0 - 4.0 total dry mil thickness
      b. Finish: Series 1028 Enduratone gloss or Enduratone Series 1029 semi-gloss - one or more coats, 2.5 – 3.5 dry total dry mil thickness
   2. Or equal
Coating System 5

A. Service:
   1. Structural steel, miscellaneous metals and steel, ductile iron, or cast iron piping
   2. Submerged, intermittently submerged, or splash zone applications (within 3’ of highest possible water level).

B. Typical Examples:
   1. Structural steel
   2. Steel, ductile, or cast iron piping not otherwise coated as specified in piping sections.
   3. Pump base elbows, pumps, mixers and other process equipment
   4. Pipe supports

C. Surface Preparation:
   1. Shop: SSPC-SP 10 Near-White Blast Cleaning
   2. Field: Sandblasting of field welds and other imperfections. Owner’s Representative may require all areas to be blasted at his discretion, SSPC-SP 6, commercial blast as specified in herein.

D. Product and Manufacturer: One of the following shall be provided:
   1. All systems described in Paragraph B except pumps
      a. Tnemec
         1) **Primer:** Series L69 Hi-Build Epoxoline II - one or more coats, 3.0 - 5.0 total dry mil thickness
         2) **Intermediate:** Series L69 Hi-Build Epoxoline II - one or more coats, 3.0 - 5.0 total dry mil thickness
         3) **Finish:** Series L69 Hi-Build Epoxoline II - one or more coats, 3.0 - 5.0 total dry mil thickness
            a) Note: Finish color for all non-buried piping to be gunmetal grey.
      b. Or equal
   2. Pumps
      a. Tnemec
         1) **Primer:** Series L69 Hi-Build Epoxoline II - one or more coats, 3.0 - 5.0 total dry mil thickness
         2) **Finish:** Series L69 Hi-Build Epoxoline II - one or more coats, 3.0 - 5.0 total dry mil thickness
      b. Or equal
Coating System 6

A. Service:
   1. Galvanized structural steel, galvanized miscellaneous metals, and galvanized steel pipe.
   2. Submerged, intermittently submerged, or splash zone applications (within 3’ of highest possible water level).

B. Typical Examples:
   1. Structural steel
   2. Steel piping not otherwise coated as specified in piping sections.
   3. Pump base elbows, pumps, mixers and other process equipment
   4. Pipe supports

C. Surface Preparation:
   1. Solvent Cleaning, SSPC-SP 1 as specified in herein, followed by brush off blast to provide an anchor profile of 1.5 to 2.0 mils minimum

D. Product and Manufacturer: One of the following shall be provided:
   1. All systems described in Paragraph B
      a. Tnemec
         1) Primer: Series L69 Hi-Build Epoxoline II -- one or more coats, 3.0 - 5.0 total dry mil thickness
         2) Intermediate: Series L69 Hi-Build Epoxoline II -- one or more coats, 3.0 - 5.0 total dry mil thickness
         3) Finish: Series L69 Hi-Build Epoxoline II -- one or more coats, 3.0 - 5.0 total dry mil thickness
      b. Or equal
Coating System 7

A. Service:
   1. Plastics including PVC and CPVC Piping
   2. Interior or exterior exposure
   3. Non-submerged applications

B. Typical Example:
   1. Exposed PVC and CPVC piping.
   2. Notable Exceptions:
      a. Do not coat submerged or partially submerged plastic piping.
      b. Do not coat plastic valves, unions, valve handles or other similar plastic items.
      c. Do not coat exposed PVC conduit or exposed rigid steel with PVC coating conduit.

C. Surface Preparation:
   1. Plastic shall be prepared in accordance with SSPC SP-1 (Solvent Cleaning) followed by SSPC-SP 2 (Hand Tool cleaning). Contractor shall use a solvent compatible with the specified coating and roughen surfaces by sanding.

D. Product and Manufacturer: One of the following shall be provided:
   1. Carboline
      a. Finish: Carbothane 134VOC – two coats, 5.0 total dry mil thickness
   2. Tnemec
      a. Finish: Tnemec Series 1075 – two coats, 5.0 total dry mil thickness
   3. International
      a. Finish: ICI Devoe Devthane 378H - two coats, 5.0 total dry mil thickness
   4. Or equal
Coating System 8

A. **Service:**
   1. Concrete structures, exterior, buried.

B. **Typical Example:**
   1. Manhole, wet well and emergency storage tank exterior below grade.

C. **Surface Preparation:**
   1. Prepare all surfaces to receive coating per manufacturer's recommendations.

D. **Product and Manufacturer**
   1. Xypex Concentrate damp-proofing exterior coating.
      a. 1 coat, 60 mils.
   2. No substitutions.
PART 3 - EXECUTION

3.01 Examination
A. The Contractor and his applicator shall examine the areas and conditions under which painting work is to be performed and notify the Owner’s Representative in writing of conditions detrimental to the proper and timely completion of the Work. The Contractor shall not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Owner’s Representative.

B. The Contractor shall not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

3.02 Preparation
A. Coordination:
   1. The Contractor shall review installation procedures under other Sections and coordinate the installation of items that must be field painted in this Section.
   2. The Contractor shall coordinate the painting of areas to be painted that will be inaccessible once equipment has been installed.
   3. The Contractor shall provide finish coats that are compatible with the prime paints used.
   4. The Contractor shall review other Sections of these Specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates.
   5. The Contractor shall be responsible for the compatibility of all shop primed and field painted items in this Contract.
   6. The Contractor shall furnish information on the characteristics of the finish materials proposed to use, to ensure that compatible prime coats are used. Barrier coats shall be provided over incompatible primers or primers shall be removed and re-primed as required.

B. Protection:
   1. Finished Work of other trades and surfaces not being painted concurrently or not to be painted shall be covered or otherwise protected.
   2. Work of other trades shall be protected, whether to be painted or not, against damage by the painting and finishing work. All such work shall be left undamaged. All damage shall be corrected by cleaning, repairing or replacing, and repainting, as acceptable to the Owner's Representative.
   3. Wet Paint signs shall be provided as required to protect newly painted finishes. All temporary protective wrapping provided for protection of this Contract shall be removed after completion of painting operations.

C. Surface Preparation
   1. General:
      a. All preparation and cleaning procedures shall be performed as specified herein and in strict accordance with the paint manufacturer's instructions for each particular substrate and atmospheric condition.
      b. All hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish painted shall be removed or provided surface
applied protection prior to surface preparation and painting operations. The Contractor shall remove, if necessary, for the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, the removed items shall be reinstalled by workmen skilled in the trades involved.

c. Surfaces to be painted shall be cleaned before applying paint or surface treatments. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. The cleaning and painting shall be programmed so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.

d. All surfaces that were not shop painted or that were improperly shop painted, and all abraded or rusted shop painted surfaces, which are to be painted, as determined by the Owner’s Representative, shall be prepared as specified below.

2. Concrete and Masonry Surfaces:
   a. Surfaces of concrete, precast concrete, and concrete block to be painted and sealed with clear finish shall be prepared by removing all efflorescence, chalk, dust, dirt, grease and oils with soap and water.
   b. The alkalinity and moisture content of the surfaces to be painted shall be determined by performing appropriate tests. If the surfaces are found to be sufficiently alkaline to cause blistering and burning of the finish paint, this condition shall be corrected before application of paint. The Owner’s Representative shall be provided with suitable testing materials to carry out alkalinity and moisture tests.
   c. The Contractor shall not paint over surfaces where the moisture content exceeds 8 percent, unless otherwise permitted in the manufacturer’s printed directions.
   d. Concrete and concrete block surfaces that cannot be adequately cleaned by soap and water shall be acid etched. Exceedingly dense concrete may require a second etching.
   e. Brush blast clean shall be equivalent to SSPC-SP 7, to open bug holes and remove all non-adhering concrete. All areas so prepared shall be thoroughly cleaned before beginning coating work.

3. Ferrous Metals:
   a. Non-submerged ferrous surfaces, including structural steel and miscellaneous metal to be shop primed, shall be cleaned of all oil, grease, dirt, mill scale and other foreign matter by commercial blast cleaning complying with SSPC-SP 6.
   b. Submerged ferrous surfaces, including structural steel and miscellaneous metal to be shop primed, shall be cleaned of all oil, grease, dirt, mill scale and other foreign matter by near-white blasting complying with SSPC-SP 10.
   c. Non-submerged, ferrous surfaces that have not been shop-coated shall be cleaned of all oil, grease, dirt, loose mill scale and other foreign substances by commercial blasting, complying with SSPC-SP 6.
   d. Submerged ferrous surfaces that have not been shop-coated or that, in the opinion of the Owner’s Representative, have been improperly shop-coated, shall be cleaned of all oil, grease, dirt, mill scale and other foreign matter by near-white blasting complying with SSPC-SP 10.
   e. Bare and blasted or pickled clean metal shall be treated with metal treatment wash coat, prior to priming only if recommended by the paint manufacturer.
   f. Shop applied prime coats that have damaged or bare areas shall be touched-up with primer recommended by the coating manufacturer after commercial blasting complying with SSPC-SP 6.
g. Weld Preparation: Remove weld spatter and slag by chipping or grinding. Grind all sharp edges and corners to a smooth contour. Welds to be ground free from undercuts, recesses and pinholes.

4. Non-Ferrous Metal Surfaces:
   a. Non-ferrous metal surfaces shall be cleaned in accordance with the coating system manufacturers' instructions for the type of service, metal substrate, and application required.

5. Galvanized Surfaces:
   a. The Contractor shall clean free of oil and surface contaminants with solvent or other methods recommended by the coating manufacturer, complying with SSPC-SP 1.
   b. All coated galvanized ferrous metal, interior and exterior, shall be cleaned of all oil, grease, dirt, mill scale and other foreign matter by a brush-off blast cleaning complying with SSPC-SP 7 with 1.5 to 2.0 mils profile.

D. Materials Preparation

1. General:
   a. Painting materials shall be mixed and prepared in strict accordance with the manufacturer's directions.
   b. Coating materials produced by different manufacturers shall not be mixed, unless otherwise permitted by the manufacturer's instructions.
   c. Materials not in actual use shall be stored in tightly covered containers. Containers used in storage, mixing, and application of paint shall be maintained in a clean condition, free of foreign materials and residue.
   d. All materials shall be stirred before application to produce a mixture of uniform density, and as required during the application of the materials. Any film that may form on the surface shall not be stirred into the material. The film shall be removed and, if necessary, the material shall be strained before using.
   e. Brush stripe edges and corners to achieve specified coating thickness and coverage.

2. Tinting:
   a. Each undercoat shall be tinted a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied. Undercoats shall be tinted to match the color of the finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat. A code number shall be provided to identify material tinted by the manufacturer.

3. Mixing:
   a. The Contractor shall mix only in mixing pails placed in a suitably sized non-ferrous or oxide resistant metal pans to protect concrete floor from splashes or spills which could stain exposed concrete or react with subsequent finish floor material.
   b. Paint shall be mixed and applied only in containers bearing accurate product name of material being mixed or applied.

3.03 Application

A. General:

1. Paint shall be applied by mechanical application techniques such as roller, brush, trowel, air spray, or airless spray in accordance with the manufacturer's directions and recommendations.
of Paint Application Specifications No. 1 in SSPC Vol. 2, where applicable, or as required in these Specifications. Brushes best suited for the type of material being applied shall be used. Where approved by the Owner's Representative, rollers of carpet, velvet back, or high pile sheep's wool shall be used, as recommended by the paint manufacturer for material and texture required.

2. The number of coats and paint film thickness required is the same regardless of the application method. Succeeding coats shall not be applied until the previous coat has completely dried.

3. Where multiple coats of the same material is used, tint prime and intermediate coats in order to distinguish each coat.

4. Additional coats shall be applied when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. This is of particular importance regarding intense primary accent colors. The Contractor shall insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.

5. Surfaces not exposed to view do not require color coding but require the same coating systems specified for exposed surfaces. Exposed to view surfaces are defined as those areas visible when permanent or built-in fixture, convextor covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.

6. The backs of access panels and removable or hinged covers shall be painted to match the exposed surfaces.

7. Aluminum parts in contact with dissimilar materials shall be painted as specified with appropriate finish.

8. Brush stripe welds; bolts; nuts; edges and corners to achieve proper coating thicknesses.

B. Electrical Work:

1. Electrical items to be painted include, but are not limited to, the following:
   a. Conduit and fittings.
   b. Miscellaneous panels, junction boxes, motors and accessories.

C. Minimum / Maximum Coating Thickness:

1. The Contractor shall apply each material at not less than the manufacturer’s recommended spreading rate, and provide total dry film thickness as specified. Extra coat shall be applied if required to obtain specified total dry film thickness or uniform opacity. If the recommended maximum coating thickness is exceeded, the excess amount will be removed and repaired as specified.

D. System Coating Thickness:

1. The system total dry mil thickness shall be the sum of the Primer, Intermediate and Finish Coats specified.

E. Scheduling Painting:

1. The first-coat material shall be applied to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration. Abrasive blasted ferrous metal surfaces shall be coated within eight (8) hours on the same day of abrasive blasting.

2. Subsequent coats shall be applied as per manufacturer’s written recoat parameters as detailed on their product data sheet. Sufficient time between successive coating shall be
allowed to permit proper drying. The Contractor shall not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting of loss of adhesion of the undercoat.

F. Prime Coats:
1. Primed and sealed walls and ceilings shall be recoated where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects caused by insufficient sealing.

G. Pigmented (Opaque) Finish:
1. The Contractor shall completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

H. Brush Application:
1. All brush coats shall be brushed-out and worked onto the surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable. All glass and color break lines shall be neatly drawn.

I. Mechanical Applicators:
1. Mechanical methods shall be used for paint application as suggested by the paint manufacturer. Conduct spray coating under controlled conditions. Protect adjacent structure for overspray.
2. For spray application, apply coating to thickness not greater than suggested in paint manufacturer's instruction.
3. Wherever spray application is used, each coat shall be applied to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of 2 coats in one pass.

3.04 Field Quality Control
A. The right is reserved by the Owner's Representative to invoke the following material testing procedure at any time, and any number of times during the period of field painting:
1. Engage the service of an independent testing laboratory to sample any of the paint being used. Samples of materials delivered to the project site will be taken, identified and sealed, and certified in the presence of the Contractor.
2. The testing laboratory will perform appropriate tests for any or all of the following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative material analysis.
3. If the test results show that the material being used does not comply with the specified requirements, the Contractor may be directed to stop the painting Work, and remove the non-complying paint; pay for testing; repaint surfaces coated with the rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with the specified paint, the two coatings are non-compatible.

B. Prior to initial coat and after completion of each successive coat of paint, the Contractor shall notify the Owner's Representative. After inspection, checking of film thickness and approval by the Owner's Representative, proceed with the succeeding coat. Contractor shall supply the Owner's Representative for his use a Gardner dry-film thickness gage.
3.05 Cleaning
A. During the progress of the Work, all discarded paint materials, rubbish, cans and rags shall be removed from the site at the end of each work day.
B. Upon completion of painting work, all paint-spattered surfaces shall be cleaned. Spattered paint shall be removed by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
C. At the completion of work of other trades, all damaged or defaced painted surfaces shall be touched-up and restored, as determined by the Owner’s Representative.

3.06 Demonstration
A. Completed Work:
   1. The Contractor shall match approved samples for color, texture and coverage.
   2. Work not in compliance with specified requirements shall be removed, refinished or repainted, as required by the Owner’s Representative.

** END OF SECTION **
SECTION 11010
GENERAL REQUIREMENTS FOR EQUIPMENT

PART 1 - GENERAL

1.01 Summary
A. Scope: This section provides the general requirements that must be met by all equipment supplied under Division 11 and or shown on the drawings.

B. Equipment Lists: Equipment lists, if any, presented in these specifications and shown on the drawings are included for the convenience of the Engineer and Contractor and are not intended to represent a rigorous and precise listing of all equipment, devices and material to be provided under this contract. The Contractor agrees to rely solely upon his own material and equipment takeoff lists for this purpose.

1.02 References
A. This section references the following documents. They are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFMBA</td>
<td>Methods of Evaluating Load Ratings of Ball and Roller Bearings</td>
</tr>
<tr>
<td>ANSI B1.1</td>
<td>Unified Inch Square Threads</td>
</tr>
<tr>
<td>ANSI B2.1</td>
<td>Pipe Threads (Except Dupeal)</td>
</tr>
<tr>
<td>ANSI B16.1</td>
<td>Cast Iron Pipe Flanges and Flanged Fittings, Class 125</td>
</tr>
<tr>
<td>ANSI B18.2.1</td>
<td>Square and Hex Head Bolts and Screws, Including Askew Head Bolts, Hex Cap Screws, and Lag Screws</td>
</tr>
<tr>
<td>ANSI B 18.2.2</td>
<td>Square and Hex Nuts</td>
</tr>
</tbody>
</table>

1.03 Submittals
A. General: The submittal for each individual equipment or groups of related equipment shall be in accordance with Section 01340 – Submittals Procedures.

B. Required Submittal Data: In addition to the data required in Section 01340 – Submittals Procedures, the following information shall be submitted for each piece of equipment. Additional submittal requirements, specific to individual equipment items, are listed in the individual equipment specifications.

1. The proposed equipment shall be identified by the equipment numbers listed in the specifications and on the drawings.

2. Manufacturer and manufacturer’s type designation

3. A photocopy of the equipment specifications shall be included. All paragraphs shall be initialed to show compliance. Any exceptions to these specifications along with justification for each exception shall be clearly presented.

4. Manufacturer’s catalog data confirming rated capacity, horsepower, efficiency and electrical requirements
5. Shop drawings
6. Predicted performance curves developed for the specific application. In the case of rotating equipment, performance curves shall show speed, capacity, pressure, efficiency and power for all specified conditions
7. Motor submittal data
8. Cross-sectional views of machines showing details of construction
9. Data and calculations required to justify selection of size of components such as shafts, bearings, and peripheral equipment necessary to conform to these specifications
10. Parts lists, with materials of construction
11. Installation, startup, and shakedown requirements noting all items to be inspected and confirmed at each stage of installation, startup, and shakedown.
12. An electronic copy of the main equipment Operation and Maintenance manual(s) for general information as part of initial equipment submittal in addition to the requirements of specification 01300.
13. Contractor shall certify that all shop applied coatings are compatible with the approved field coating system specified in Section 09900 – Protective Coating Systems. If a barrier coating is required, the Contractor shall so state.

1.04 Quality Assurance
A. Arrangement: The arrangement of equipment shown is based upon information available to the District at the time of design and is not intended to show exact dimensions peculiar to a specific manufacturer unless otherwise indicated. The drawings are, in part, diagrammatic and some features of the illustrated equipment installation may require revision to meet actual equipment installation requirements. Structural supports, foundations, connected piping and valves shown may have to be altered to accommodate the equipment provided. No additional payment will be made for such revisions and alterations.
B. Control Devices: Control devices, wiring, starters, panels, light, and other electrical items provided with mechanical equipment shall, in general, conform to the requirements of Division 16 as well as any requirements of the particular equipment specification.

1.05 Delivery, Storage and Handling
A. Protection during Shipment
   1. Each item of equipment shall be shipped to the site of the work with either the manufacturer’s shop applied prime coating or a vinyl paint prime coating. The prime coating shall be applied over clean dry surfaces in accordance with the paint manufacturer’s recommendations. The prime coating will serve as a base for field-applied finish coats.
   2. Bearing housings shall be wrapped or otherwise sealed to prevent contamination by grit and dirt, and ventilation and other types of openings shall be taped closed.

PART 2 - PRODUCTS

2.01 Flanges and Pipe Threads
A. Flanges on equipment and appurtenances:
   1. Shall conform in dimensions and drilling to ANSI B16.1, Class 125.
   2. Unless otherwise specified, metric dimensioned flanges not allowed.
3. Unless otherwise specified, flanges shall be flat faced.

B. Pipe threads:
   1. Shall conform in dimension and limits of size to ANSI B1.1, coarse thread series, Class 2 fit.
   2. Threaded flanges shall have a standard taper pipe thread conforming to ANSI B2.1.

C. Flange assembly bolts:
   1. Shall be heavy pattern, hexagonal head, carbon steel machine bolts with heavy pattern, hot pressed, hexagonal nuts conforming to ANSI B18.2.1 and B18.2.2.

2.02 Bearings

A. Unless otherwise specified, equipment bearings shall be oil or grease lubricated, ball or roller type, designed to withstand the stresses of the service specified. Each bearing shall be rated in accordance with the latest revisions of AFMBA Methods of Evaluating Load Ratings of Ball and Roller Bearings for one of the following classes of B-10 rating life:

<table>
<thead>
<tr>
<th>Class</th>
<th>Hours of Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>8,000</td>
</tr>
<tr>
<td>M2</td>
<td>20,000</td>
</tr>
<tr>
<td>M3</td>
<td>50,000</td>
</tr>
<tr>
<td>M4</td>
<td>100,000</td>
</tr>
<tr>
<td>M5</td>
<td>200,000</td>
</tr>
</tbody>
</table>

B. Unless otherwise specified, equipment shall have bearings rated for Class M4 life or greater.

C. Grease lubricated bearings, except those specified to be factory sealed and lubricated, shall be fitted with easily accessible grease supply, flush, drain and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be standard hydraulic Alemite type.

D. Oil lubricated bearings shall be equipped with either a pressure lubricating system or a separate oil reservoir type system. Each oil lubrication system shall be of sufficient size to safely absorb the heat energy normally generated in the bearing under a maximum ambient temperature of 60 degrees C and shall be equipped with a filler pipe and an external level indicator gauge.

2.03 V-Belt Assemblies

A. V-belt assemblies shall be Dodge Dyna-V belts with matching Dyna-V sheaves and Dodge Taper-lock bushings, Wood’s Super V-Belts with matching Sure-Grip sheaves and Wood’s Sure-Grip bushings, or equal.

B. Sheaves and bushings shall be statically balanced. Additionally, sheaves and bushing which operate at a peripheral speed of more than 550 feet per minute shall be dynamically balanced. Sheaves shall be separately mounted on their bushings by means of three pull-up or cap tightening screws. Bushings shall be key seated to the drive shaft.

C. Belts shall be selected for not less than 150 percent of rated driver horsepower and, where two sheaves sizes are specified, shall be capable of operating with either set of sheaves. Belts shall be of the antistatic type where explosion-proof equipment is specified.
2.04 Seals

A. Mechanical

1. Unless otherwise specified, mechanical seals may be internal or external type, balanced or unbalanced type, and single or double seals except as herein specified. An internal type seal may be used where clean sealing liquid is provided, either from the pumped liquid or an external source. When the pumped liquid is corrosive, abrasive, toxic or flammable, an internal double seal shall be provided with adequate sealing liquid pressure to prevent entry of pumped liquid into the seal chamber, or an external seal may be provided. The sealing liquid shall be within the temperature limits and at the flushing rate recommended by the equipment manufacturer.

2. The seal may be balanced or unbalanced, as recommended by the equipment manufacturer. To maintain the necessary minimum or maximum pressure across the seal faces, spring pressure shall be uniformly distributed to the sealing faces by a coil spring or multiple springs. The rotating seal element shall be clamped to the shaft and provided with O-ring seal. The stationary seal element shall be sealed with O-ring or gasket material.

3. Seal faces shall be tungsten carbide to tungsten carbide except on the double seal where the seal in contact with pump liquid shall be carbon. The O-ring gasket material shall be as recommended by the manufacturer for the liquid being pumped. Other parts shall be 316 stainless steel.

B. Stuffing Box: Unless otherwise specified, each stuffing box shall be cast separately, bolted to the bearing frame, tapped to permit installation of a clean liquid seal, and shall be large and sufficiently deep to hold a minimum of five rows of packing and a bronze lantern water seal ring. Packing shall be die-molded packing rings of material suitable for the intended service and as recommended by the manufacturer. Sealing liquid shall be the pumped liquid unless otherwise specified. Taps for external sealing and a lantern ring shall be provided. When used, lantern rings shall be of two-piece construction and shall be provided with tapped holes to facilitate removal. Packing gland halves and studs shall be 316 stainless steel.

2.05 Couplings

A. Unless otherwise specified in the particular Equipment Sections, equipment with a driver greater than 2 HP, and where the input shaft of a driven unit is directly connected to the output shaft of the driver, shall have its two shafts connected by a flexible coupling which can accommodate angular misalignment, parallel misalignment and end float, and which cushions shock loads and dampens torsional vibrations. The flexible member shall consist of a tire with synthetic tension members bonded together in rubber. The flexible member shall be attached to flanges by means of clamping rings and cap screws, and the flanges shall be attached to the stub shaft by means of taperlock bushings which shall give the equivalent of a shrunk-on-fit. There shall be no metal-to-metal contact between the driver and the driven unit. Each coupling shall be sized and provided as recommended by the coupling manufacturer for the specific application, considering horsepower, speed of rotation, and type of service.

B. Where torque or horsepower capacities of couplings of the foregoing type is exceeded, Thomas-Rex, Falk Steel Flex, or equal, couplings will be acceptable provided they are sized in accordance with the equipment manufacturer’s recommendations and sizing data are submitted. They shall be installed in conformance to the coupling manufacturer’s instructions.

2.06 Guards

A. Exposed moving parts shall be provided with guards which meet the requirements of CAL/OSHA. Guards shall be fabricated of solid 14-gauge steel. Guards shall be galvanized after fabrication
and shall be designed to be readily removable to facilitate maintenance of moving parts. Reinforced holes shall be provided. Reinforced holes shall be provided.

### 2.07 Caution Signs

A. Equipment with guarded moving parts which operates automatically or by remote control shall be identified by signs reading “CAUTION – AUTOMATIC EQUIPMENT MAY START AT ANY TIME.” Signs shall be installed near guarded moving parts.

### 2.08 Pressure Taps, Test Plugs, and Gauges

A. Weather shown or not shown on the drawings, ½” pressure taps w/plugs shall be provided on the suction and discharge sides of all pumps, blowers and compressors. Pressure and vacuum test gauges shall be provided where shown or specified.

### 2.09 Nameplates

A. Nameplates shall be provided on each item of equipment and shall contain the specified equipment name or abbreviation. Equipment nameplates shall be engraved or stamped on corrosion resistant material and fastened to the equipment in an accessible location with a No. 4 or larger oval head stainless steel screws or drive pins.

### 2.10 Lubricants

A. The Contractor shall provide for each item of mechanical equipment a supply of the lubricant required for the initial filling and for the commissioning period.

B. Lubricants shall be of the type recommended by the equipment manufacturer and shall be products of the District’s current lubricant supplier.

C. The Contractor shall limit the various types of lubricants by consolidating them, with the equipment manufacturer’s approval, into the least number of different types. Not less than 90 days before the date shown in his construction schedule for starting, testing, and adjusting equipment.

D. Contractor shall provide the District with three copies of a list showing the required lubricants, after consolidation, for each item of mechanical equipment. The list shall show estimated quantity of lubricant needed for a full year’s operation, assuming the equipment will be operating continuously.

### 2.11 Spare Parts

A. Parts and materials shall be furnished in manufacturer’s unopened cartons, boxes, crates or other protective covering suitable for preventing corrosion or deterioration for the maximum length of storage that may be normally anticipated. They shall be clearly marked and identified.

B. During construction, parts shall be stored in buildings or trailers with floor, roof and closed sides and in accordance with manufacturer’s recommendations. They shall be protected from weather, condensation and humidity.

C. Spare parts and materials shall be delivered to the District upon completion of the Work or when the District assumes beneficial occupancy. Contractor shall then place them in permanent storage rooms or areas approved by the District’s Representative.

D. A letter of transmittal shall accompany the spare parts and shall include the following:

1. Date of letter and transfer of parts and material
2. Contract title and number
3. Contractor’s name and address
4. A complete inventory of the parts and material, listing the applicable Specification Section for each

5. A place for the District to sign and signify receipt of the parts and materials

E. Contractor shall be fully responsible for loss or damage to parts and material until they are transmitted to the District.

PART 3 - EXECUTION

3.01 Installation

A. Each item of equipment provided shall be installed and tested within the tolerances recommended by the equipment manufacturer.

3.02 Testing

A. Items of equipment specified in this Section shall be tested as required in each section and in accordance with Division 1 requirements.

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. This section includes the requirements for supply and installation of mounts, supports, and anchorage hardware for all equipment and accessories required to make a complete system including but not limited to piping, fans, and ducts.

1.02 System Description
A. Design Requirements
   1. Requirements of Regulatory Agencies:
      a. All tanks, and related piping, equipment and related supports and equipment anchorages shall be designed and supplied by the Contractor in accordance with National and State requirements including, but not limited to CBC, AWWA & ANSI Standards.
   2. Project Specific Requirements:
      a. See the structural drawings for project specific seismic and wind load parameters.
      b. If there is a conflict between this section and the structural drawings, the structural drawings will govern.
   3. Additional Design Requirements:
      a. In addition to code requirements, anchors and supports shall be designed to allow for expansion and contraction throughout the full potential temperature differential (both operational and off-line conditions).
      b. Anchors shall be capable of supporting equipment and accessories in all service and testing conditions.
      c. Anchorage shall allow for proper leveling.
      d. Allowances shall be provided for horizontal and vertical adjustment after installation and operation.

1.03 Submittals
A. The following items shall be submitted in accordance with the requirements of Section 01340 – Submittals Procedures and Section 11010 - General Requirements for Equipment:
   1. Calculations:
      a. Calculations for all of the work required above. All calculations must be made and signed by a civil or structural engineer currently registered in the State of California.
   2. Design codes and criteria used
   3. Equipment weight, support points, and center of gravity
   4. Anchor and hardware details
   5. Concrete embeds (if any)
   6. Isolation mounts (vibratory and reciprocating equipment)
B. Inasmuch as all anchorage of equipment will be made to cast-in-place concrete elements, it is imperative that types of anchorage be coordinated with the concrete placement.

C. If calculations and anchorage details are not submitted prior to placing of concrete, the Contractor will become responsible for any strengthening of concrete elements because of superimposed seismic loading.

1.04 Quality Assurance

A. Allow for special inspection for the installation of chemical anchors in accordance with CBC requirements.

B. Expansion type anchors or adhesive type anchors shall not be allowed as a substitute for cast-in-place anchors.

PART 2 - PRODUCTS

2.01 General

A. All equipment located on floor slabs shall be mounted on concrete pads.

B. Concrete pedestals and pad dimensions shall be provided with submittal.

1. Unless otherwise shown on the drawings, the minimum edge distance for anchors is 1.5 times anchor embedment, but no less than 6”.

C. All conduits, piping connections, drains, etc., shall be enclosed by the concrete base.

D. Where a steel base is shown or specified between the equipment and the concrete pedestal, it shall be hot-dip galvanized after fabrication.

2.02 Materials

A. Unless otherwise specified on the drawings, materials of construction for anchoring devices shall conform to the following:

1. Anchor bolts and other anchoring devices, nuts, and washers shall be type 304 stainless steel.

2. Anchor bolts and other anchoring devices, nuts, and washers shall be type 316 stainless steel if installed outside, below the top of walls of water containing structures, on the underside of roofs, slabs, or walkways, or on the dry side of walls on water containing structures.

2.03 Cast Iron Bases

A. Cast iron bases do not require galvanizing but must be sealed in accordance with the requirements specified in Section 09900 – Protective Coating Systems.

B. All fasteners requiring connections to the base shall be terminated by nuts welded to the bottom side of the base and plugged with cork, plastic plugs or grease, or acorn nuts.

C. In no case shall the fastener terminate only into the metal base.

2.04 Anchors

A. Epoxy and wedge anchors used in concrete shall be approved for cracked concrete per ACI 318 Appendix D.

B. See structural drawings for further requirements.

2.05 Adjustability
A. Provide leveling grout for equipment mounting unless otherwise detailed on Drawings.

PART 3 - EXECUTION

3.01 Installation

A. Equipment

1. Except where a higher lateral force is required by code, each piece of equipment installed shall be anchored to resist minimum lateral seismic forces for the site.

2. No equipment shall be anchored to vertical structural elements without written approval of the Engineer.

3. Vibratory equipment shall be supported by isolator mounts to limit transmissibility to structure.

4. Non-vibrating isolation equipment shall be anchored directly to the supporting floor system.

5. In addition to the anchorage, all equipment shall be internally designed so that all static and moving parts are anchored to the supporting framework to resist the imposed seismic force. All forces must be transmitted to the base in order to be anchored as required.

B. Piping

1. All piping, raceways, accessories, and appurtenances, furnished with equipment shall be anchored to resist lateral seismic forces.

2. Piping with flexible connections and/or expansion joints shall be anchored such that the intended uses of these joints are maintained in the piping system.

C. Anchor bolts

1. Prior to installing nuts on anchor bolts, coat with non-seize compound to prevent galling of threads.

2. Nuts shall be tightened to the full effort of a man with an ordinary wrench.

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. This section specifies submersible pumps for pumping runoff water that has been collected from the solids stabilization basin.

B. The following list of related sections is provided for the convenience of the Contractor. It includes the commonly referenced sections that are in-general applicable to all equipment supplied. This list does not excuse the Contractor from any requirement given in a section not specifically listed below. Where there is a difference between this specification and any other specifications, the conflict shall be resolved at the sole discretion of the Engineer.

1. All sections of Division 1 including but not limited to 01340 – Submittals, 01600 – Material & Equipment Substitution, and Section – 01660 Testing.

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>05910</td>
<td>Hot-Dip Zinc Coating</td>
</tr>
<tr>
<td>09900</td>
<td>Protective Coating Systems</td>
</tr>
<tr>
<td>11010</td>
<td>General Requirements for Equipment</td>
</tr>
<tr>
<td>11050</td>
<td>Equipment Mounting</td>
</tr>
<tr>
<td>16000</td>
<td>Electrical</td>
</tr>
<tr>
<td>17000</td>
<td>Instrumentation</td>
</tr>
</tbody>
</table>

1.02 System Description
A. The pumps shall be suitable for heavy-duty continuous submerged service and shall be capable of intermittent operation with the motor above liquid surface.

B. The pumps shall be submersible non-clog sump pumps and shall be provided with pump motor, base elbows, slide guide rails and brackets, pump discharge connection couplings, electrical devices internal to pump housing, all submersible cabling for power and control conductors, lifting chains as shown and specified and other items as required for a complete and operational system.
C. Operating Requirements:

1. **Pump – Flygt NP 3085 SH 3 453**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Capacity, gpm</td>
<td>90</td>
</tr>
<tr>
<td>Rated Total Dynamic Head, ft</td>
<td>19</td>
</tr>
<tr>
<td>Maximum Static Head, ft</td>
<td>16</td>
</tr>
<tr>
<td>Maximum Motor Speed, rpm</td>
<td>1,670</td>
</tr>
<tr>
<td>Maximum Motor Horsepower</td>
<td>2.2</td>
</tr>
</tbody>
</table>

1.03 Submittals

A. The Contractor shall provide the following submittals, in accordance with Section 01340 – Submittals Procedures, in addition to the submittals required by Section 11010 - General Requirements for Equipment.

1. Shop drawings for each unit.
2. Outline installation drawings for each unit.
3. Material list(s) and catalog information showing the details of construction.
4. List(s) of recommended Spare Parts and Special Tools.
5. Seismic anchorage requirements per Section 11050 - Equipment Mounting.

B. Manufacturer’s Instructions and Field Reports: In accordance with the requirements of Section 11010 - General Requirements for Equipment instructions for installation and testing of equipment shall be provided with equipment submittals. A manufacturer’s certification letter shall be submitted in accordance with Section 01660 – Testing.

C. Operation and Maintenance: In accordance with Section 01360 – Operating and Maintenance Information, paper or electronic copies of the primary equipment Operation and Maintenance manuals shall be submitted for information with the initial equipment submittals. This is in addition to the information that shall be submitted in accordance with Section 01340 – Submittals.

1.04 Quality Assurance

A. General: The pumps shall be capable of continuous operation in a municipal wastewater application. The solids to be encountered will be those typically found in municipal wastewater treatment service including heterogeneous mixtures of inorganic and organic solids. Among the inorganic solids will be small rocks, sand, pieces of metal, animal bones and similar objects, while the organic solids may be expected to include vegetable parts, rags, paper products, rubber goods, fecal matter, and semi-solid grease particles. In addition, the liquid may be expected to include detergents, industrial solvents, petroleum products and water.

B. Single Source Responsibility: Pump equipment specified in this Section shall be by one manufacturer who has been regularly engaged in the design and manufacture of the equipment. The manufacturer shall have supplied pump equipment that has been in successful operation, at similar installations, for at least five (5) years.

C. Manufacturer shall furnish and coordinate drivers, drive controls, lifting rails, covers, access ways, and miscellaneous components as specified.

D. Manufacturer shall provide written installation and check out requirements.
E. Shop Tests: Each pump shall be fully assembled in the shop and tested prior to shipment. Each pump shall be tested in the shop prior to shipment for free rotation of all moving parts.

1.05 Delivery, Storage, and Handling
A. All equipment shall be shipped and delivered fully assembled, except where partial disassembly is required in order to conform to transportation regulations or for the protection of components.
B. The Contractor shall be responsible for unloading of the machinery and shall have equipment on-site available at the time of delivery permitting proper hoisting of the equipment.

1.06 Project / Site Conditions
A. The equipment shall be suitable for the service specified. The pump and motor will be submerged for extended periods of time. The pumped fluid temperature is expected to range from 10 degrees F and 104 degrees F. The relative humidity is expected to range from 20 to 100 percent.

1.07 Warranty
A. The manufacturer shall furnish the District with a written warranty to cover the pumps against defects in workmanship and material for a period of (5) years and rotating parts for a period of five (5) years under normal use and service from the date of acceptance of installation by the District. Warranty shall not be prorated.
B. The manufacturer’s warranty shall be issued in the District’s name.

1.08 Maintenance
A. Spare parts and special tools shall be furnished as listed below.
   1. Mechanical Seal: 1 each size and type
   2. O-Ring set
   3. Power cable entry seal set
   4. Manufacturer’s standard moisture protection relay
B. One (1) set of special tools as necessary to provide for complete assembly or disassembly of specified equipment and components for each type or size of equipment specified.

PART 2 - PRODUCTS

2.01 Manufacturers
A. Pump shall be NP 3085 SH 3~ Adaptive 453, 139 mm Impeller as manufactured by Flygt Corporation, no equal.

2.02 Materials
A. Materials shall be as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump, motor casing, bracket, discharge base, and elbow</td>
<td>Cast iron, ASTM A 48 Class 35B</td>
</tr>
<tr>
<td>Guide Rails, fasteners, and lifting chain</td>
<td>Stainless steel, AISI Type 316</td>
</tr>
<tr>
<td>All exposed nuts and bolts</td>
<td>Stainless steel, AISI Type 304</td>
</tr>
</tbody>
</table>
2.03 Equipment

A. Pump and Motor Casing

1. Type: Water tight, air filled
2. Water Tightness: Able to run submerged up to 65 feet; and to run dry.
3. Motor Cooling: Each unit shall be provided with an integral motor cooling system that shall encircle the stator housing. A motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104 degrees F (40 degrees C). Operational restrictions at temperatures below 104 degrees F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.
4. Design Working Pressure: Minimum 1.10 times maximum shutoff total dynamic head with maximum diameter impeller at maximum operating speed plus maximum suction static head or minimum 20 pounds per square inch gauge.
5. O-Ring Seals: Capable of sealing mated surfaces (major components) watertight, with the following features.
   a. Machined surfaces and grooves
   b. O-Ring contact on 4 surfaces and O-Ring compression on 2 surfaces
   c. Does not require specific fastener torque or tension to obtain watertight joint
   d. Does not require secondary sealing compounds, gasket, grease or other devices

B. Impellers

1. Type: Non-clog
2. Number of Vanes: Maximum 2
3. Water Passages: Smooth enough to prevent clogging by stringy or fibrous materials
4. Passage Sizes: Large enough to pass solids with minimum sphere size of 3 inches or smaller for motors larger than 2 horsepower.
5. Casting: One piece, free of cracks, and porosity
6. Balance Vanes: Vanes shall be evenly balanced to minimize vibration and excessive wear
7. Method for Securing Impeller to Shafts: The impeller shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.
8. Rotation: As indicated on the Drawing; clockwise looking from top when not indicated
9. Balance: As specified in Section 11010 – General Requirements for Equipment
10. Vibration Criteria: As per manufacturer’s recommendations

C. Bearings
1. **Type:** Anti-friction meeting AFBMA standards. Bearing lubrication system shall be sized to safely absorb energy normally generated in bearing under maximum ambient temperature of 60 degrees Celsius.

2. Pump shaft shall rotate on a minimum of two (2) permanently sealed, grease lubricated bearings.

3. Upper bearing shall be a single deep groove ball bearing.

4. Lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces.

5. **Bearing life:** One of the following whichever provides longer bearing life in intended service
   a. Minimum L10 life of 50,000 hours in accordance with AFBMA standards at rated design point.
   b. Minimum 24,000 hours at bearing design load imposed by pump shutoff with maximum sized impeller at rated speed.

**D. Shaft Seals**

1. **Upper Seal Unit Material:** One stationary tungsten-carbide ring and one positively driven rotating tungsten-carbide ring.

2. **Lower Seal Unit Material:** One stationary and one positively driven rotating tungsten-carbide ring.

3. **Features:**
   a. Tandem arrangement running in an oil chamber.
   b. Design oil chamber to assure that air is left in the oil chamber to absorb the expansion of the oil due to temperature variations.
   c. Oil in oil chamber shall be FDA approved, paraffin type colorless, odorless, and non-toxic.
   d. Independent spring system between seal interfaces able to withstand maximum suction submergences.
   e. Does not require pressure differential to affect sealing.
   f. Does not use pumped media for lubrication.
   g. Lower mechanical seal effectively lubricated from oil chamber housings.
   h. Not damaged when pump is run dry (unsubmerged) for extended periods.
   i. **Springs and Other Hardware:** Stainless steel, 300 or 400 series.
   j. **Moisture Sensing System:** Intrinsically safe type that signals seal leakage.
   k. Provide oil chamber with manufacturer’s standard drain and inspection plug, with positive anti-leak seal, easily accessible from the outside.

**E. Pump Shaft**

1. Pump and Motor Shaft shall be a single piece unit. Shafts using mechanical couplings shall not be acceptable.

**F. Discharge Base Elbow and Stand Alone Pump Base**

1. **Features**
   a. Structurally capable of firmly supporting dual guide rails, discharge piping and pumping unit under operating conditions
b. Once or more integral support legs or pads with bolting to sump floor provisions

c. Incorporates 90 degree flanged elbow that receives horizontal flow from pump and discharges flow vertically

2. Support Base

a. Provide cast iron base elbow for installation in wet pit with suitable coating. See Section 09900 – Protective Coating Systems.

b. The entire weight of the pump/motor shall be borne by the pump discharge elbow.

c. See Section 11050 – Equipment Mounting for more information on base.

3. Discharge Interface

a. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact.

b. Self-aligning without having to enter the wet well.

c. Discharge elbow to mate to pump discharge and transition to discharge piping.

d. Piping: Contractor to provide flanged piping connections as scheduled in Section the Drawings in accordance with ASME standards, minimum Class 125 or as required to meet specified design pressure, whichever is greater.

4. Stand Alone Pump Base: Provide Stand Alone bases for pumps in addition to base elbow.

G. Guide Rails, Brackets, Fasteners, and Lifting Chain for Each Pump

1. Features:

a. Dual pipes or dual rails that extend from discharge base to upper bracket unless scheduled otherwise.

b. Rail wall thickness sufficient to suspend pump unit between brackets plus minimum 50 percent safety factor.

c. Sized to fit discharge base and sliding bracket of pump.

d. Integral, self-aligning, cast iron sliding brackets that seal pump to discharge base under operating conditions.

e. Intermediate guide rail brackets where indicated on the Drawings or at 20-foot maximum intervals.

f. Lifting Type 316 stainless steel chain of sufficient strength and length to permit safe removal of pump unit from sump.

g. Rigging Equipment shall comply with CAL/OSHA code

1) Chain shall have permanently affixed and legible identification markings as prescribed by the manufacturer that indicate the recommended safe working load.

2) Attachment slings shall have permanently affixed and legible markings as prescribed by the manufacturer that indicate the recommended safe working load for the type(s) of hitch(es) used, the angle upon which it is based, and the number of legs if more than one.

3) Hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links or other attachments to the lifting chain shall have a rated capacity at least equal to that of the alloy steel chain with which they are used or the sling shall not be used in excess of the rated capacity of the weakest component.
4) Makeshift links or fasteners formed from bolts or rods, or other such attachments, shall not be used.

h. Each pump shall be fitted with a grip eye system along with a minimum of 40 feet of lifting chain for use with the grip eye system. Cable shall not be allowed.

H. Motor and Power Cables

1. Motors: Featured as specified

2. Motor Characteristics:

   a. Squirrel cage induction motor, shell type design: If explosion proof motor scheduled, provide motor that is UL or FM listed for NEC Class 1, Division 1, Groups C and D service, whether submerged or unsubmerged.

   b. All electrical parts in water tight housing

   c. Horsepower: As scheduled. Listed motor horsepower is the maximum to be supplied. However, motor control center (MCC) and other electrical equipment are sized for scheduled motor horsepower.

   d. Voltage: 460 V; Phases: 3; Frequency, Hertz: 60

   e. Service Factor: 1.15

   f. NEMA Design Type: B

3. Motor Insulation: Class H insulation, moisture resistant, to 120 degrees Celsius maximum. Able to withstand 40 degrees Celsius ambient temperature plus 80 degrees Celsius temperature rise.

4. Provide motors that are rated suitable for continuous operation in 40 degrees Celsius ambient temperature at project site altitude.

5. The motor shall be designed for continuous duty handing pumped media of 40 degrees Celsius and capable of a minimum of fifteen (15) evenly spaced starts per hour.

6. The motor shall be capable of continuous operation under load with the motor submerged, partially submerged or exposed, without derating the motor.

7. If cooling jacket required, provide with the following:

   a. Functional with motor submerged, partially submerged, or exposed.

   b. Spray systems, air moving equipment or secondary cooling systems are not acceptable.

   c. Motor Sealing: Design motor case and seals to withstand 65 feet of submergence.

   d. Thermal Protection: Provide automatic reset motor stator temperature detectors, 1 switch in each phase winding. If any detector is activated, the sensor shall activate an alarm and shut down the motor. The thermal detectors shall activate when the stator temperature exceeds 125 degrees Celsius.

   e. Moisture Detection: Provide a moisture detection sensor in the seal chamber or motor housing. If leakage is detected in the stator chamber, the sensor shall activate an alarm and shut down the pump/motor.

I. Power / Control Cables

1. Submersible to same water depth as motor casing.

2. Insulation rated for 90 degrees Celsius

3. Non-wicking fillers
4. Length: Sufficient to connect to surface junction box (without the need of splices) as indicated on the Drawings or 30 feet, whichever is greater.

5. All Power and control conductors shall terminate at terminal blocks in the junction box.

6. Sized to conform to NEC, ICEA, and CSA specifications

7. Provide stainless steel cable and stainless steel wire braid sleeve to support power cable from under side of wet well roof slab or access frame.

J. Cable Entry Seal and Junction Chamber

1. Cable entry seal design shall not require specific torque requirements to insure a watertight and submersible seal.

2. Cable entry seal shall consist of a single cylindrical elastomeric grommet, flanked by stainless steel washers.

3. The entry body shall perform compression and strain relief that is separate from the sealing function.

4. The cable entry junction chamber shall be separate from the motor chamber to prevent foreign material from gaining access to the motor interior through the top of the pump.

K. Control

1. Controls shall be provided in accordance with Division 16 and Division 17 requirements.

2. Pumps shall be provided with built-in thermal overload protection on each phase and with moisture leakage protection in the motor chamber. Provide manufacturer’s standard moisture protection relay for pump control circuit.

2.04 Fabrication

A. Pump manufacturer to factory prime pump/motor and interior and exterior of discharge elbow in accordance with Section 09900 – Protective Coating Systems.

B. Contractor to provide sand blasted and apply field coatings as specified in Section 09900 – Protective Coating Systems.

PART 3 - EXECUTION

3.01 Installation

A. Equipment shall be installed in strict conformance with manufacturer’s installation instructions.

3.02 Field Quality Control

A. After installation of the units and all appurtenances, each unit shall be subjected to a field running test under actual operating conditions. The field tests shall be made by the Contractor in the presence of and as directed by the District’s Representative. The field test shall demonstrate that under all conditions of operation each unit:

1. Has not been damaged by transportation or installation

2. Has been properly installed

3. Has no mechanical defects

4. Is in proper alignment

5. Has been properly connected
6. Is free of overheating of any parts
7. Is free of all objectionable vibration
8. Is free of excessive noise
9. Is free of overloading of any parts
10. Shall operate as specified

3.03 Installation
A. Equipment shall be installed in strict conformance with the drawings and the manufacturer's installation instructions and recommendations.

3.04 Manufacturer's Representative
A. The manufacturer's qualified representative shall inspect the installation of the equipment, make any necessary adjustments, test and place the equipment in satisfactory operating condition.
B. Manufacturer's qualified representative shall provide the requisite services for the minimum hours listed below, travel time excluded:
   1. Four (4) hours for on-site assistance and training shall be provided. Training details to be submitted three (3) weeks prior to scheduled training.

**END OF SECTION**
SECTION 11010
GENERAL REQUIREMENTS FOR EQUIPMENT

PART 1 - GENERAL

1.01 Summary
A. **Scope:** This section provides the general requirements that must be met by all equipment supplied under Division 11 and or shown on the drawings.

B. **Equipment Lists:** Equipment lists, if any, presented in these specifications and shown on the drawings are included for the convenience of the Engineer and Contractor and are not intended to represent a rigorous and precise listing of all equipment, devices and material to be provided under this contract. The Contractor agrees to rely solely upon his own material and equipment takeoff lists for this purpose.

1.02 References
A. This section references the following documents. They are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFMBA</td>
<td>Methods of Evaluating Load Ratings of Ball and Roller Bearings</td>
</tr>
<tr>
<td>ANSI B1.1</td>
<td>Unified Inch Square Threads</td>
</tr>
<tr>
<td>ANSI B2.1</td>
<td>Pipe Threads (Except Dupeal)</td>
</tr>
<tr>
<td>ANSI B16.1</td>
<td>Cast Iron Pipe Flanges and Flanged Fittings, Class 125</td>
</tr>
<tr>
<td>ANSI B18.2.1</td>
<td>Square and Hex Head Bolts and Screws, Including Askew Head Bolts, Hex Cap Screws, and Lag Screws</td>
</tr>
<tr>
<td>ANSI B18.2.2</td>
<td>Square and Hex Nuts</td>
</tr>
</tbody>
</table>

1.03 Submittals
A. **General:** The submittal for each individual equipment or groups of related equipment shall be in accordance with Section 01340 – Submittals Procedures.

B. **Required Submittal Data:** In addition to the data required in Section 01340 – Submittals Procedures, the following information shall be submitted for each piece of equipment. Additional submittal requirements, specific to individual equipment items, are listed in the individual equipment specifications.

1. The proposed equipment shall be identified by the equipment numbers listed in the specifications and on the drawings.

2. Manufacturer and manufacturer’s type designation

3. A photocopy of the equipment specifications shall be included. All paragraphs shall be initialed to show compliance. Any exceptions to these specifications along with justification for each exception shall be clearly presented.

4. Manufacturer’s catalog data confirming rated capacity, horsepower, efficiency and electrical requirements
5. Shop drawings
6. Predicted performance curves developed for the specific application. In the case of rotating equipment, performance curves shall show speed, capacity, pressure, efficiency and power for all specified conditions
7. Motor submittal data
8. Cross-sectional views of machines showing details of construction
9. Data and calculations required to justify selection of size of components such as shafts, bearings, and peripheral equipment necessary to conform to these specifications
10. Parts lists, with materials of construction
11. Installation, startup, and shakedown requirements noting all items to be inspected and confirmed at each stage of installation, startup, and shakedown.
12. An electronic copy of the main equipment Operation and Maintenance manual(s) for general information as part of initial equipment submittal in addition to the requirements of specification 01300.
13. Contractor shall certify that all shop applied coatings are compatible with the approved field coating system specified in Section 09900 – Protective Coating Systems. If a barrier coating is required, the Contractor shall so state.

1.04 Quality Assurance
A. Arrangement: The arrangement of equipment shown is based upon information available to the District at the time of design and is not intended to show exact dimensions peculiar to a specific manufacturer unless otherwise indicated. The drawings are, in part, diagrammatic and some features of the illustrated equipment installation may require revision to meet actual equipment installation requirements. Structural supports, foundations, connected piping and valves shown may have to be altered to accommodate the equipment provided. No additional payment will be made for such revisions and alterations.
B. Control Devices: Control devices, wiring, starters, panels, light, and other electrical items provided with mechanical equipment shall, in general, conform to the requirements of Division 16 as well as any requirements of the particular equipment specification.

1.05 Delivery, Storage and Handling
A. Protection during Shipment
1. Each item of equipment shall be shipped to the site of the work with either the manufacturer’s shop applied prime coating or a vinyl paint prime coating. The prime coating shall be applied over clean dry surfaces in accordance with the paint manufacturer’s recommendations. The prime coating will serve as a base for field-applied finish coats.
2. Bearing housings shall be wrapped or otherwise sealed to prevent contamination by grit and dirt, and ventilation and other types of openings shall be taped closed.

PART 2 - PRODUCTS

2.01 Flanges and Pipe Threads
A. Flanges on equipment and appurtenances:
1. Shall conform in dimensions and drilling to ANSI B16.1, Class 125.
2. Unless otherwise specified, metric dimensioned flanges not allowed.
3. Unless otherwise specified, flanges shall be flat faced.

B. Pipe threads:
   1. Shall conform in dimension and limits of size to ANSI B1.1, coarse thread series, Class 2 fit.
   2. Threaded flanges shall have a standard taper pipe thread conforming to ANSI B2.1.

C. Flange assembly bolts:
   1. Shall be heavy pattern, hexagonal head, carbon steel machine bolts with heavy pattern, hot pressed, hexagonal nuts conforming to ANSI B18.2.1 and B18.2.2.

2.02 Bearings

A. Unless otherwise specified, equipment bearings shall be oil or grease lubricated, ball or roller type, designed to withstand the stresses of the service specified. Each bearing shall be rated in accordance with the latest revisions of AFMBA Methods of Evaluating Load Ratings of Ball and Roller Bearings for one of the following classes of B-10 rating life:

<table>
<thead>
<tr>
<th>Class</th>
<th>Hours of Operation</th>
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<tbody>
<tr>
<td>M1</td>
<td>8,000</td>
</tr>
<tr>
<td>M2</td>
<td>20,000</td>
</tr>
<tr>
<td>M3</td>
<td>50,000</td>
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<tr>
<td>M4</td>
<td>100,000</td>
</tr>
<tr>
<td>M5</td>
<td>200,000</td>
</tr>
</tbody>
</table>

B. Unless otherwise specified, equipment shall have bearings rated for Class M4 life or greater.

C. Grease lubricated bearings, except those specified to be factory sealed and lubricated, shall be fitted with easily accessible grease supply, flush, drain and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be standard hydraulic Alemite type.

D. Oil lubricated bearings shall be equipped with either a pressure lubricating system or a separate oil reservoir type system. Each oil lubrication system shall be of sufficient size to safely absorb the heat energy normally generated in the bearing under a maximum ambient temperature of 60 degrees C and shall be equipped with a filler pipe and an external level indicator gauge.

2.03 V-Belt Assemblies

A. V-belt assemblies shall be Dodge Dyna-V belts with matching Dyna-V sheaves and Dodge Taper-lock bushings, Wood’s Super V-Belts with matching Sure-Grip sheaves and Wood’s Sure-Grip bushings, or equal.

B. Sheaves and bushings shall be statically balanced. Additionally, sheaves and bushing which operate at a peripheral speed of more than 550 feet per minute shall be dynamically balanced. Sheaves shall be separately mounted on their bushings by means of three pull-up or cap tightening screws. Bushings shall be key seated to the drive shaft.

C. Belts shall be selected for not less than 150 percent of rated driver horsepower and, where two sheaves sizes are specified, shall be capable of operating with either set of sheaves. Belts shall be of the antistatic type where explosion-proof equipment is specified.
2.04 Seals

A. Mechanical

1. Unless otherwise specified, mechanical seals may be internal or external type, balanced or unbalanced type, and single or double seals except as herein specified. An internal type seal may be used where clean sealing liquid is provided, either from the pumped liquid or an external source. When the pumped liquid is corrosive, abrasive, toxic or flammable, an internal double seal shall be provided with adequate sealing liquid pressure to prevent entry of pumped liquid into the seal chamber, or an external seal may be provided. The sealing liquid shall be within the temperature limits and at the flushing rate recommended by the equipment manufacturer.

2. The seal may be balanced or unbalanced, as recommended by the equipment manufacturer. To maintain the necessary minimum or maximum pressure across the seal faces, spring pressure shall be uniformly distributed to the sealing faces by a coil spring or multiple springs. The rotating seal element shall be clamped to the shaft and provided with O-ring seal. The stationary seal element shall be sealed with O-ring or gasket material.

3. Seal faces shall be tungsten carbide to tungsten carbide except on the double seal where the seal in contact with pump liquid shall be carbon. The O-ring gasket material shall be as recommended by the manufacturer for the liquid being pumped. Other parts shall be 316 stainless steel.

B. Stuffing Box: Unless otherwise specified, each stuffing box shall be cast separately, bolted to the bearing frame, tapped to permit installation of a clean liquid seal, and shall be large and sufficiently deep to hold a minimum of five rows of packing and a bronze lantern water seal ring. Packing shall be die-molded packing rings of material suitable for the intended service and as recommended by the manufacturer. Sealing liquid shall be the pumped liquid unless otherwise specified. Taps for external sealing and a lantern ring shall be provided. When used, lantern rings shall be of two-piece construction and shall be provided with tapped holes to facilitate removal. Packing gland halves and studs shall be 316 stainless steel.

2.05 Couplings

A. Unless otherwise specified in the particular Equipment Sections, equipment with a driver greater than 2 HP, and where the input shaft of a driven unit is directly connected to the output shaft of the driver, shall have its two shafts connected by a flexible coupling which can accommodate angular misalignment, parallel misalignment and end float, and which cushions shock loads and dampens torsional vibrations. The flexible member shall consist of a tire with synthetic tension members bonded together in rubber. The flexible member shall be attached to flanges by means of clamping rings and cap screws, and the flanges shall be attached to the stub shaft by means of taperlock bushings which shall give the equivalent of a shrunk-on-fit. There shall be no metal-to-metal contact between the driver and the driven unit. Each coupling shall be sized and provided as recommended by the coupling manufacturer for the specific application, considering horsepower, speed of rotation, and type of service.

B. Where torque or horsepower capacities of couplings of the foregoing type is exceeded, Thomas-Rex, Falk Steel Flex, or equal, couplings will be acceptable provided they are sized in accordance with the equipment manufacturer’s recommendations and sizing data are submitted. They shall be installed in conformance to the coupling manufacturer’s instructions.

2.06 Guards

A. Exposed moving parts shall be provided with guards which meet the requirements of CAL/OSHA. Guards shall be fabricated of solid 14-gauge steel. Guards shall be galvanized after fabrication.
and shall be designed to be readily removable to facilitate maintenance of moving parts. Reinforced holes shall be provided. Reinforced holes shall be provided.

2.07 Caution Signs
A. Equipment with guarded moving parts which operates automatically or by remote control shall be identified by signs reading “CAUTION – AUTOMATIC EQUIPMENT MAY START AT ANY TIME.” Signs shall be installed near guarded moving parts.

2.08 Pressure Taps, Test Plugs, and Gauges
A. Weather shown or not shown on the drawings, ½” pressure taps w/plugs shall be provided on the suction and discharge sides of all pumps, blowers and compressors. Pressure and vacuum test gauges shall be provided where shown or specified.

2.09 Nameplates
A. Nameplates shall be provided on each item of equipment and shall contain the specified equipment name or abbreviation. Equipment nameplates shall be engraved or stamped on corrosion resistant material and fastened to the equipment in an accessible location with a No. 4 or larger oval head stainless steel screws or drive pins.

2.10 Lubricants
A. The Contractor shall provide for each item of mechanical equipment a supply of the lubricant required for the initial filling and for the commissioning period.
B. Lubricants shall be of the type recommended by the equipment manufacturer and shall be products of the District’s current lubricant supplier.
C. The Contractor shall limit the various types of lubricants by consolidating them, with the equipment manufacturer’s approval, into the least number of different types. Not less than 90 days before the date shown in his construction schedule for starting, testing, and adjusting equipment.
D. Contractor shall provide the District with three copies of a list showing the required lubricants, after consolidation, for each item of mechanical equipment. The list shall show estimated quantity of lubricant needed for a full year’s operation, assuming the equipment will be operating continuously.

2.11 Spare Parts
A. Parts and materials shall be furnished in manufacturer’s unopened cartons, boxes, crates or other protective covering suitable for preventing corrosion or deterioration for the maximum length of storage that may be normally anticipated. They shall be clearly marked and identified.
B. During construction, parts shall be stored in buildings or trailers with floor, roof and closed sides and in accordance with manufacturer’s recommendations. They shall be protected from weather, condensation and humidity.
C. Spare parts and materials shall be delivered to the District upon completion of the Work or when the District assumes beneficial occupancy. Contractor shall then place them in permanent storage rooms or areas approved by the District’s Representative.
D. A letter of transmittal shall accompany the spare parts and shall include the following:
   1. Date of letter and transfer of parts and material
   2. Contract title and number
   3. Contractor’s name and address
4. A complete inventory of the parts and material, listing the applicable Specification Section for each.

5. A place for the District to sign and signify receipt of the parts and materials

E. Contractor shall be fully responsible for loss or damage to parts and material until they are transmitted to the District.

PART 3 - EXECUTION

3.01 Installation

A. Each item of equipment provided shall be installed and tested within the tolerances recommended by the equipment manufacturer.

3.02 Testing

A. Items of equipment specified in this Section shall be tested as required in each section and in accordance with Division 1 requirements.

**END OF SECTION**
SECTION 11050
EQUIPMENT MOUNTING

PART 1 - GENERAL

1.01 Summary
A. This section includes the requirements for supply and installation of mounts, supports, and anchorage hardware for all equipment and accessories required to make a complete system including but not limited to piping, fans, and ducts.

1.02 System Description
A. Design Requirements
1. Requirements of Regulatory Agencies:
   a. All tanks, and related piping, equipment and related supports and equipment anchorages shall be designed and supplied by the Contractor in accordance with National and State requirements including, but not limited to CBC, AWWA & ANSI Standards.
2. Project Specific Requirements:
   a. See the structural drawings for project specific seismic and wind load parameters.
   b. If there is a conflict between this section and the structural drawings, the structural drawings will govern.
3. Additional Design Requirements:
   a. In addition to code requirements, anchors and supports shall be designed to allow for expansion and contraction throughout the full potential temperature differential (both operational and off-line conditions).
   b. Anchors shall be capable of supporting equipment and accessories in all service and testing conditions.
   c. Anchorage shall allow for proper leveling.
   d. Allowances shall be provided for horizontal and vertical adjustment after installation and operation.

1.03 Submittals
A. The following items shall be submitted in accordance with the requirements of Section 01340 – Submittals Procedures and Section 11010 - General Requirements for Equipment:
1. Calculations:
   a. Calculations for all of the work required above. All calculations must be made and signed by a civil or structural engineer currently registered in the State of California.
2. Design codes and criteria used
3. Equipment weight, support points, and center of gravity
4. Anchor and hardware details
5. Concrete embeds (if any)
6. Isolation mounts (vibratory and reciprocating equipment)
B. Inasmuch as all anchorage of equipment will be made to cast-in-place concrete elements, it is imperative that types of anchorage be coordinated with the concrete placement.

C. If calculations and anchorage details are not submitted prior to placing of concrete, the Contractor will become responsible for any strengthening of concrete elements because of superimposed seismic loading.

1.04 Quality Assurance
A. Allow for special inspection for the installation of chemical anchors in accordance with CBC requirements.

B. Expansion type anchors or adhesive type anchors shall not be allowed as a substitute for cast-in-place anchors.

PART 2 - PRODUCTS

2.01 General
A. All equipment located on floor slabs shall be mounted on concrete pads.

B. Concrete pedestals and pad dimensions shall be provided with submittal.
   1. Unless otherwise shown on the drawings, the minimum edge distance for anchors is 1.5 times anchor embedment, but no less than 6”.

C. All conduits, piping connections, drains, etc., shall be enclosed by the concrete base.

D. Where a steel base is shown or specified between the equipment and the concrete pedestal, it shall be hot-dip galvanized after fabrication.

2.02 Materials
A. Unless otherwise specified on the drawings, materials of construction for anchoring devices shall conform to the following:
   1. Anchor bolts and other anchoring devices, nuts, and washers shall be type 304 stainless steel.

B. Anchor bolts and other anchoring devices, nuts, and washers shall be type 316 stainless steel if installed outside, below the top of walls of water containing structures, on the underside of roofs, slabs, or walkways, or on the dry side of walls on water containing structures.

2.03 Cast Iron Bases
A. Cast iron bases do not require galvanizing but must be sealed in accordance with the requirements specified in Section 09900 – Protective Coating Systems.

B. All fasteners requiring connections to the base shall be terminated by nuts welded to the bottom side of the base and plugged with cork, plastic plugs or grease, or acorn nuts.

C. In no case shall the fastener terminate only into the metal base.

2.04 Anchors
A. Epoxy and wedge anchors used in concrete shall be approved for cracked concrete per ACI 318 Appendix D.

B. See structural drawings for further requirements.

2.05 Adjustability
A. Provide leveling grout for equipment mounting unless otherwise detailed on Drawings.

PART 3 - EXECUTION

3.01 Installation
A. Equipment
   1. Except where a higher lateral force is required by code, each piece of equipment installed shall be anchored to resist minimum lateral seismic forces for the site.
   2. No equipment shall be anchored to vertical structural elements without written approval of the Engineer.
   3. Vibratory equipment shall be supported by isolator mounts to limit transmissibility to structure.
   4. Non-vibrating isolation equipment shall be anchored directly to the supporting floor system.
   5. In addition to the anchorage, all equipment shall be internally designed so that all static and moving parts are anchored to the supporting framework to resist the imposed seismic force. All forces must be transmitted to the base in order to be anchored as required.
B. Piping
   1. All piping, raceways, accessories, and appurtenances, furnished with equipment shall be anchored to resist lateral seismic forces.
   2. Piping with flexible connections and/or expansion joints shall be anchored such that the intended uses of these joints are maintained in the piping system.
C. Anchor bolts
   1. Prior to installing nuts on anchor bolts, coat with non-seize compound to prevent galling of threads.
   2. Nuts shall be tightened to the full effort of a man with an ordinary wrench.

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary

A. This section specifies submersible pumps for pumping runoff water that has been collected from the solids stabilization basin.

B. The following list of related sections is provided for the convenience of the Contractor. It includes the commonly referenced sections that are in-general applicable to all equipment supplied. This list does not excuse the Contractor from any requirement given in a section not specifically listed below. Where there is a difference between this specification and any other specifications, the conflict shall be resolved at the sole discretion of the Engineer.

1. All sections of Division 1 including but not limited to 01340 – Submittals, 01600 – Material & Equipment Substitution, and Section – 01660 Testing.

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>05910</td>
<td>Hot-Dip Zinc Coating</td>
</tr>
<tr>
<td>09900</td>
<td>Protective Coating Systems</td>
</tr>
<tr>
<td>11010</td>
<td>General Requirements for Equipment</td>
</tr>
<tr>
<td>11050</td>
<td>Equipment Mounting</td>
</tr>
<tr>
<td>16000</td>
<td>Electrical</td>
</tr>
<tr>
<td>17000</td>
<td>Instrumentation</td>
</tr>
</tbody>
</table>

1.02 System Description

A. The pumps shall be suitable for heavy-duty continuous submerged service and shall be capable of intermittent operation with the motor above liquid surface.

B. The pumps shall be submersible non-clog sump pumps and shall be provided with pump motor, base elbows, slide guide rails and brackets, pump discharge connection couplings, electrical devices internal to pump housing, all submersible cabling for power and control conductors, lifting chains as shown and specified and other items as required for a complete and operational system.
C. Operating Requirements:

1. **Pump – Flygt NP 3085 SH 3 453**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Capacity, gpm</td>
<td>90</td>
</tr>
<tr>
<td>Rated Total Dynamic Head, ft</td>
<td>19</td>
</tr>
<tr>
<td>Maximum Static Head, ft</td>
<td>16</td>
</tr>
<tr>
<td>Maximum Motor Speed, rpm</td>
<td>1,670</td>
</tr>
<tr>
<td>Maximum Motor Horsepower</td>
<td>2.2</td>
</tr>
</tbody>
</table>

1.03 Submittals

A. The Contractor shall provide the following submittals, in accordance with Section 01340 – Submittals Procedures, in addition to the submittals required by Section 11010 - General Requirements for Equipment.

1. Shop drawings for each unit.
2. Outline installation drawings for each unit.
3. Material list(s) and catalog information showing the details of construction.
4. List(s) of recommended Spare Parts and Special Tools.
5. Seismic anchorage requirements per Section 11050 - Equipment Mounting.

B. Manufacturer’s Instructions and Field Reports: In accordance with the requirements of Section 11010 - General Requirements for Equipment instructions for installation and testing of equipment shall be provided with equipment submittals. A manufacturer’s certification letter shall be submitted in accordance with Section 01660 – Testing.

C. Operation and Maintenance: In accordance with Section 01360 – Operating and Maintenance Information, paper or electronic copies of the primary equipment Operation and Maintenance manuals shall be submitted for information with the initial equipment submittals. This is in addition to the information that shall be submitted in accordance with Section 01340 – Submittals.

1.04 Quality Assurance

A. General: The pumps shall be capable of continuous operation in a municipal wastewater application. The solids to be encountered will be those typically found in municipal wastewater treatment service including heterogeneous mixtures of inorganic and organic solids. Among the inorganic solids will be small rocks, sand, pieces of metal, animal bones and similar objects, while the organic solids may be expected to include vegetable parts, rags, paper products, rubber goods, fecal matter, and semi-solid grease particles. In addition, the liquid may be expected to include detergents, industrial solvents, petroleum products and water.

B. Single Source Responsibility: Pump equipment specified in this Section shall be by one manufacturer who has been regularly engaged in the design and manufacture of the equipment. The manufacturer shall have supplied pump equipment that has been in successful operation, at similar installations, for at least five (5) years.

C. Manufacturer shall furnish and coordinate drivers, drive controls, lifting rails, covers, access ways, and miscellaneous components as specified.

D. Manufacturer shall provide written installation and check out requirements.
E. Shop Tests: Each pump shall be fully assembled in the shop and tested prior to shipment. Each pump shall be tested in the shop prior to shipment for free rotation of all moving parts.

1.05 Delivery, Storage, and Handling
A. All equipment shall be shipped and delivered fully assembled, except where partial disassembly is required in order to conform to transportation regulations or for the protection of components.
B. The Contractor shall be responsible for unloading of the machinery and shall have equipment on-site available at the time of delivery permitting proper hoisting of the equipment.

1.06 Project / Site Conditions
A. The equipment shall be suitable for the service specified. The pump and motor will be submerged for extended periods of time. The pumped fluid temperature is expected to range from 10 degrees F and 104 degrees F. The relative humidity is expected to range from 20 to 100 percent.

1.07 Warranty
A. The manufacturer shall furnish the District with a written warranty to cover the pumps against defects in workmanship and material for a period of (5) years and rotating parts for a period of five (5) years under normal use and service from the date of acceptance of installation by the District. Warranty shall not be prorated.
B. The manufacturer’s warranty shall be issued in the District’s name.

1.08 Maintenance
A. Spare parts and special tools shall be furnished as listed below.
   1. Mechanical Seal: 1 each size and type
   2. O-Ring set
   3. Power cable entry seal set
   4. Manufacturer’s standard moisture protection relay
B. One (1) set of special tools as necessary to provide for complete assembly or disassembly of specified equipment and components for each type or size of equipment specified.

PART 2 - PRODUCTS

2.01 Manufacturers
A. Pump shall be NP 3085 SH 3~ Adaptive 453, 139 mm Impeller as manufactured by Flygt Corporation, no equal.

2.02 Materials
A. Materials shall be as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump, motor casing, bracket, discharge base, and elbow</td>
<td>Cast iron, ASTM A 48 Class 35B</td>
</tr>
<tr>
<td>Guide Rails, fasteners, and lifting chain</td>
<td>Stainless steel, AISI Type 316</td>
</tr>
<tr>
<td>All exposed nuts and bolts</td>
<td>Stainless steel, AISI Type 304</td>
</tr>
</tbody>
</table>
2.03 Equipment

A. Pump and Motor Casing
   1. Type: Water tight, air filled
   2. Water Tightness: Able to run submerged up to 65 feet; and to run dry.
   3. Motor Cooling: Each unit shall be provided with an integral motor cooling system that shall encircle the stator housing. A motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104 degrees F (40 degrees C). Operational restrictions at temperatures below 104 degrees F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.
   4. Design Working Pressure: Minimum 1.10 times maximum shutoff total dynamic head with maximum diameter impeller at maximum operating speed plus maximum suction static head or minimum 20 pounds per square inch gauge.
   5. O-Ring Seals: Capable of sealing mated surfaces (major components) watertight, with the following features.
      a. Machined surfaces and grooves
      b. O-Ring contact on 4 surfaces and O-Ring compression on 2 surfaces
      c. Does not require specific fastener torque or tension to obtain watertight joint
      d. Does not require secondary sealing compounds, gasket, grease or other devices

B. Impellers
   1. Type: Non-clog
   2. Number of Vanes: Maximum 2
   3. Water Passages: Smooth enough to prevent clogging by stringy or fibrous materials
   4. Passage Sizes: Large enough to pass solids with minimum sphere size of 3 inches or smaller for motors larger than 2 horsepower.
   5. Casting: One piece, free of cracks, and porosity
   6. Balance Vanes: Vanes shall be evenly balanced to minimize vibration and excessive wear
   7. Method for Securing Impeller to Shafts: The impeller shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.
   8. Rotation: As indicated on the Drawing; clockwise looking from top when not indicated
   9. Balance: As specified in Section 11010 – General Requirements for Equipment
   10. Vibration Criteria: As per manufacturer’s recommendations

C. Bearings
1. Type: Anti-friction meeting AFBMA standards. Bearing lubrication system shall be sized to safely absorb energy normally generated in bearing under maximum ambient temperature of 60 degrees Celsius.

2. Pump shaft shall rotate on a minimum of two (2) permanently sealed, grease lubricated bearings.

3. Upper bearing shall be a single deep groove ball bearing.

4. Lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces.

5. Bearing life: One of the following whichever provides longer bearing life in intended service
   a. Minimum L10 life of 50,000 hours in accordance with AFBMA standards at rated design point.
   b. Minimum 24,000 hours at bearing design load imposed by pump shutoff with maximum sized impeller at rated speed.

D. Shaft Seals

1. Upper Seal Unit Material: One stationary tungsten-carbide ring and one positively driven rotating tungsten-carbide ring.

2. Lower Seal Unit Material: One stationary and one positively driven rotating tungsten-carbide ring.

3. Features:
   a. Tandem arrangement running in an oil chamber.
   b. Design oil chamber to assure that air is left in the oil chamber to absorb the expansion of the oil due to temperature variations.
   c. Oil in oil chamber shall be FDA approved, paraffin type colorless, odorless, and non-toxic.
   d. Independent spring system between seal interfaces able to withstand maximum suction submergences.
   e. Does not require pressure differential to affect sealing.
   f. Does not use pumped media for lubrication.
   g. Lower mechanical seal effectively lubricated from oil chamber housings.
   h. Not damaged when pump is run dry (unsubmerged) for extended periods.
   i. Springs and Other Hardware: Stainless steel, 300 or 400 series.
   j. Moisture Sensing System: Intrinsically safe type that signals seal leakage.
   k. Provide oil chamber with manufacturer’s standard drain and inspection plug, with positive anti-leak seal, easily accessible from the outside.

E. Pump Shaft

1. Pump and Motor Shaft shall be a single piece unit. Shafts using mechanical couplings shall not be acceptable.

F. Discharge Base Elbow and Stand Alone Pump Base

1. Features
   a. Structurally capable of firmly supporting dual guide rails, discharge piping and pumping unit under operating conditions
b. Once or more integral support legs or pads with bolting to sump floor provisions

c. Incorporates 90 degree flanged elbow that receives horizontal flow from pump and discharges flow vertically

2. Support Base

a. Provide cast iron base elbow for installation in wet pit with suitable coating. See Section 09900 – Protective Coating Systems.

b. The entire weight of the pump/motor shall be borne by the pump discharge elbow.

c. See Section 11050 – Equipment Mounting for more information on base.

3. Discharge Interface

a. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact.

b. Self-aligning without having to enter the wet well.

c. Discharge elbow to mate to pump discharge and transition to discharge piping.

d. Piping: Contractor to provide flanged piping connections as scheduled in Section the Drawings in accordance with ASME standards, minimum Class 125 or as required to meet specified design pressure, whichever is greater.

4. Stand Alone Pump Base: Provide Stand Alone bases for pumps in addition to base elbow.

G. Guide Rails, Brackets, Fasteners, and Lifting Chain for Each Pump

1. Features:

a. Dual pipes or dual rails that extend from discharge base to upper bracket unless scheduled otherwise.

b. Rail wall thickness sufficient to suspend pump unit between brackets plus minimum 50 percent safety factor.

c. Sized to fit discharge base and sliding bracket of pump.

d. Integral, self-aligning, cast iron sliding brackets that seal pump to discharge base under operating conditions.

e. Intermediate guide rail brackets where indicated on the Drawings or at 20-foot maximum intervals.

f. Lifting Type 316 stainless steel chain of sufficient strength and length to permit safe removal of pump unit from sump.

g. Rigging Equipment shall comply with CAL/OSHA code

1) Chain shall have permanently affixed and legible identification markings as prescribed by the manufacturer that indicate the recommended safe working load.

2) Attachment slings shall have permanently affixed and legible markings as prescribed by the manufacturer that indicate the recommended safe working load for the type(s) of hitch(es) used, the angle upon which it is based, and the number of legs if more than one.

3) Hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links or other attachments to the lifting chain shall have a rated capacity at least equal to that of the alloy steel chain with which they are used or the sling shall not be used in excess of the rated capacity of the weakest component.
4) Makeshift links or fasteners formed from bolts or rods, or other such attachments, shall not be used.

h. Each pump shall be fitted with a grip eye system along with a minimum of 40 feet of lifting chain for use with the grip eye system. Cable shall not be allowed.

H. Motor and Power Cables
1. Motors: Featured as specified
2. Motor Characteristics:
   a. Squirrel cage induction motor, shell type design: If explosion proof motor scheduled, provide motor that is UL or FM listed for NEC Class 1, Division 1, Groups C and D service, whether submerged or unsubmerged.
   b. All electrical parts in water tight housing
   c. Horsepower: As scheduled. Listed motor horsepower is the maximum to be supplied. However, motor control center (MCC) and other electrical equipment are sized for scheduled motor horsepower.
   d. Voltage: 460 V; Phases: 3; Frequency, Hertz: 60
   e. Service Factor: 1.15
   f. NEMA Design Type: B
3. Motor Insulation: Class H insulation, moisture resistant, to 120 degrees Celsius maximum. Able to withstand 40 degrees Celsius ambient temperature plus 80 degrees Celsius temperature rise.
4. Provide motors that are rated suitable for continuous operation in 40 degrees Celsius ambient temperature at project site altitude.
5. The motor shall be designed for continuous duty handing pumped media of 40 degrees Celsius and capable of a minimum of fifteen (15) evenly spaced starts per hour.
6. The motor shall be capable of continuous operation under load with the motor submerged, partially submerged or exposed, without derating the motor.
7. If cooling jacket required, provide with the following:
   a. Functional with motor submerged, partially submerged, or exposed.
   b. Spray systems, air moving equipment or secondary cooling systems are not acceptable.
   c. Motor Sealing: Design motor case and seals to withstand 65 feet of submergence.
   d. Thermal Protection: Provide automatic reset motor stator temperature detectors, 1 switch in each phase winding. If any detector is activated, the sensor shall activate an alarm and shut down the motor. The thermal detectors shall activate when the stator temperature exceeds 125 degrees Celsius.
   e. Moisture Detection: Provide a moisture detection sensor in the seal chamber or motor housing. If leakage is detected in the stator chamber, the sensor shall activate an alarm and shut down the pump/motor.
I. Power / Control Cables
1. Submersible to same water depth as motor casing.
2. Insulation rated for 90 degrees Celsius
3. Non-wicking fillers
4. Length: Sufficient to connect to surface junction box (without the need of splices) as indicated on the Drawings or 30 feet, whichever is greater.

5. All Power and control conductors shall terminate at terminal blocks in the junction box.

6. Sized to conform to NEC, ICEA, and CSA specifications

7. Provide stainless steel cable and stainless steel wire braid sleeve to support power cable from under side of wet well roof slab or access frame.

J. Cable Entry Seal and Junction Chamber

1. Cable entry seal design shall not require specific torque requirements to insure a watertight and submersible seal.

2. Cable entry seal shall consist of a single cylindrical elastomeric grommet, flanked by stainless steel washers.

3. The entry body shall perform compression and strain relief that is separate from the sealing function.

4. The cable entry junction chamber shall be separate from the motor chamber to prevent foreign material from gaining access to the motor interior through the top of the pump.

K. Control

1. Controls shall be provided in accordance with Division 16 and Division 17 requirements.

2. Pumps shall be provided with built-in thermal overload protection on each phase and with moisture leakage protection in the motor chamber. Provide manufacturer’s standard moisture protection relay for pump control circuit.

2.04 Fabrication

A. Pump manufacturer to factory prime pump/motor and interior and exterior of discharge elbow in accordance with Section 09900 – Protective Coating Systems.

B. Contractor to provide sand blasted and apply field coatings as specified in Section 09900 – Protective Coating Systems.

PART 3 - EXECUTION

3.01 Installation

A. Equipment shall be installed in strict conformance with manufacturer’s installation instructions.

3.02 Field Quality Control

A. After installation of the units and all appurtenances, each unit shall be subjected to a field running test under actual operating conditions. The field tests shall be made by the Contractor in the presence of and as directed by the District’s Representative. The field test shall demonstrate that under all conditions of operation each unit:

1. Has not been damaged by transportation or installation

2. Has been properly installed

3. Has no mechanical defects

4. Is in proper alignment

5. Has been properly connected
6. Is free of overheating of any parts
7. Is free of all objectionable vibration
8. Is free of excessive noise
9. Is free of overloading of any parts
10. Shall operate as specified

3.03 Installation
A. Equipment shall be installed in strict conformance with the drawings and the manufacturer's installation instructions and recommendations.

3.04 Manufacturer's Representative
A. The manufacturer's qualified representative shall inspect the installation of the equipment, make any necessary adjustments, test and place the equipment in satisfactory operating condition.
B. Manufacturer’s qualified representative shall provide the requisite services for the minimum hours listed below, travel time excluded:
   1. Four (4) hours for on-site assistance and training shall be provided. Training details to be submitted three (3) weeks prior to scheduled training.

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. This Section specifies requirements for piping systems consisting of pipe, fittings and valves.
B. Specific requirements for piping and valves included within each piping system are specified on individual pipe and valve specifications.

1.02 Piping System Specification Sheets (Pipespec)
A. Each piping system is specified in the following PIPESPEC sheets:
B. Piping services are grouped according to the chemical and physical properties of the fluid conveyed and/or by the temperature or pressure requirements. Each grouping of services is identified by a piping system number.
C. The following list the piping services and associated system number, fluid category, and pipe marker background color of each service.

<table>
<thead>
<tr>
<th>Service Abbreviation</th>
<th>Service</th>
<th>System</th>
<th>Category</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD</td>
<td>Process Drain</td>
<td>10</td>
<td>Wastewater</td>
<td>Brown</td>
</tr>
<tr>
<td>W</td>
<td>Potable Water</td>
<td>14</td>
<td>Water</td>
<td>Blue</td>
</tr>
<tr>
<td>FM</td>
<td>Force Main</td>
<td>15</td>
<td>Wastewater</td>
<td>Green</td>
</tr>
</tbody>
</table>
PART 2 - MATERIALS

2.01 Piping Materials

PIPING SYSTEM SPECIFICATION SHEET: SYSTEM 10
System Includes: PD – Drain

Test Requirements
- Medium: Air
- Pressure: See below
- Duration: See below

Gasket Requirements
- Flange/ Cpl Neoprene (Oil resistant)

Piping
- All Sizes
  - Pipe: Dual Wall, corrugation, smooth interior HDPE, per AASHTO M252, Type S
  - Joints: Bell and Spigot (Watertight per ASTM D3212)
  - Fittings: Dual Wall, corrugation, smooth interior HDPE Fitting, with Bell and Spigot watertight connections.
  - Valves: None
PIPING SYSTEM SPECIFICATION SHEET: SYSTEM 14

System Includes: PW – Potable Water

Test Requirements

Medium: Water
Pressure: 150 psi
Duration: 120 minutes

Gasket Requirements

Flange/ Cpl SBR or EPDM

Exposed Piping and Valves

All Sizes
- Pipe: Polyvinyl chloride (PVC), ASTM D1785, schedule 80, coating per Section 09900 – Coating Systems, see Section 15064 – PVC Pipe
- Joints: Solvent welded socket
- Fittings: Polyvinyl chloride (PVC), schedule 80, Solvent welded socket
- Valves: NSF 61 certified ball, gate, globe

Buried Piping

All Sizes
- Pipe: Polyvinyl chloride (PVC), ASTM D1785, schedule 80, see Section 15064
- Joints: Solvent welded socket
- Fittings: Polyvinyl chloride (PVC), schedule 80, Solvent welded socket
- Valves: None
PIPING SYSTEM SPECIFICATION SHEET: SYSTEM 15

System Includes: FM - Force Main

Test Requirements

Medium: Water
Pressure: 150 psi
Duration: 120 Minutes

Gasket Requirements

Flange/ Cpl Neoprene (Oil resistant)

Exposed and Inside Wet Well Piping

All sizes

Pipe: Steel AWWA C200 Fusion Bonded epoxy lined and coated AWWA C213.
Joints: Grooved or Flanged as shown
Fittings: Grooved or Flanged as shown
Valves: Plug, Check Valve
PART 3 - EXECUTION

3.01 Installation

A. General:

1. Only proper implements, tools, and facilities as recommended by the pipe manufacturer's standard printed installation instructions shall be used.
2. The interior of all pipes shall be cleaned of all foreign matter before installing.
3. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.
4. Lay pipe with label facing up.
5. While pipe laying is NOT in progress, the open ends of the installed pipe shall be closed to prevent trench water from entering into the interior of the pipe.
   a. Adequate backfill shall be deposited on pipe to prevent floating of pipe.
   b. Any pipe that has floated shall be removed from the trench, cleaned, and re-laid in an acceptable manner.
   c. The use of burlap, wood, or other similar temporary plugs will not be permitted.
6. Cable, rope, or other devices used for lowering fittings into trench shall be attached around the exterior of fitting for handling. Under no circumstances shall the cable, rope or other device be attached through the fitting's interior for handling.

B. Diagrammed Pipe

1. Where such pipelines are shown only in diagram, they shall be arranged clear of other pipelines, equipment and walking areas, and shall be accessible for maintenance.
   a. Such pipelines shall be fitted and installed in a neat and workmanlike manner in accordance with approved shop drawings.
   b. An adequate number of unions shall be provided to facilitate dismantling or removal.
2. The final locations of appurtenances included as part of diagrammed pipelines shall be shown on the approved shop drawings or as determined in the field by the District’s Representative.

C. Anchorage

1. All bends, plugs, joints, caps and tees in pressure piping systems shall be anchored by means of restrained joints unless otherwise specified or shown.

D. Pipe Flexibility

1. Unless otherwise specified or shown, wherever piping 6 inches in diameter and larger passes from concrete to earth, 2 sleeve type flexible pipe couplings or flexible joints shall be provided with the first joint between 2 feet and 3 feet from the face of the structure.
   a. The spacing between the two couplings shall be between 2 and 3 feet.
   b. A single sleeve type flexible pipe coupling can be utilized if the concrete wall penetration employs a flexible pipe seal.
   c. Where required for resistance to pressure, flexible couplings shall be restrained.

E. Vents and Drains

1. Manual air vents shall be provided at the high points of each reach of pipeline whether shown or not shown on drawings.
a. Manual air vents shall consist of a ¼” bronze cock and short copper tubing return.
b. Copper tubing shall be routed to the nearest floor.
c. Manual air vents in piping systems for fluids containing solids shall be 1-inch non-
lubricated eccentric plug valves fitted with quick couplers.

2. Whether shown or not shown on drawings all pipelines shall be provided with a tap or welded
nipple and valved drain on the bottom of the pipe.
a. Drains shall be piped to a sump, gutter, floor drain or other collection point.
b. Drain valves shall be 1” gate valves unless shown otherwise.
c. When drains cannot be run to collection points, they shall be rerouted to a point of easy
access.

3. Warning Tape and Tracer Wire
a. Warning tape shall be installed 12 inches above all potable water, recycled water, primary
influent and foul air pipes. Tape shall be spread flat with message side up before
backfilling.
b. Tracer wire shall be continuous and attached to all potable water and recycled water pipes.
Tracer wire through valve boxes shall be placed outside of riser and inside of valve box.
c. The final locations of hose valves and other such appurtenances included as part of
diagrammed pipelines shall be shown on the approved shop drawings or as determined in
the field by the District’s Representative.

3.02 Cleaning and Flushing
A. General:
   1. Piping systems shall be flushed and cleaned prior to testing. The Contractor may, in order to
      facilitate the cleaning of sections of buried or exposed piping between isolating valves, clean
      and test the system as specified in this section, prior to connection to the valve. Use of this
      procedure, however, will not waive the requirement for a full test of the completed system.
   2. Piping shall first be cleaned by pulling a tightly fitting cleaning ball or swab through the system.
B. Air Systems:
   1. Air or Foul Air system piping 6 inches in diameter and smaller shall be blown out, using air or
      the testing medium specified.
   2. Air or Foul Air system piping larger than 6 inches shall be cleaned by having a swab or “pig”
      drawn through the entire length of the pipe. After connection to the equipment, it shall then be
      blown out using the equipment.
C. Liquid Systems:
   1. After completion of cleaning, piping systems shall be flushed with clean water for a minimum
      period of 15 minutes at the flow rate required to produce a minimum velocity of 6 feet per
      second.
      a. Contractor is responsible for all temporary piping and facilities required.
      b. Contractor shall comply with all State and Local regulations and requirements for disposal
         of flushing water.
   2. Potable water piping systems shall be flushed and disinfected in accordance with AWWA
      C651. Post disinfection testing shall be done and paid for by the Contractor.
3.03 Testing

A. Upon completion of installation the Contractor shall test each piping system.
   1. Equipment that may be damaged by the specified test conditions shall be isolated.
   2. Each test gauge shall be selected so that the specified test pressure falls within the upper half of the gauge's range.
   3. The Contractor shall notify the District’s Representative prior to each test and shall perform each test in the presence of the District’s Representative.
   4. Pipes shall not be encased in concrete until leakage test is completed and passed.
   5. Pipes shall not be covered by concrete slabs or pavement until leakage test is completed and passed.
   6. Exposed Pipes shall not be insulated until leakage test is completed and passed.
   7. Flanges or flex couplings shall not be backfilled or buried until leakage test is completed and passed.

B. Pumped or Pressure Systems:
   1. Prior to testing, the pipeline shall be slowly and carefully filled with water. All air shall be expelled slowly from the pipe and appurtenances in a manner so as not to create excessive surge pressures.
   2. The pipeline shall be filled with water at least twenty-four hours prior to testing when.
   3. Where air valves or other suitable outlets are not available for releasing air before applying the test, approved taps and fittings shall be installed and later securely plugged.
   4. The Contractor may, at his own risk, test against existing valves. Suspected leaking of the existing valves will not be accepted as a reason for having not passed the leakage test requirements. These valves shall either be repaired or replaced prior to the start of another testing sequence. All new valves shall be tested against a reduced pressure side. Butterfly valves shall be tested in both directions.
   5. The length of pipe being tested at any one time shall not exceed 2,000 feet unless otherwise approved by the Engineer or District’s Representative.
   6. The pipeline then shall be brought up to 100 psi or 50 psi greater than operating pressure of the system or as specified on the Pipe System Specification Sheets, whichever is greater, measured at the lowest point of the section of the pressure zone being tested.
   7. The test duration shall be two hours. Pressure in the pipeline shall be maintained within 2 psi of the calculated test pressure for the full two-hour duration. The individual testing of the valves may be of a shorter duration as approved by the Engineer or District’s Representative.
   8. The allowable leakage shall not exceed 30 gallons per 24 hours per mile of pipe per inch of nominal diameter.
   9. During the pressure and leakage test, all accessible appurtenances shall be inspected for visual signs of leakage.
   10. All visible leaks shall be corrected immediately, regardless of the amount of leakage and the test shall be run again for its full duration.
   11. All leaks detected shall be repaired to a water tight condition.

C. Gravity Systems
   1. Mandrel Test
a. The test shall be performed after backfill and compaction but prior to final paving and prior to leak testing.
b. The pipeline shall be balled and flushed just prior to pulling the mandrel through.
c. A rigid mandrel with a circular cross section of 95% of true average inside diameter shall be pulled through by hand.
d. If the mandrel sticks in the pipe at any point, the pipe shall be repaired or replaced and retested.

2. Air Test
   a. After the mandrel test, each section of the gravity pipeline between successive manholes/structures shall be air tested as follows:
      1) With all outlets plugged, air shall be slowly added until the internal pressure is raised to 3.0 pounds per square inch gage (psig).
      2) The air compressor used to add air to the pipeline shall have a blowoff valve set at 5 psig to ensure that at no time the internal pressure in the pipeline exceeds 5 psig.
      3) The internal pressure of 3.5 psig shall be maintained for at least five minutes to allow the air temperature to stabilize, after which the air supply shall be disconnected and the pressure allowed to decrease to 3.0 psig.
      4) If the pressure drops below 2.5 psig in less than the time given in the following table, the section of pipe fails the test.

<table>
<thead>
<tr>
<th>Pipe Size (inches)</th>
<th>Minimum Time (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>122</td>
</tr>
<tr>
<td>6</td>
<td>184</td>
</tr>
<tr>
<td>8</td>
<td>245</td>
</tr>
<tr>
<td>10</td>
<td>306</td>
</tr>
<tr>
<td>12</td>
<td>367</td>
</tr>
<tr>
<td>15</td>
<td>460</td>
</tr>
<tr>
<td>&gt;15</td>
<td>370 x pipe diameter in feet</td>
</tr>
</tbody>
</table>

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. This section specifies mortar lined steel pipe, fittings, connections, linings, and coatings for water service application.

B. References
1. This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWWA C200</td>
<td>Standard for Steel Water Pipe</td>
</tr>
<tr>
<td>AWWA M11</td>
<td>Steel Pipe – A Guide for Design and Installation</td>
</tr>
<tr>
<td>AWWA C205</td>
<td>Cement-Mortar Protective Lining and Coating for Steel Water Pipe – Shop Applied</td>
</tr>
<tr>
<td>AWWA C206</td>
<td>Standard for Field Welding of Steel Water Pipe</td>
</tr>
<tr>
<td>AWWA C207</td>
<td>Standard for Steel Pipe Flanges for Waterworks Service</td>
</tr>
<tr>
<td>AWWA C208</td>
<td>Standard for Dimensions for Fabricated Steel Water Pipe Fittings</td>
</tr>
<tr>
<td>AWWA C209</td>
<td>Cold-Applied Tape Coatings for Steel Water Pipe, Special Sections, Connections, and Fittings</td>
</tr>
<tr>
<td>AWWA C602</td>
<td>Standard for Cement-Mortar Lining of Water Pipelines – In Place</td>
</tr>
<tr>
<td>AWWA C604</td>
<td>Installation of Buried Steel Water Pipe</td>
</tr>
<tr>
<td>AWS D1.1</td>
<td>Structural Welding Code - Steel</td>
</tr>
<tr>
<td>AWS A3.0</td>
<td>Standard Welding Terms and Definitions</td>
</tr>
<tr>
<td>AWS QC1</td>
<td>Standard for AWS Certification for Welding Inspectors</td>
</tr>
<tr>
<td>NSF 61</td>
<td>Drinking Water System Components – Health Effects</td>
</tr>
<tr>
<td>SPFA</td>
<td>Steel Pipe Fabricators Association Quality Certification Program for Steel Pipe and Accessory Manufacturers</td>
</tr>
</tbody>
</table>

1.02 Submittals
A. Descriptive literature showing pipe dimensions, joints, couplings, coatings/linings and other details for each size of pipe indicated.
B. Affidavits of Compliance with AWWA C200, AWWA C205, AWWA C209, AWWA C213, AWWA C214, ASTM A53, and ASTM A106, as applicable, and Contractor's layout drawings shall be submitted in accordance with Section 01340

C. Fabrication drawings.

D. Factory test reports.

E. Coating manufacturer's qualifications.

F. Reports of ASME Section IX welding certifications.

1.03 Quality Assurance

A. Manufacturer Qualifications
   1. Pipe manufacturer shall have current SPFA and ISO 9001 Certification.
   2. The pipe manufacturer shall have a minimum of five (5) years continuous experience in manufacturing the pipe and fittings specified for this project
   3. Qualifying experience for pipe and fittings fabrication shall include a minimum of three projects completed or in current fabrication within the past five (5) years with similar diameters and wall thickness.

B. Welder Qualifications
   1. Qualify and certify welding procedures, welders, and operators in accordance with ASME Section IX, for shop welding and AWS D1.1 for project site welding of piping work.
   2. Qualification for welders: Welding shall be performed by welders holding current certification for the welding procedures in use.

C. Tests
   1. All materials used in the manufacture of the pipe shall be tested in conformance with AWWA C200 and C205.

1.04 Delivery, Storage and Handling

A. During loading, transportation and unloading, prevent damage to pipes and coatings. Load and unload each pipe under control at all times. Under no circumstances will a dropped pipe be used unless inspected and accepted by the District's Representative. Place skids or blocks under each pipe in the shop and securely wedge pipe during transportation to protect pipe, lining, and coating.

PART 2 - PRODUCTS

2.01 Manufacturers

A. Ameron
B. Northwest Pipe
C. Hanson
D. Mid America
E. Or Equal

2.02 Pipe

A. Pipe shall be fusion epoxy lined and coated steel cylinder pipe per AWWA C200.
B. AWWA C200 pipe minimum wall thickness shall be 0.25 inches. Increased thickness shall be provided where specified.

C. NSF Certification – All materials that may be in contact with drinking water shall be in compliance with NSF/ANSI 61.

D. Fabricated pipe spools shall be welded by ASME-certified welders. Welds shall be made in accordance with the requirements of ASME Section IX, ANSI B31.1, ANSI B31.3, or AWWA C200, C207 and C208.

E. Steel Cylinder:
   1. Steel pipe and fittings shall be fabricated from steel sheet or coil that conforms to:
      a. Yield Strength: 36,000 psi minimum.
      b. Coils: Steel coils shall be made from the continuous cast process or continuous cast slabs conforming to the physical and chemical characteristics of ASTM A1011 (for thickness up to 0.239 inch) or ASTM A1018 (for thickness greater than 0.239 inch).
      c. Fittings can also be fabricated from plate conforming to ASTM A36 or ASTM A572 Grade 42.
   2. Steel coils or plates shall be fine grained, fully killed and manufactured using the continuous casting process. The maximum carbon content shall be 0.25%. The maximum sulfur content shall not exceed 0.015 percent. The steel shall also meet a maximum carbon content of 0.45 as determined by criteria specified in AWS D1.1.
   3. Steel pipe and fittings shall be fabricated and tested in conformance with AWWA C200. The cylinders shall be fabricated by butt-welded spiral seam, girth seam or longitudinal seam.
   4. All welders and welding operators shall be qualified under the standard qualification procedures of the ASME Boiler and Pressure Vessel Code, Section IX or AWS D1.1.
   5. An expanding press or swaging die shall form bells for the lap-welded field joints.

2.03 Fittings and Appurtenances
A. Steel fittings and appurtenances shall conform to the requirements of ASTM A234 or ASTM A105, ANSI B16.11.

B. Fabricated steel fittings and appurtenances shall conform to AWWA C200 and C208. All fittings shall be designed in accordance with AWWA Manual M11 for the design pressures of the external loads shown.

C. Wall thickness for fittings shall be reinforced to withstand either internal pressures, both circumferential and longitudinal, or external loading conditions, whichever is greater. In no case shall wall thickness of fittings be less than that of adjacent pipe.

2.04 Connections
A. Welded Joints:
   1. Provide field welds, as needed, in accordance with AWWA C206.
   2. Welded connections shall be sound and free from embedded scale or slag, with tensile strength of weld not less than that of thinner of connected sections. Welds to be watertight.
   3. Field Welds piping shall be one of the following:
      a. Bell and spigot lap welds
         1) Shall be double weld (inside and outside).
         2) Provide ¼” NPT air test holes with lining blockouts.
b. Butt strap welds
   1) Shall be welded both inside and outside joint.
   2) Longitudinal joint in the butt-strap to use full-penetration welds before making the circumferential fillet welds.
   3) Provide ¼” NPT air test holes with lining blockouts.
   4) Do not make alignment changes at butt-strap joints
   5) Do not use mitered Butt-straps

B. Flange Connections:
   1. Flanges: Unless otherwise specified, steel flanges shall be Class D, E or F ring flanges for internal pressures up to 150 psi, 275 psi, and 300 psi, respectively in accordance with AWWA C207. Flanges shall be in conformance with ASME B16.447 for higher pressure applications.
   2. All Bolts and nuts shall be type 316 stainless steel per ASTM F593 and F594.
   3. Use flat faced flanges to mate with dissimilar materials.
   4. Blind flanges shall be in accordance with the appropriate standard as determined by the maximum operating pressure.

C. Grooved Connections:
   1. Carbon Steel, A-53B/A-106B - Roll or cut grooved-ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends to be grooved in accordance with Victaulic current listed standards conforming to ANSI/AWWA C-606.
   2. Grooved couplings shall meet the requirements of ASTM F-1476
   3. Victaulic Standard Mechanical Couplings, 2 inch (DN50) through 12 inch (DN300):
      a. Manufactured in two segments of cast ductile iron, conforming to ASTM A-536, Grade 65-45-12.
      b. Gaskets shall be pressure responsive synthetic rubber, grade to suit the intended service, conforming to ASTM D-2000. (Gaskets used for potable water applications shall be UL classified in accordance with ANSI/NSF-61 for potable water service.)
      c. Mechanical Coupling bolts shall be zinc plated (ASTM B-633) heat treated carbon steel track head conforming to ASTM A-449 and ASTM A183, minimum tensile strength 110,000 psi (758450 kPa) as provided standard Victaulic.

D. Gaskets shall be as shown in Section 15060.

2.05 Pipe Lining
A. Fusion Epoxy Lining:
   1. Pipe (including butt ends) and fittings shall be fusion bonded epoxy coated and lined in accordance with AWWA C213. Surface preparation shall be in accordance with SSPC-SP 10/NACE No. 2 Near White Blast Cleaning. The application method shall be by the fluidized bed method and shall attain 12 mils minimum dry film thickness.
   2. Fusion bonded epoxy coating and lining shall be 3M Scotchkote 206N, or equal.
   3. Field welds, connections and otherwise damaged areas shall be patched according to the coating manufacturer's instruction with 3M Scotchkote 206N.
   4. Damaged areas shall be patched according to the coating manufacturer's instructions with 3M Scotchkote 206N.
2.06 Pipe Coating

A. Fusion Epoxy Coating:

1. Where specified, pipe and fittings shall be fusion epoxy coated in accordance with AWWA C213. Surface preparation shall be in accordance with SSPC-SP 10 Near White Blast Cleaning. The application method shall be by the fluidized bed method and shall attain 12 mils minimum dry film thickness.

2. Field welds, connections and otherwise damaged areas shall be coated and patched according to the manufacturer’s instructions with 3M Scotchkote 206N.

3. Fusion epoxy coating shall be 3M Scotchkote 203, or equal.

B. Polyethylene Tape Coating:

1. Where specified, pipe and fittings shall be coated with primer and wrapped in accordance with AWWA C214 and C209. The coating application shall be a continuous step operation in conformance with AWWA C214, Section 3. The total coating thickness shall be not less than 50 mils for pipe 24 inches and smaller and not less than 80 mils for pipe 26 inches and larger.

2. Polyethylene tape coating system shall be as specified in AWWA C214 and C209.

PART 3 - EXECUTION

3.01 Installation

A. Installed work in accordance with AWWA M11, AWWA C604, and per contract documents.

B. Joining Methods - Flanges:

1. Facing method:
   a. Insert slip-on flange on pipe.
   b. Assure maximum tolerances for flange faces from normal with respect to axis of pipe is 0.005 IN per foot of flange diameter.
   c. Test flanges after welding to pipe for true to face condition and reface, if necessary, to bring to specified tolerance.

C. Joining Method - Welded Joints:

1. Perform welding in accordance with AWWA C206 and this Section.

2. For flange attachment perform in accordance with AWWA C207.

3. Have each welding operator affix an assigned symbol to all his welds.

4. Mark each longitudinal joint at the extent of each operator's welding.

5. Mark each circumferential joint, nozzle, or other weld into places 180 degrees apart.

6. Joining method:
   a. Leave 1/8 to 3/8 IN of flange bolts projecting beyond face of nut after tightening.
   b. Coordinate dimensions and drillings of flanges with flanges for valves, pumps, equipment, tank, and other interconnecting piping systems.
   c. When bolting flange joints, exercise extreme care to assure that there is no restraint on opposite end of pipe or fitting which would prevent uniform gasket compression or cause unnecessary stress, bending or torsional strains being applied to cast flanges or flanged fittings.
1) Allow one (1) flange free movement in any direction while bolts are being tightened.
   d. Do not assemble adjoining flexible coupled, mechanical coupled or welded joints until flanged
      joints in piping system have been tightened.
   e. Gradually tighten flange bolts uniformly to permit even gasket compression.
   f. Do not overstress bolts to compensate for poor installation.

D. Joining Method – Grooved Joints:
   1. Pipe ends shall be clean and free from indentations, projections and roll marks in the area from
      pipe end to groove for proper gasket sealing.
   2. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended
      service as specified.
   3. Install the Victaulic AGS piping system in accordance with the latest Victaulic installation
      instructions.
   4. AGS products shall not be installed with standard grooved end pipe or components. (Installing
      AGS products in combination with standard grooved end products could result in joint separation
      and/or leakage.)
   5. Use Victaulic grooving tools with AGS roll sets to groove the pipe. Follow Victaulic guidelines for
      tool selection and operation.
   6. Couplings installation shall be complete when visual metal-to-metal contact is reached.
   7. See the latest copy of Victaulic’s Field Assembly and Installation Instruction Pocket Handbook (I-100).

E. Takedown Couplings: Takedown couplings shall be screwed unions, flanged or grooved end
   mechanical coupling type joints and shall be provided as specified. Flanged or grooved end joints
   shall be employed on pipelines 2-1/2 inches in diameter and larger. Where piping passes through
   walls, takedown couplings shall be provided within 3 feet of the wall, unless specified otherwise. A
   union or flanged connection shall be provided within 2 feet of each threaded end valve.

F. Flexibility: Unless otherwise specified, piping 2 inches in diameter and larger passing from concrete
   to earth shall be provided with pipe couplings or flexible joints as specified (1) within 2 feet of the
   structure and (2) within 3 feet of the first joint. Where required for resistance to pressure, mechanical
   couplings shall be restrained in accordance with AWWA M11, paragraph 13.10, Tables 13-6 and 13-7,
   and Figure 13-17.

G. Install buried piping per Section 15060.

3.02 TESTING
   A. Hydrostatic testing shall be per Section 15060 in accordance with Section 4 of AWWA C600.

**END OF SECTION**
SECTION 15064
PVC PIPE

PART 1 - GENERAL

1.01 Summary
A. This section specifies polyvinylchloride (PVC) for pressurized and non-pressurized systems.

1.02 References
A. This section contains references to some or all of the following documents, most recent edition. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI/AWWA C900</td>
<td>Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-in Through 12-in for Water Distribution</td>
</tr>
<tr>
<td>ANSI/AWWA C905</td>
<td>Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14-in Through 48-in for Water Distribution</td>
</tr>
<tr>
<td>ASTM D1785</td>
<td>Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120</td>
</tr>
<tr>
<td>ASTM D2241</td>
<td>Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)</td>
</tr>
<tr>
<td>ASTM D2321</td>
<td>Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications</td>
</tr>
<tr>
<td>ASTM D2774</td>
<td>Standard Practice for Underground Installation of Thermoplastic Pressure Piping</td>
</tr>
<tr>
<td>ASTM D2855</td>
<td>Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings</td>
</tr>
</tbody>
</table>
1.03 Drinking Water System Components

A. All water system components with wetted parts in contact with drinking water shall be in conformance with the U.S. Safe Drinking Water Act, the California State Waterworks Standards, and local Health Department Standards, including the requirements stated in the latest or most current version of NSF/ANSI 61 Annex G, NSF/ANSI 372 for “lead free” plumbing.

1.04 Submittals

A. The following shall be submitted by the Contractor in accordance with the requirements in Section 01340 – Submittal.

1. Alignment/ Layout drawings

2. Manufacturer's certificates shall be provided with each delivery. This certifies that each pipe section complies with this specification.

3. Manufacturers' Affidavits of compliance with applicable references

4. Descriptive literature showing pipe dimensions, joints, couplings and other details for each size of pipe indicated.

1.05 Quality Assurance

A. The pipe, joints and fittings shall be tested in accordance with the requirements of this specification and as specified in the reference standards. The Contractor shall submit the test results to the District’s Representative.

B. Additional sampling may be requested of any material for testing by the District at the District’s expense. The additional samples shall be furnished by the Contractor at no additional cost to the District.

1.06 Delivery, Storage and Handling

A. Delivery

1. Pipe shipment should be carefully inspected by the Contractor upon arrival for defects or damage during delivery.

2. The Manufacturer shall mark the nominal pipe diameter, pressure class, manufacturer's name, date of extrusion, ASTM designation and PVC Cell Classification on the pipe.
B. Storage
   1. Pipe shall be stored in such a way as to prevent sagging, compression or bending.
   2. Pipe shall be protected from direct sunlight by covering with an opaque material while permitting air circulation.
   3. Gaskets should be stored in a cool, dark place out of direct sunlight.

C. Handling
   1. Handling of the PVC pipe shall be done in accordance with manufacturer’s instructions to insure that the pipe is not damaged in any manner during storage, transit, loading, unloading, and installation.
   2. Any length of pipe having a gouge, scratch, or other permanent indentation more than 10 percent of the wall thickness in depth shall be rejected.
   3. Defective, damaged or rejected pipe shall be immediately removed from the working area and replaced by the contractor at no additional cost to the District.

1.07 Warranty
A. The pipe shall be warranted to be free of defects in material for a period of one year from substantial completion.

PART 2 - PRODUCTS

2.01 Material
A. PVC material for pipes and fitting shall complying with Cell Classification 12454-B or better, in accordance with ASTM D1784.
B. PVC shall be normal impact unless otherwise specified
C. Pipe Color shall be based on application as follows:
   1. Blue: potable water
   2. Brown: drains
   3. Green: sanitary sewer, sewer force mains, scum, sludge, waste activated sludge

2.02 PVC Non-Pressure Pipe
A. SDR 26 and 35
   1. Pipe shall meet the requirements of ASTM D2241, ASTM D3034 and ASTM F679.
   2. Fittings and Joints
      a. Push-on:
         1) ASTM D3034
         2) Gaskets: ASTM F477
B. Schedule 40 and 80
   1. Pipe shall meet the requirements of ASTM D1785.
   2. Fittings and Joints:
      a. Socket type:
1) Schedule 40: ASTM D2665
2) Schedule 80: ASTM D2467
3) Solvent weld cement for socket type connections: ASTM D2564.

2.03 PVC Pressure Pipe

A. Schedule 40, 80, and 120
   1. Pipe shall meet the requirements of ASTM D1785.
   2. Fittings and Joints:
      a. Socket type:
         1) Schedule 40: ASTM D2466
         2) Schedule 80: ASTM D2467
         3) Solvent weld cement for socket type connections: ASTM D2564.
      b. Threaded:
         1) Schedule 80: ASTM D2464
      c. Flanged:
         1) Flanged shall be used for transitions between PVC pipe and pipe of different material
         2) Flange bolts for submerged or wet conditions shall be 316 stainless steel.
         3) PVC flanges shall be Class 300 conforming to ANSI B16.5 made of material similar to pipe.

B. C900/ C905:
   1. Pipe shall meet the requirements of AWWA Standard C900/ C905, Pressure Class 150 psi.
   For Fire Water Service, Pressure Class 200 psi FM approved.
   2. Fittings:
      a. Push-on:
         1) C900: AWWA Standard C907
         2) C905: ASTM D3139
         3) Push on gaskets: ASTM F477
   3. Joints:
      a. Push-on:
         1) ASTM D3139
         2) Push-on gaskets: ASTM F477
   4. Restraints:
      a. Mechanical joint fittings: EBAA 2000PV, Romac PVC RomaGrip, Star Pipe PVC Ring Lock, or equal.
      c. Push-on joint: EBAA 1600, Romac 611, Star Pipe 1100C or equal.
PART 3 - EXECUTION

3.01 General
A. All installation, jointing, tests for defects and leakage shall be performed in the presence of the District's Representative and shall be subject to his approval before acceptance.
B. All material found to have defects will be rejected and the Contractor shall promptly remove such defective materials from the work site.
C. Installation shall conform to the requirements of the following standard practices, instructions furnished by the pipe manufacturer, and to the supplementary requirements or modifications specified in this section. Wherever the provisions of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.
1. AWWA Manual M23: C900/C905 PVC Pressure Pipe
2. ASTM D2321: SDR 26
3. ASTM D2855 and F402: Solvent welding joining procedure
D. Unless otherwise specified, paint PVC piping exposed to direct sunlight as specified in Section 09900 – Protective Coating Systems.

3.02 Trenching and Backfill
A. Trench excavation and backfill shall conform to all requirements detailed in Section 02200 – Earthwork and District Standards.

3.03 Installation
A. General:
1. Pipe and fittings shall be of the sizes indicated.
2. Proper implements, tools, and facilities as recommended by the pipe manufacturer's standard printed installation instructions shall be provided and used by the Contractor for safe and efficient execution of the Work.
3. The interior of the pipe shall be cleaned of all foreign matter before installing.
4. The pipe and accessories shall be inspected for defects prior to lowering into the trench. Any defective, damaged or unsound pipe shall be repaired or replaced.
5. All pipe, fittings, valves, and accessories shall be carefully lowered into the trench by means of derrick, ropes, or other suitable equipment in such a manner as to prevent damage to pipe and fittings.
6. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.
7. While laying pipe is NOT in progress, the open ends of the installed pipe shall be closed to prevent trench water from entering into the interior of the pipe. Adequate backfill shall be deposited on pipe to prevent floating of pipe. Any pipe that has floated shall be removed from the trench, cleaned, and re-laid in an acceptable manner. The use of burlap, wood, or other similar temporary plugs will not be permitted.
8. No pipe shall be laid when, in the opinion of the District's Representative, the trench conditions or the weather are unsuitable for such work.
B. Field Cutting Pipe
1. Cutting and machining of the pipe shall be accomplished in accordance with the pipe manufacturer's standard procedures for this operation.
2. Pipe shall NOT be cut with a cold chisel, standard iron pipe cutter, wedge type roll cutter or any other method that may fracture the pipe or will produce ragged, uneven edges.

3. Pipe shall be square cut with fine tooth saw or other cutter or knife designed for use with plastic pipe.

4. After cutting, the end of the pipe shall be beveled using a beveling tool, portable type sander or abrasive disc. Remove burrs by smoothing edges with a knife, file, or sandpaper.

C. Field Joining Pipe Joints and Fittings:
1. Pipe shall be jointed in compliance with manufacturer's printed instructions.

2. All pressure pipe shall be suitably restrained by use of thrust blocks or other means as approved by the Engineer.

3. Solvent Weld Joint Type Pipe
   a. Test fit dry pipe and fittings before applying cement. Pipe should enter socket without forcing at least one-third but not more than two-thirds the depth of socket. Fittings that are looser or tighter shall not be used.
   b. Thoroughly clean and dry the pipe end and socket of fittings prior to application of solvent.
   c. Before applying cement, apply clean primer evenly to outside surface and end of pipe and inside surface of socket. Purple primer will not be permitted for use.
   d. Apply cement evenly to outside surface and end of pipe and inside surface of socket. Avoid excess application of cement but insure complete coverage of all bonding surfaces.
   e. Mark depth of socket on pipe to guide application of cement and insure full insertion of pipe.
   f. Insert pipe in socket, twisting pipe or fitting approximately 1/2 turn as pipe is being seated in socket. Make sure pipe is fully seated providing a bond between end of pipe and shoulder of socket.
   g. Immediately wipe excess cement from pipe leaving no more than a 1/8 inch fillet at fitting end. Hold assembled joint in place for approximately 15 seconds and allow to set for 30 minutes before moving. Avoid rough handling for 48 hours. Longer periods may be required in cold or wet weather.

4. Mechanical Joints
   a. Cut off and remove bevel end of pipe before installing in mechanical joint.

5. Bends, Tees, and Reducers
   a. Ductile-iron and/or PVC fittings shall be installed utilizing standard installation procedures.
   b. Cable, rope, or other devices used for lowering fittings into trench shall be attached around the exterior of fitting for handling. Under no circumstances shall the cable, rope or other device be attached through the fitting’s interior for handling.

3.04 Compaction of Pipe Bedding and Backfill
A. Compaction of pipe bedding and backfill material shall conform to the requirements of Section 02200 – Earthwork.

3.05 Testing
A. Field testing of gravity sewer pipe shall be conducted and acceptability determined in accordance with of Section 15060 – Piping Systems.
**END OF SECTION**
SECTION 15075
HDPE PIPE AND APPURTENANCES

PART 1 - GENERAL

1.01 Description
A. Furnish, install, and test repaired section of high-density polyethylene (HDPE) pipe and appurtenances as indicated for non-pressure pipe.

1.02 References
A. Pipe dimensions and manufacturing requirements:

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
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<tbody>
<tr>
<td>ASTM F714-05</td>
<td>Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter</td>
</tr>
<tr>
<td>ASTM D2513-05</td>
<td>Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings</td>
</tr>
<tr>
<td>ASTM D3035-03a</td>
<td>Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter</td>
</tr>
<tr>
<td>ASTM D3350-05</td>
<td>Standard Specification for Polyethylene Plastics Pipe and Fittings Materials</td>
</tr>
<tr>
<td>ASTM D1248 - 05</td>
<td>Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable</td>
</tr>
</tbody>
</table>

B. Installation standards:

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
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<tbody>
<tr>
<td>ASTM D2321-05</td>
<td>Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications</td>
</tr>
<tr>
<td>ASTM D2774-04</td>
<td>Standard Practice for Underground Installation of Thermoplastic Pressure Piping</td>
</tr>
</tbody>
</table>

C. Pipe joining standards:

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>ASTM F2620</td>
<td>Standard Practice for Heat Fusion of Polyethylene Pipe and Fittings</td>
</tr>
<tr>
<td>ASTM D2627</td>
<td>Standard Practice of Heat Fusion Joining of Polyolefin Pipe and Fittings</td>
</tr>
</tbody>
</table>

D. Piping fitting standards:

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM F1055</td>
<td>Standard Specification for Electrofusion Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing</td>
</tr>
</tbody>
</table>
1.03 Quality Assurance
A. Furnish all labor and equipment necessary to assist the District in inspecting pipe upon delivery. Remove and return rejected pipe immediately.
B. All tests shall be made in accordance with methods prescribed by the ASTM specification, and the acceptance or rejection is based on the test results.
C. HDPE Fusion Technician
   1. Technician making fusion bonded joints shall be employed or trained by the fusion equipment manufacturer.
   2. The technician making the fusion bonded joints shall have the following minimum experience:
      a. Performed fusion bonding on at least three prior projects.
      b. Performed fusion bonding on at least 5,000 feet of 6-inch (or larger) HDPE pipe.
D. HDPE Fusion Measurements
   1. Fusion machine heater plate surface temperatures and hydraulic cylinder interface pressures shall be recorded during the butt-fusion joining operations. Measurements shall be permanently recorded utilizing a McElroy DataLogger or District-approved equal.

1.04 Submittals
A. Shop Drawings: Submit the following in accordance with Section 01340-Submittals.
   1. Shop drawings and descriptive literature showing pipe dimensions, joints, and other details for each size of pipe indicated.
   2. Certification from manufacturer with each delivery that pipe complies with this specification.
   3. Certified copies of test reports with each delivery, stated compliance with ASTM F714-05 and ASTM D3350-05 as appropriate.
   4. If the Contractor proposes any deviations from the design alignment, for example using a curve instead of a fitting where a PI or VPI is shown, appropriate information must be submitted, including manufacturer’s recommended minimum allowable bend radius of pipe. Engineer reserves the right to require a larger minimum radius.
   5. Pipe manufacturers’ joint assembly procedure including cool down time and datalogger equipment.
   6. HDPE Fusion Technician’s experience and qualifications.
   7. Submit written certification from the HDPE pipe fusion equipment supplier that the fusion technician has received training in the proper use of the fusion equipment and the manufacturer’s recommended fusion equipment.
   8. Description of pressure and leakage test procedures to be used.
   9. Description of all testing equipment to be used during pressure and leakage testing.
   10. Fusion data (heater plate temperature, hydraulic cylinder interface pressures, time/duration, etc.) shall be submitted to the District within two days following the completion of any joint. Failure to submit this information may result in the joint being rejected and replaced.
B. Samples
   1. Wall Uniformity Samples. The purpose of these samples is to visually check wall uniformity to determine if the HDPE resin pellets fully melted during the extrusion process.
a. The District will select 5 sticks from the total number of sticks delivered to the project to obtain a sample from.
b. Each sample will be five feet long and will come from the end of the pipe.
c. After the District selects a sample, the Contractor shall cut the sample from the pipe and load the sample onto the District's truck.
d. The exposed cross-section will be examined for uniform color, appearance, consistency, and other properties.
e. The samples will be stored for future testing if needed.

PART 2 - PRODUCTS

2.01 Pipe

A. HDPE Pipe

1. Pipe shall be high molecular weight, high density polyethylene pipe (HDPE).
2. The material shall be listed by the Plastic Pipe Institute (PPI) with a designation of PE 3408 and have a minimum cell classification of 345464C, or D as described in ASTM D3350-05.
3. The pipe material shall meet the requirements for Type III, Class B, Category 5, Grade P34 material as described in ASTM D1248-05.
4. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw pipe material.
5. Pipe and fittings shall be made in conformance with ASTM F714-05 and ASTM D3261-03 as modified for the specified material.
6. The pipe shall be homogeneous throughout and free of cracks, holes, foreign inclusions or other injurious defects. It shall be uniform in density and other physical properties.
7. Any pipe not meeting these criteria shall be rejected and taken from the site.
8. Pipe shall conform to the nominal sizes and standard dimension ratios shown on the Drawings.
9. Pipe shall be delivered in 40-foot lengths or longer but not longer than can be transported over highways. This is required to minimize field construction time and to maximize the control over the environmental conditions that affect the butt-fusion process and thereby the ultimate quality of the completed joint.

B. HDPE Non-Pressure Pipe

1. Corrugated HDPE pipe shall be smooth interior wall Type S and shall be specified in AASHTO M 252 (pipeline sizes 3” – 10”) and M 294 (pipeline sizes 12” – 60”), and shall be manufactured from high density polyethylene virgin compounds.
2. Gravity pipe shall be installed in accordance with ASTM D2321-05 titled “Standard Practice for Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity Applications”.
3. Wall thickness of Type S corrugated HDPE pipe shall be thickness of the inner liner measured between corrugated valleys.
4. The pipe stiffness shall be determined in accordance with ASTM D2412-02. Pipe stiffness shall be determined for three (3) test specimens for each manufactured run.
5. The joint shall be bell and spigot design and shall include a rubber gasket meeting the requirements of ASTM F477-08.
6. Fittings shall meet ASTM D3212-07 requirements and shall not reduce or impair the overall integrity or function of the pipeline. Fittings may be either molded or fabricated Common Corrugated fittings including in-line joint such as tees, wyes, and end caps. Fittings shall be installed as defined in ASTM D3350-08.

7. The pipe stiffness shall be determined in accordance with ASTM D2412-08. Pipe stiffness shall be determined for 3 test specimens for each manufactured run.

8. Water tightness shall be obtained by the use of durable, high quality, resilient joint materials designed to perform the intended function. The field water testing shall meet ASTM F 1417-92. Materials shall be neoprene expanded rubber or sheet rubber gaskets, “O” ring rubber gaskets, butyl rubber base joint sealant, or other approved resilient material.

9. Pipe shall be laid and jointed in accordance with the manufacturer’s printed recommendations and following provisions in order to be suitable for the purpose intended. Necessary facilities shall be provided for lowering and properly placing the sections of pipe in the trench.

10. The pipe shall be laid to line and grade with the sections closely jointed.

11. Every precaution shall be taken to prevent flooding the pipe trench before backfilling operations.

12. New pipe shall be connected to existing or new drainage facilities as shown in the Drawings.

13. Connections of HDPE to existing structures and pipes shall be as follows:
   a. Connections to cast-in-place structures shall include a water-stop at mid-wall of the structure.
   b. Connections to pre-cast structures shall include a water-stop at mid-wall of the structure, and opening shall be filled with cement grout in conformance with Section 03315 – Grout. For corrugated piping used watertight connector with prefabricated manhole adapter.
   c. Connections to existing HDPE pipe shall be made with a premium split-coupling saddle tee.
   d. Connections to existing PVC shall be made with a PVC saddle with a HDPE/SDR35 PVC adaptor.
   e. Connections to existing DIP shall be made with a DIP tap and heat shrink material around the joint. Heat shrink material shall be supplied by the HDPE pipe manufacturer.

2.02 Joints

A. General
   1. For pipe installed using open cut construction, joints shall be butt fusion joints, or flanged joints. Friction or pressure couplings are not acceptable.

B. Butt Fusion Joints
   1. Butt fusion techniques shall meet all requirements of ASTM D2657 and D3261.
   2. Butt fusion between pipes that are more than two DR steps different is not allowed. A transition fitting shall be required to connect pipes more than two DR steps different. A transition fitting shall be a short plain pipe with one end taper bored to match the thinner walled pipe. For example, to connect DR 11 and DR 21 pipe, a plain piece of DR 11 pipe with one end taper bored to DR 21 shall be used.

C. Flanged Joints
   1. All flanged joints shall consist of HDPE flange adaptors and backup rings.
2. Full face flat ring gaskets of 1/8-inch black reinforced rubber conforming to ANSI B-16.21 shall be installed between the opposing ends of the flange adapters. Gaskets shall have bolt holes and be held in position by the bolts.

3. All backup rings (flanges) shall be polypropylene encapsulated ductile iron.
4. Backup rings shall meet the pressure class of the pipe.
5. Bolt sets (bolt, nut, and washers) shall be 316 stainless steel unless noted otherwise.

D. Electro-fusion Joints
1. Shall only be used as system closures.
2. Shall meet AWWA C906 requirements.
3. Shall be fully pressure rated to meet or exceed the joining pipe’s pressure rating.
4. The inside diameter of the electro-fusion coupling shall match the joining pipe outside diameter.

2.03 Fittings
A. Fittings shall be polyethylene fabricated fittings and shall meet the following requirements.
   1. All fittings shall be molded.
   2. All fittings shall be SDR11.
   3. All fittings shall be fabricated from the same PE3408 material as the pipe.
   4. All fittings shall be fully pressure rated and meet requirements for AWWA C906.
   5. Reinforced fittings (fiberglass wrapped for example) are not allowed.
   6. All fittings shall have taper bored ends to meet adjoining pipe wall thickness.
   7. All elbows shall be sweep elbows. For example, all 90 degree elbows shall be 5-segment elbows and all 45 degree elbows shall be 3-segment elbows.
   8. All fittings shall be pressure tested to four times working pressure of pipe for five seconds or alternative back-bend test as provided for in AWWA C906.

B. Polyethylene flange adapters shall be made with sufficient through-bore length to be clamped in a butt-fusion machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves to provide gasket-less sealing, or to restrain the gasket against blow-out.

2.04 Locator Stations
A. Detection Wire & Locator Stations shall be per Standard Details.

2.05 Flared Ends
A. Flared Ends shall meet the requirements of ASTM D3350 minimum cell classification 213320C.
   1. Flared shall not be built with a significant invert elevation and will match the slope shown on the plans.

PART 3 - EXECUTION

3.01 Inspection
A. Inspect each pipe and fitting prior to fusion of the joints. Remove defective pipes from the site.
B. Wall Uniformity Samples shall be obtained as described in Part 1.

3.02 Handling
A. Store all pipe materials in accordance with pipe manufacturer’s recommendations until installation.
   1. Keep pipe at ambient outdoor temperature.
   2. Provide temporary shading.
   3. Any covering practices that will cause a temperature build-up are not acceptable.
B. Handle all pipe material in accordance with pipe manufacturer’s recommendations. Handle all pipe material carefully to avoid any damage.

3.03 Rejection of Pipe
A. Pipe sections with gouges or cuts deeper than 10% of the wall thickness shall be cut out and removed and replaced by the Contractor at no additional cost to the District. Undamaged pipe portions shall be rejoined using butt-fusion joining methods.

3.04 Fabrication
A. Butt-fusion Joining
   1. Clean joint surfaces: Prepare joint surfaces according to manufacturer’s recommendations. Use devices to force pipes together with minimum open recess inside and outside and tightly seal joints. Avoid forces that could wedge apart and split ends.
   2. Do not pull or cramp joints without permission of Engineer.
   3. Remove unfitable pipes and replace with sound units.

3.05 Installation
A. Support pipe as shown on drawings. Permanently supporting on saddles, blocking or stones is prohibited.
B. Clear pipe units of debris, dirt, etc. before installation and keep clean until acceptance.
C. Install to lines and grades indicated or required by Engineer.
D. Driving pipe down to required grade by striking with shovel handle, timber, or other object is prohibited.
E. Lifting pipe with chains, steel chokers, or other metal devices is not allowed. Use nylon slings or other non-damaging materials. Do not allow excessive longitudinal deflections when handling long lengths of pipe.
F. Close open ends of pipe with plywood caps or blind flanges secured in place.
G. After bedding pipe, place and compact bedding between pipe and sides of trench. Compact bedding under lower half of pipe. Place and compact bedding as indicated and in conformance with Section 02200 - Earthwork.
H. Prevent pipe flotation in trench.
I. Make open ends of pipe and branches watertight with temporary plugs when pipe installation is not in progress.
J. If water is in the trench, do not remove plug until provisions are made to prevent water, earth, or other substances or material from entering the pipe.
K. The Contractor shall not use the pipeline as a conductor for trench drainage.
L. Cleaning:
   1. Prevent earth, water, and other materials from entering the pipeline.
   2. Clean pipeline upon completion.

M. Locator (tracer) wire:
   1. All HDPE pipe shall be installed with locator (tracer) wire and locator stations. Refer to Drawings for configuration.
   2. Locator stations shall be installed at 600-foot intervals along all HDPE pipelines unless otherwise shown. For horizontal directional drilling installations, install locator stations at both ends of each drilling operation.

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. This Section includes valves and miscellaneous components.

1.02 Submittals
A. Annotated Product Bulletins for all valves, miscellaneous components, and accessories utilized with materials and details of construction.
B. Outline installation drawings for all valves, miscellaneous components, and accessories utilized.
A. List(s) of recommended Spare Parts and Special Tool.
B. Operation and Maintenance Data: Installation, operating and maintenance data in accordance with Section 01770 – Contract Closeout.

1.03 Delivery, Storage, and Handling
A. All valves and miscellaneous items shall be packed, shipped, stored and handled in accordance with manufacturer recommendations.

1.04 Warranty
A. Provide manufacturer’s written warranty, issued in the District’s name, to cover the equipment supplied against defects in workmanship and material for a period of one (1) year from the date of acceptance under normal use and service. Warranty shall include all materials and labor required.

PART 2 - PRODUCTS

2.01 Plug Valves
A. Plug valves shall be non lubricated eccentric plug valve type suitable for drip tight, bi-directional shutoff at a minimum rated valve design pressure of 175 psig for valve sizes ½” to 12” and 150 psi for valve sizes 14” and larger.
B. The plug valves shall be full port, rounded or rectangular. Rectangular ported valves are unacceptable for gravity sanitary sewer applications.
C. Buried plug valves shall be provided with position indicator.
D. The bonnet shall be of bolted construction.
E. Plug valves shall be flanged ends and drilled to ANSI B16.5 class 150 or mechanical joint ends for buried service.
F. Shaft bearings shall be permanently lubricated, replaceable type.
G. Materials of construction shall be as follows:

<table>
<thead>
<tr>
<th>Components</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>ASTM A126, Class B or Ductile Iron ASTM A536</td>
</tr>
<tr>
<td>Body Bearing</td>
<td>316 SST</td>
</tr>
<tr>
<td>Component</td>
<td>Material</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Plug</td>
<td>Buna N-faced</td>
</tr>
<tr>
<td>Thrust Bearing</td>
<td>PTFE</td>
</tr>
<tr>
<td>Gasket</td>
<td>Non-asbestos filler in Styrene-Butadiene Rubber Binder</td>
</tr>
<tr>
<td>Bonnet</td>
<td>Cast Iron, ASTM A126, Class B</td>
</tr>
<tr>
<td>Bonnet Bearing</td>
<td>316L SST</td>
</tr>
<tr>
<td>Bonnet Screws</td>
<td>Carbon Steel, Grade 2, Zinc Plated</td>
</tr>
<tr>
<td>Packing</td>
<td>NBR Acrylonitrile-Butadiene, V-type</td>
</tr>
<tr>
<td>Gland</td>
<td>Cast Iron</td>
</tr>
<tr>
<td>Gland Stud</td>
<td>Zinc Plated</td>
</tr>
<tr>
<td>Nuts, bolts, springs and washers</td>
<td>Zinc Plated for exposed service, Stainless steel for buried service</td>
</tr>
</tbody>
</table>

H. Design of the valve components shall conform to the following:

1. Valve Packing: AWWA C504, Section 3.7 and C507, Section 10
2. Valve seats: AWWA C504 Paragraph 3.5 and C507 Paragraph 7.2.
4. Plug Valves shall be in full conformance with the latest revision of the AWWA C517 standard

I. Plug valves 8-inch and larger shall be provided with totally enclosed, worm gear driven, handwheel operated actuators. Handwheels shall be 16-inch diameter minimum.

J. Coating: Plug valves shall be NSF approved 2 part epoxy coated to an 8 mil minimum thickness (dry).
   1. Coatings shall conform to AWWA C550 for all interior and exterior surfaces.
   2. Contractor shall coat the exterior of valve per Section 09900 – Protective Coating Systems to match piping system color, or color per District’s approval.

K. Manufacturers/Models:
   1. Plug valves shall be GA Figure 517 Eco-Centric, or approved equal.
   2. Position Indicators shall be Trumbull Industries, or approved equal.

L. Locking Chain
   1. Provide heavy-duty chain for protecting plug valve handwheels from tampering.

2.02 Rubber Flapper Check Valves

A. The rubber flapper check valve shall be of the full body type with a domed access cover and only two moving parts, the flexible disc and the disc accelerator.
B. The seating surface shall be on a 45 degree angle to minimize disc travel.
C. Swing check valves shall be designed, manufactured, and tested in accordance with AWWA C508.
D. Valves shall be flanged in accordance with ANSI B16.1, Class 125.
E. Valves shall be full opening type, designed for a minimum working pressure of 250 psi.
F. Provide external visual valve disc position indicator.
G. Provide manual actuator to open valve to initiate backflow.
H. Materials of construction shall be as follows:

<table>
<thead>
<tr>
<th>Components</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body/Cover</td>
<td>Ductile Iron, A536 GR. 65-45-12</td>
</tr>
<tr>
<td>Disc</td>
<td>Buna – N, ASTM D2000-BG</td>
</tr>
<tr>
<td>Disc Accelerator</td>
<td>Stainless steel, Type 302</td>
</tr>
<tr>
<td>Backflow Actuator</td>
<td>Stainless steel stem and T-handle with bronze bushing</td>
</tr>
<tr>
<td>Backflow Actuator Seal</td>
<td>Buna – N</td>
</tr>
<tr>
<td>Mechanical Indicator</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Gasket</td>
<td>Compressed non-asbestos fiber</td>
</tr>
</tbody>
</table>

I. **Coating**: Valve shall be lined and coated with an ANSI/NSF 61 approved fusion bonded epoxy coating or two part epoxy, 12 mil minimum thickness (dry).

1. Coatings shall conform to AWWA C550 for all interior and exterior surfaces.
2. Contractor shall coat the exterior of valve per Section 09900 – Protective Coating Systems to match piping system color, or color per District’s approval.

J. **Manufacturers/Models**: Valmatic Surgebuster Series 7200, or equal.

### 2.03 Miscellaneous Valves and Components

A. **Valve Boxes (not used):**

1. Provide 9” inside diameter precast, traffic rated, type G5 valve boxes with bolt down cast iron covers by Christy Concrete Products, Jensen Precast, or equal
2. Valve boxes outside of street or traffic locations shall be installed with a 12-inch wide by 12-inch deep concrete collar (6 sack mix) with a #4 rebar reinforcing ring.
3. All valve box lids shall be marked for Sewer, Reclaimed Water, or Potable Water to match service.
4. All gate valves shall be centered in a one-piece riser stock with the use of a riser aligner or equal.

### 2.04 Manual Operators

A. All valves, except check valves and air/vacuum valves, shall be provided with manual operators unless otherwise specified.

1. The operator shall be either levers or handwheels opened in the counterclockwise direction, unless otherwise indicated.
2. Each valve body shall have cast thereon the word OPEN and an arrow indicating the direction to open.
3. Valves mounted higher than 6 feet above floor or operating level shall have chain operators.
4. Unless otherwise indicated, valves of sizes 8-inch and larger shall have gear-assisted operators.
2.05 Buried Valves

A. Where buried, valves shall have extensions with square nuts.

1. Extended wrench nuts shall be provided with position indicator and debris cap. Trumbull Industries, or equal.

2. Wrench nuts shall comply with Section 19 of AWWA C500.

3. A minimum of two operating keys, but no less than one key per every ten valves, shall be provided.

4. Provide valve boxes for all buried or below-grade inaccessible valves.

5. Geared buried plug valves shall have a position indicator installed at top of extension.

PART 3 - EXECUTION

3.01 Installation

A. General:

1. Valves shall be installed in accordance with the manufacturer’s instructions.

2. Valves shall be independently supported to prevent stress on pipe.

B. Access:

1. Valves shall be installed to provide easy access for operation, removal and maintenance and to prevent interferences between the valve operators and structural members or other obstructions.

3.02 Field Testing

A. Products shall be field-tested for compliance with the indicated requirements.

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. Unless otherwise specified or shown, this section includes valves and piping accessories required to make the work complete and acceptable including the following:
   1. Valve box
   2. Hose valves
   3. Quick disconnects
   4. Manual air vents
   5. Pressure gauges
   6. Service saddles

1.02 Submittals
A. Submittals shall comply with the requirements of Sections 01330 – Submittals Procedures and 11010 - General Requirements for Equipment
B. Operation and Maintenance Data: Installation, operating and maintenance data in accordance with Section 01360 - Operating and Maintenance Information

1.03 Quality Assurance:
A. Performance and Design Requirements:
   1. Equipment supplied under this specification shall be of manufacturers and model numbers listed below, or equal:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manufacturer and/or Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve boxes</td>
<td>Christy, Traffic Valve Box, No. G05TBOX, Cast Iron Bolt Down Lid, No. G05CT</td>
</tr>
<tr>
<td>Hose valves</td>
<td>Crane Co. 117, Jenkins 112 (with adapter)</td>
</tr>
<tr>
<td>Quick disconnects and Dust Cap</td>
<td>Industrial Interchange Profile (Red, ISO 6150-B, US-MIL-SPEC-C-4109)</td>
</tr>
<tr>
<td>Air</td>
<td>Swagelok, Milton Quick Charge</td>
</tr>
<tr>
<td>Water</td>
<td>Ever-Tite Part A, Gate Part A</td>
</tr>
<tr>
<td>Pressure gauge</td>
<td>Red Valve Co., Inc. of Carnegie, PA, Series 40</td>
</tr>
<tr>
<td>Service saddles</td>
<td>GPK, Multi, Romac CB Series, Fast-T Products w/ Shear Coupling; or equal</td>
</tr>
</tbody>
</table>

1.04 Standards
A. Test Pressure Gauges: Gauge accuracy shall comply with ANSI B40.1, Grade 2A.
1.05 Delivery, Storage, and Handling
A. All valves and piping shall be packed, shipped, stored and handled in accordance with manufacturer recommendations.

1.06 Project / Site Conditions
A. All items will be located in an exterior area. Temperature is expected to vary from 10 degrees F to 115 degrees F. Relative humidity is expected to vary from 20 to 100 percent.

PART 2 - PRODUCTS

2.01 Materials

<table>
<thead>
<tr>
<th>Component</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve boxes</td>
<td>Cast iron, lid and grade ring</td>
</tr>
<tr>
<td></td>
<td>Extension, reinforced concrete</td>
</tr>
<tr>
<td>Hose valves</td>
<td>Brass, composition disc</td>
</tr>
<tr>
<td>Quick disconnects</td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>To match piping system</td>
</tr>
<tr>
<td>Water</td>
<td>Ductile Iron</td>
</tr>
<tr>
<td>Pressure gauges</td>
<td>Carbon Steel or 316 Stainless</td>
</tr>
<tr>
<td></td>
<td>Fill Fluid: Ethylene Glycol &amp; Water 200° F,</td>
</tr>
<tr>
<td>Service Saddles</td>
<td>Ductile iron, epoxy coated service saddle with double strap stainless steel strap.</td>
</tr>
</tbody>
</table>

2.02 General:
A. A union or flanged connection shall be provided within 2 feet of each threaded end valve unless the valve can be otherwise easily removed from the piping.

2.03 Valve Boxes:
A. Valve boxes extending to the finished or established ground or paved surfaces shall be provided for all buried valves.
   1. Where the operating nut is in the slab, the floor box shall be bronze bushed.
   2. Where the operating nut is below the slab, the opening in the bottom of the box shall be sufficient for passage of the operating key.
   3. Where the shaft length exceed 30 inches, a 1/8 inch flat plate centering guide shall be welded to steel shaft at min 2- feet below operating nut.
B. They shall have suitable base castings to fit properly over the bonnets of their respective valves and heavy top sections with stay-put covers.
   1. Bolt downs shall be used in high traffic areas.
C. Covers shall be of the screw or sliding type having 5-1/4 inch shaft diameter or greater. All cast iron parts shall be coated by dipping a hot bituminous varnish.
2.04 Hose Valves:
A. Unless otherwise noted, hose valves shall be brass, composition disc.
B. Hose outlet
   1. Three-quarter inch valves shall have hose thread outlet
   2. 1 inch valves shall have iron pipe hose thread outlet.
C. Hose valves mounted on walls of buildings shall be provided with chrome-plated escutcheon plates.

2.05 Quick Disconnects
A. Quick disconnects shall not be disconnectable under pressure.
B. Quick disconnects for air service shall be 1/2 inch, unless otherwise noted.
C. Quick disconnects for water service shall be 1 inch size, unless otherwise specified or shown.
A. Camlock coupling shall be flanged PT Coupling 316 SST or equal.
B. Camlock coupling shall be provided with an 316 SST V-coupler cap.

2.06 Pressure Gauges
A. Pressure Sensors are to be of the full flange design, to be retained between standard ANSI B16.1 Class 125 / 6.5 Class 150 pipeline flanges.
   1. Flange bolts shall pass through sensor body and flanges.
   2. The outside diameter of the sensor shall match the outside diameter of the mating flange. Face-to face of the entire sensor shall be no longer than specifications MSS-SP67.
B. Sensor shall be flow through design with flexible elastomer sensing ring around the full circumference.
C. The elastomer sensing ring shall be rigidly clamped between metal end cover flanges, and no part of the elastomeric sensing ring shall be exposed to the external face of the sensor. There shall be no dead ends or crevices and flow passage shall make the sensor self-cleaning.
D. The pressure sensing ring shall measure pressure for 360° around the full inside circumference of the pipeline.

2.07 Service Saddles
A. The saddle shall meet all applicable AWWA C800 standards and shall be NSF 61 listed.
B. The saddle shall have an outlet for the service connection that will allow an NPT or AWWA thread to be tapped into it, in sizes from 5/8" through 4", depending on the saddle body size.
C. The saddles shall be provided with the following connections

<table>
<thead>
<tr>
<th>Size</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 1/2&quot; and smaller sizes</td>
<td>two 1½” bales with inserted straps</td>
</tr>
<tr>
<td>Above 3 ½”:</td>
<td>2 straps 1 ½” wide</td>
</tr>
</tbody>
</table>
D. The gasket shall be fully entrapped in the saddle body to hold it in place.
PART 3 - EXECUTION

3.01 General

A. The installation, protection, testing, disinfection and cleaning of all valves and piping accessories shall be in accordance with the procedures for piping as described in Section 15055 – Piping Materials and Components.

**END OF SECTION**
SECTION 15190
MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.01 Summary
A. This section includes materials and installation of mechanical systems identification.

1.02 Submittals
A. Submit manufacturer's technical product data and installation instructions for each identification material and device required in accordance with Section 01330 – Submittals Procedures.
B. Schedules:
   1. Submit valve schedule for each piping system,
      a. Typewritten and reproduced on 8-1/2- by 11-inch bond paper.
      b. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any), column indicating if mechanical device is intended for emergency shutoff and similar special uses
      c. In addition to mounted copies, furnish extra copies for maintenance manuals

1.03 Quality Assurance
   1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.
   2. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices, unless otherwise indicated.

PART 2 - PRODUCTS

2.01 Mechanical Identification Materials
A. Manufacturer's standard products of categories and types required for each application as referenced in other Division 15 sections. Where more than a single type is specified for application, provide single selection for each product category.
B. Manufacturers:

2.02 Plastic Pipe Markers
A. Plastic markers for coding pipe shall conform to ANSI A13.1 as manufactured by W. H. Brady Company, Seton Name Plate Corporation, or equal.
B. Markers shall be the mechanically-attached type that are easily removable; they shall not be the adhesive applied type.
   1. Markers shall consist of pressure sensitive legends applied to plastic backing that is strapped or otherwise mechanically attached to the pipe.
2. Legend and backing shall be resistant to petroleum based oils and grease and shall meet the criteria for humidity, solar radiation, rain, salt, fog and leakage fungus, as specified by MIL-STD-810C.

3. Plastic coding markers shall not be the individual letter type but shall be manufactured and applied in one continuous length of plastic.

C. Markers bearing the legends on background colors selected by the Owner’s Representative shall be provided in the heights required by ANSI A13.1.

D. Pipe markers shall include unidirectional and bidirectional arrows required by ANSI A13.1.

2.03 Tracer Wire

A. Tracer wire shall be #12 insulated solid strand copper wire and included for piping as indicated herein.

2.04 Warning Tape

A. Tracer tape shall be 12 inches wide and included for piping as indicated herein. Tracer tape shall be made of inert plastic material suitable for direct burial and capable of stretching to twice its original length.

B. Tracer tape shall be blue for potable water, purple for recycled water, and green for all other lines.

C. A warning message shall be printed on the tape in black letters, maximum interval of 2 feet.
   1. For Potable Water the message shall read “CAUTION: BURIED WATER PIPE BELOW.”
   2. For Sewer Line the message shall read “CAUTION: BURIED SEWER PIPE BELOW”.
   3. For all other services the message shall read "CAUTION: BURIED PIPE BELOW”.

2.05 Valve Tags

A. Brass Valve Tags:
   1. Polished brass valve tags with stamp-engraved piping system abbreviation in ¼-inch high letters and sequenced valve numbers 1/2 inch high, and with hole for fastener.
   2. 1-1/2-inch diameter tags, except as otherwise indicated.

B. Valve Tag Fasteners:
   1. Solid brass chain (wire link or beaded type), or solid brass S-hooks.

C. Access Panel Markers:
   1. Manufacturer's standard 1/16-inch thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve.
   2. Include center hole to allow attachment.

2.06 Engraved Plastic-Laminate Signs

A. Engraving stock melamine plastic laminate, Federal Specification L-P-387, in the size and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color), punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

B. Thickness:
   1. 1/16 inch for units up to 20 sq.in. or 8 inches in length; 1/8 inch for larger units.

C. Fasteners:
1. Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.07 Plastic Equipment Markers
A. Manufacturer's standard laminated plastic, color-coded equipment markers. Conform to the following color code:
   1. Green: Cooling equipment and components.
   2. Yellow: Heating equipment and components.
B. Nomenclature:
   1. Match terminology used on drawing schedules as closely as possible.
C. Size:
   1. Provide approximate 2-1/2- by 4-inch markers for control devices, dampers, and valves; and
   2. 4-1/2- by 6-inch markers for equipment.

2.08 Lettering and Graphics
A. Coordinate names, abbreviations and other designations used in mechanical identification work with corresponding designations shown, specified or scheduled.
B. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.
C. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples: Chiller No. 3, Air Handling Unit No. 42, Standpipe F12, and the like).

PART 3 - EXECUTION

3.01 Installation
A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.02 Piping System Identification
A. Install pipe markers as specified in Section 15055 – Piping Materials and Components.

3.03 Valve Identification
A. General: Provide valve tag on every valve, cock and control device in each piping system. Exclude check valves, valves within factory fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibbs, shutoff valves at plumbing fixtures, and similar rough-in connections of end use fixtures. List each tagged valve in valve schedule for each piping system.
B. Install mounted valve schedule in each mechanical room.
3.04 Mechanical Equipment Identification

A. General: Install engraved plastic laminate sign or plastic equipment marker on or near each item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices: Pumps, compressors, chillers, cooling towers and similar motor driven units, electric duct heaters, terminal units, coils, fans, water heaters, blowers, unitary HVAC equipment, tanks and pressure vessels, filters, water treatment systems and similar equipment.

3.05 Adjusting and Cleaning

A. Adjusting: Relocate any mechanical identification device which has become visually blocked.
B. Cleaning: Clean face of identification devices, and glass frames of valve charts

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. The Contractor shall provide the following electrical power system studies for the project job:
   1. Short Circuit study
   2. Protective device coordination study
   3. Arc Flash Hazard Analysis
B. The Contractor shall be responsible for ensuring that all parties involved in the studies have the necessary information and data to carry out the studies. The Contractor shall obtain and distribute the information and data from the Utility, the District and the manufacturers of the equipment and materials.
C. The Protective Device Coordination Study must be submitted and approved prior to final acceptance of the electrical system
D. The Contractor shall be responsible for supplying the information and data in a timely manner to allow the short-circuit analysis to be completed prior to final installation.
E. If during the studies, the Contractor finds any inadequacies in the equipment or protective devices, he shall make recommendations for improvements as soon as they are identified.
   1. All electrical cabinets and disconnects must be rated Arc Flash Hazard Risk Category 2 or less.
      a. Any locations noted as greater than Arc Flash Hazard Risk Category 2 shall be immediately brought to Engineer's attention. Provide recommendations for improvements.

1.02 References
A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications:

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEE 141</td>
<td>Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems</td>
</tr>
<tr>
<td>IEEE 241</td>
<td>Recommended Practice for Electric Power systems in Commercial Buildings</td>
</tr>
<tr>
<td>IEEE 242</td>
<td>Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems</td>
</tr>
<tr>
<td>IEEE 399</td>
<td>Recommended Practice for Industrial and Commercial Power System Analysis</td>
</tr>
<tr>
<td>IEEE 1015</td>
<td>Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems</td>
</tr>
</tbody>
</table>


1.03 Definitions

1.04 System Description
A. The scope of the studies shall include all new distribution and control equipment supplied by the Contractor and the Contractor.

1.05 Submittals
A. Submit a draft of the final report for review by the Engineer. The report shall include the following as further described in Part 3.
   1. Summary of the results of the short circuit and the protective device evaluation and coordination studies
   2. Description, purpose, basis and scope of the study
   3. Single line diagram generated by the selected computer program with node identification
   4. Tabulations of electrical capacities and characteristics of the equipment and protective devices
   5. Table comparing the calculated short circuit and the equipment ratings
   6. Coordination curves showing the proposed settings with the characteristics of the equipment and protective devices shown graphically on industry standard graph paper

B. Submit a draft of the final report for review by the Engineer. The report shall include the following as further described in Part 3.
   1. Engineer Comments from the preliminary submittal shall be incorporated in the following documents.
      a. Summary of the results of the short circuit and the protective device evaluation and coordination studies
      b. Description, purpose, basis and scope of the study
c. Single line diagram generated by the selected computer program with node identification
d. Tabulations of electrical capacities and characteristics of the equipment and protective devices
e. Table comparing the calculated short circuit and the equipment ratings
f. Coordination curves showing the proposed settings with the characteristics of the equipment and protective devices shown graphically on industry standard graph paper

2. Arc Flash Hazard Analysis to include computed incident energy levels and flash protection boundary distances.

C. Submit study within 30 days after acceptable shop drawings have been returned for devices listed in paragraph 16011.3.02, D.1.

D. The final version of the Arc Flash Hazard Study and Arc Flash Warning Labels shall be submitted at least 30 days prior to energizing the electrical equipment.

E. Provide three (3) copies of the final power system studies and one (1) set of warning labels

1.06 Quality Assurance

A. The Contractor shall have the study prepared by qualified engineers of an independent engineering firm or equipment manufacturer. The consultant shall be a California Registered Professional Electrical Engineer who has at least five (5) years of experience and specializes in performing power system studies.

B. The independent engineering firm or the equipment manufacturer shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual arc flash analysis it has performed in the last two years.

C. The studies shall be performed using computer software from a single software company, SKM PowerTools for Window or approved equal

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 Preparation

A. The Contractor to furnish short-circuit and protective device coordination studies as prepared by an approved engineering firm or equipment manufacturer.

B. The Contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E- Standard for Electrical Safety in the Workplace, reference Article 130.3, and Annex D

3.02 Installation

A. Data Collection

1. Contractor shall furnish all data as required by the power system studies. The Engineer performing the short-circuit calculations, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the
data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.

2. Source combination may include present and future motors and generators.

3. Load data utilized may include existing and proposed loads obtained from Contract Documents, provided by the District, or The Contractor.

4. If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

B. Short-Circuit Analysis


2. Transformer design impedances shall be used when test impedances are not available.

3. Calculation of the maximum rms symmetrical three-phase short-circuit current at each significant location in the electrical system shall be made using a commercially available computer program.

4. Appropriate motor short-circuit contribution shall be included at the appropriate locations in the system so that the computer calculated values represent the highest short-circuit current the equipment will be subjected to under fault conditions.

5. A tabular computer printout shall be included which lists the calculated short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings, and notes regarding the adequacy or inadequacy of the equipment.

6. The study shall include a computer printout of input circuit data including conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.

7. The system one-line diagram shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis.

8. The computer printout shall identify the maximum available short-circuit current in rms symmetrical amperes and the X/R ratio of the fault current for each bus/branch calculation.

9. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.

   a. Evaluate equipment and protective devices and compare to short circuit ratings.

   b. Adequacy of switchgear, motor control centers and panelboard bus bars to withstand short-circuit stresses.

   c. Notify Engineer in writing, of existing, circuit protective devices improperly rated for the calculated available fault current.

C. Protective Device Time-Current Coordination Analysis

1. Perform a protective device coordination study to select fuse ratings, ratios and characteristics of associated voltage and current transformers, breaker trip characteristics and settings. Include all voltage classes of equipment from the utilities incoming line.
protective device down to and including all Main Switchboard feeder breakers, main breakers for all motor control centers, main breakers for all control panels, and, at each motor control center provide the motor circuit breaker for each motor size that is greater than 20 HP. Include a description, purpose, basis, and scope of the study and a single line diagram of the portion of the power system which is included within the study. Note inadequacies found during the study.

2. The time-current coordination analysis shall be performed with the aid of a commercially available computer program. It shall include the determination of settings, ratings, or types for the protective devices supplied. It shall also include any proposed adjustments to existing protective devices to which the supplied devices must coordinate.

3. Where necessary, an appropriate compromise shall be made between system protection and service continuity with system protection and service continuity considered to be of equal importance.

4. A sufficient number of computer generated log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.

5. Provide time-current curves graphically indicating the coordination proposed for the system, centered on conventional, full size log-log forms. Include with each curve sheet a complete title and one line diagram with legend identifying the specific portion of the system covered by that particular curve sheet. Include a detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Include the following on the curve sheets:
   a. Power Company relay and fuse characteristics
   b. Low-voltage equipment circuit breaker trip device characteristics
   c. Low-voltage fuse characteristics
   d. Pertinent transformer characteristics
   e. Pertinent motor and generator characteristics
   f. Characteristics of other system load protective devices
   g. Show transformer full load and 150%, 400%, or 600% currents, transformer magnetizing inrush, ANSI transformer withstand parameters, and symmetrical and asymmetrical fault currents at each switchgear and panelboard
   h. Motor overload characteristics
   i. Conductor damage curves

6. Include with the report the manufacturer’s time-current curves for all protective devices.

7. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, the short-circuit current availability at the device location when known, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.

8. The study shall include a separate, tabular computer printout containing the suggested device settings of all overcurrent protective devices, the equipment where the device is located, and the device number corresponding to the device on the system one-line diagram.
9. A computer generated system one-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.

10. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for increasing system protection or device coordination.

11. Significant deficiencies in protection and/or coordination shall be called to the attention of the engineer and recommendations made for improvements as soon as they are identified. Report shall also include suggestions to:
   a. Improve coordination between upstream and downstream devices
   b. Reduce fault current clearing times of upstream devices
   c. Identify equipment protection boundary and inrush current conflicts

D. Arc Flash Hazard Analysis

1. Per NEC 110.16, perform an arc-flash analysis according to IEEE Standard 1584, “IEEE Guide for Performing Arc Flash Hazard Calculations,” based upon results from the short circuit current analysis and optimized overcurrent protective device settings provided in the overcurrent protective device coordination study. Determine the following:
   a. Flash Hazard Protection Boundary
   b. Limited Approach Boundary
   c. Restricted Boundary
   d. Prohibited Boundary
   e. Incident Energy Level
   f. Required Personal Protective Equipment Class
   g. Type of Fire Rated Clothing

2. The arc flash hazard study shall include the electrical distribution system equipment shown on the single line diagrams of the contract documents. The arc flash hazard study shall be used in conjunction with the approved short circuit and protective device coordination studies. The results of the power system studies shall be present in a report format that includes the following sections:
   a. Introduction, executive summary and recommendations, assumptions, reduced copy of the single line diagram
   b. Arc Flash Evaluations Summary Spreadsheet
   c. Bus Details Sheets
   d. Arc Flash Warning Labels printed in color on adhesive backed labels

3. A detailed arc-flash hazard analysis report with computed incident energy levels (Calories per square inches) and flash protection boundary distances at equipment indicated above to insure adequate protection and safety of personnel working in the vicinity of electrical equipment.

4. Arc Flash Hazard warning stickers, sized a minimum of 3.5" x 5" with the seven items listed in paragraph A above shall be located so as to be clearly visible to qualified persons on the existing and new electrical equipment including switchboards, motor control
centers, power distribution panels, and panelboards. The labels shall include the bus name; upstream Protective Device Name, Type and Settings; bus line to line voltage and printed in color on adhesive backed Avery Labels.

a. For each 600, 480, 240, and applicable 208 volt panelboard, one arc flash label shall be provided

b. For each low voltage switchboard section, one arc flash label shall be provided

c. For each separate electrical equipment, one flash label shall be provided

3.03 Material and Equipment Schedules

A. General: Analyze the short circuit, protective device coordination, and arc flash calculations and highlight any equipment that is determined to be underrated or causes an abnormally high incident energy calculation. Propose approaches to reduce the energy levels. Proposed major corrective modification will be taken under advisement by the Engineer, and the Contractor will be given further instructions.

B. Adjust relay and protective device settings according to the recommended settings table provided by the coordination study.

C. Make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

D. Notify Engineer in writing of any required major equipment modifications.

E. Arc Flash Training: The Contractor of the Arc Flash Hazard Analysis shall train the District’s qualified electrical personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET) or equivalent.

**END OF SECTION**
SECTION 16020
ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.01 Summary

A. This Section includes the provisions for all material, labor, tools, equipment, testing and services necessary to provide a complete and operable electrical system.

B. Examine the specification and drawings for process and mechanical equipment and provide and install all conduit, wire, and cable and make connections required to place all new equipment in complete operation.

C. Following installation, protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation. When equipment intended for indoor installation is installed at the Contactor's convenience in areas where it is subject to dampness, moisture, dirt, or other adverse atmosphere until completion of construction; ensure that adequate protection from these atmospheres is provided that is acceptable to the District. Cap conduit runs during construction.

D. Interpretation of Drawings:

1. The Contactor shall inspect the site and verify all measurements and conditions and shall be responsible for the correctness of same. No extra compensation will be allowed because of differences between work shown on the drawings and measurements at the site.

2. The Contactor shall examine the architectural, structural, mechanical and manufacturer's drawings for the various equipment in order to determine exact routing and final terminations for all conduits and cables. Conduits shall be installed as near as possible to equipment enclosure.

3. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The District reserves the right to require minor changes in location of outlets or equipment, prior to installation, without incurring any additional costs or charges.

4. Existing Conditions:

a. The electrical drawings were developed from past record drawings and information supplied by the District.

b. Carry out any work involving the shutdown of existing services to any piece of equipment now functioning or the tie-in of equipment to the existing system at such time as to provide the least amount of inconvenience to the District. Provide such work when directed by the District.

c. Prior to staring any work the Contactor shall obtain all the information of the underground utilities or obstructions from the District and take proper precautions to locate the utilities.
1.02 REFERENCES

A. Electrical work, including connection to electrical equipment integral with mechanical equipment described elsewhere in these specifications, shall be performed in accordance with the latest published regulations of the following codes and standards:

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
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<tbody>
<tr>
<td>Federal Standards</td>
<td></td>
</tr>
<tr>
<td>State Codes and Ordinances and Inspecting Authorities</td>
<td></td>
</tr>
<tr>
<td>Local Codes and Ordinances and Inspecting Authorities</td>
<td></td>
</tr>
<tr>
<td>The National Board of Fire Underwriters</td>
<td></td>
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<tr>
<td>NFPA</td>
<td>National Fire Protection Association</td>
</tr>
<tr>
<td>UL</td>
<td>Underwriters Laboratories</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Electrical Manufacturers’ Association</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronic Engineers</td>
</tr>
<tr>
<td>IPCEA</td>
<td>Insulated Power Cable Engineers Association</td>
</tr>
<tr>
<td>OSHA</td>
<td>State Department of Industrial Safety</td>
</tr>
<tr>
<td></td>
<td>State Public Utilities Commission</td>
</tr>
<tr>
<td>NEC</td>
<td>National Electrical Code (NEC) for all items not specifically covered the state and local ordinance.</td>
</tr>
<tr>
<td>NFPA 79</td>
<td>Electrical Standard for Industrial Machinery</td>
</tr>
</tbody>
</table>

B. Nothing in these special provisions or on the drawings shall be interpreted as permission or direction to violate any governing code or ordinance.

C. Materials and equipment used in the performance of the electrical construction shall be fully UL approved for the class of service for which they are intended prior to submittal of shop drawings.

D. Without limiting the generality of other requirements of these specifications, all work specified herein shall conform to or exceed the applicable requirements of the National Electric Code (NEC). Where a local code or ordinance is in conflict with the NEC, the provisions of said local code ordinance shall take precedence.

E. The construction and installation of all electrical equipment and materials shall comply with all applicable provisions of the Cal OSHA Safety orders (Title 8, CCR), State Building Standards, and applicable local codes and regulations

   a. Conformance with space allocations and requirements for operations from mechanical or electrical services provided without necessitating changes in details and construction or related work.

1.03 Submittals

A. Materials and Equipment Schedules: The Contractor shall deliver to the District a complete list of all materials, equipment, apparatus, and fixtures which it proposes to use. The list shall
include sizes, names of manufacturers, catalog numbers, and such other information required to identify the items.

B. The submittal package for each individual equipment or groups of related equipment shall be complete and in accordance with this Section. The purpose of this provision is to ensure compatibility of all components specified under the specific technical specification and to provide sole source responsibility for system performance and maintenance. Notwithstanding these provisions, however, the Contactor is not relieved of its responsibility for the indicated portions of the work. The following, as a minimum, shall be submitted:

1. Manufacturer and manufacturer's type and designation
2. Manufacturer's catalog data indicating rated capacity, efficiency, rated output and other characteristics
3. Any exception to these specifications along with justification for each exception shall be clearly stated on the first page of the submittal
4. Shop drawings
5. Parts list with material of construction
6. Installation requirements, showing various clearances required
7. Details of all appurtenances to be furnished with the specified item

C. Shop drawings are required for materials and equipment listed in this and other sections. Shop drawings shall provide sufficient information to evaluate the suitability of the proposed material or equipment for the intended use, and for compliance with these Specifications. The following shall be included:

1. Front, side, and rear elevations, footprints and top views, with dimensions
2. Location and size of conduit entrances and access plates
3. Component data
4. Connection diagrams, terminal diagrams, schematic wiring diagrams, conductor size, and type, etc.
5. Method of anchoring and embedded structural members; weight
6. Finish
7. Nameplates
8. Temperature limitations, as applicable
9. Rating of equipment as per specifications and drawings
10. NEMA rating of enclosures
11. Approved listing

D. Catalog data shall be submitted to supplement all shop drawings. Catalog cuts, bulletins, brochures, or the like or photocopies of applicable pages thereof shall be submitted for mass produced, non-custom manufactured material. These catalog data sheets shall be stamped to indicate the project name, applicable Specification section and paragraph, model number, and options. This information shall be marked in spaces designated for such data in the stamp.
E. Record Drawings: In addition to the Record Drawings as a part of the record drawing requirements specified in the General Requirements, the Contractor shall show depths and routing of all concealed below-grade electrical installations. Said set of record drawings shall be available to the District and the Inspector during construction. After final inspection, the Contractor shall transfer all record drawing information to a set of reproducible vellums which shall then be delivered to the District. In addition, the Record Drawings shall show all variations between the work as actually constructed and as originally shown on the Drawings, based upon information supplied by the Contractor.

F. Manufacturer's Drawings: One set of equipment manufacturer's drawings shall be submitted to the District for its records.

G. The Contractor shall obtain and submit from the manufacturer a list of suggested spare parts for each piece of equipment according to the provisions of spare parts of the General Requirements. After approval, Contractor shall furnish such spare parts suitably packaged, identified with the equipment number, and labeled. Contractor shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment. All spare parts are intended for use by the District, only. Any spare parts which the District permits the Contractor to use for startup activities shall be replaced by the Contractor prior to the District's acceptance of beneficial use of the equipment.

1. During the term of this Contract, the Contractor shall notify the District in writing about any manufacturer's modification of the approved spare parts, such as part number, interchangeability, model change or others. If the District determines that the modified parts are no longer applicable to the supplied equipment, the Contractor at its expense shall provide applicable spare parts.

1.04 Quality Assurance

A. Performance and Design Requirements

1. Arrangement: The drawings are generally diagrammatic and the location of outlets and equipment terminals are approximate unless detailed or dimensioned. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences and the location of electrical terminations on equipment.

2. The Contractor shall examine the structural and mechanical plans and shop drawings for the various equipment to determine exact routing and final terminations for all raceways and cables. Conduits shall be stubbed up as near as possible to equipment terminals and shall be within the concrete base for the equipment or a separate concrete curb.

3. All conduit and equipment shall be installed in such a manner as to avoid all obstructions and to preserve head room and keep openings and passageways clear. Lighting fixtures, switches, convenience outlets, and similar items shall be located within finished rooms, as shown. Where the Drawings do not indicate exact locations, the Contractor shall submit proposed locations to the District for review. Where equipment is installed without instruction and must be moved, it shall be moved without additional cost to the District.

4. All work, including installation, connection, calibration, testing, and adjustment, shall be accomplished by qualified, experienced personnel working under continuous, competent supervision. The completed installation shall display competent work, reflecting adherence to prevailing industrial standards and methods.

5. Protection of Equipment and Materials: The Contractor shall provide adequate means for and shall fully protect all finished parts of the materials and equipment against damage.
from any cause during the progress of the work and until acceptable by the District and the Inspector.

6. All materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. All moving parts shall be kept clean and dry.

7. The Contactor shall replace or have refinished by the manufacturer, all damaged materials or equipment, including face plates of panels and switchboard sections, at no expense to the District.

8. Tests: The Contactor shall make all tests required by the District or the Inspector or other authorities having jurisdictions as per applicable standards. All such tests shall be performed in the presence of the District or the Inspector. The Contactor shall furnish all necessary testing equipment and pay all costs of tests, including all replacement parts and labor necessary due to damage resulting from damaged equipment or from test and correction of faulty installation.

9. Standard test reports for mass-produced equipment shall be submitted along with the shop drawing for such equipment. Test reports on testing specifically required for individual pieces of equipment shall be submitted to the District and the Inspector for review prior to final acceptance of the project.

10. Any test failure shall be corrected in a manner satisfactory to the District and Inspector.

11. The Contactor shall furnish without extra charge any additional material and labor which may be required for compliance with these laws, rules, and regulations, even though the work is not mentioned in these particular specifications or shown on the drawings.

B. Operating Requirements:

1. Contactor's Record Drawings: The Contactor shall maintain a neatly marked set of record drawings showing the installed location and routing of conduits, trays, cables, junction boxes, pull boxes, outlets, and interconnection circuits, etc., and the current status of control circuits as reflected on the control diagrams to the satisfaction of the District.

2. Inspection: The Contactor shall cooperate with the District and shall provide assistance at all times for the inspection of the electrical work performed under this contract. The Contactor shall remove covers, operate machinery, or perform any reasonable work which, in the opinion of the District, is necessary to determine the quality and adequacy of the work.

C. Quality of Materials

1. All electrical materials used on this project shall be new and free from defects.

2. All electrical materials used on this project shall conform where applicable, to the following standards, unless otherwise noted:
   a. NEMA - National Electrical Manufacturers Association
   b. ANSI - American National Standards Institute
   c. UL - Underwriters Laboratories, Inc

3. Each type of material shall be of the same manufacturer and quality throughout the work.
1.05 Delivery, Storage, and Handling

A. Throughout this Contract, provide protection for materials and equipment against loss or damage in accordance with provisions elsewhere in these Contract Documents. Throughout this Contract, follow manufacturer's recommendations for storage. Protect everything from the effects of weather. Prior to installation, store items in clean, dry, indoor locations. Store items in clean, dry, indoor, heated locations items subject to corrosion under damp conditions, and items containing electrical insulation, such as transformers, conductors, motors, and controls. Energize all space heaters furnished with equipment. Provide temporary heating, sufficient to prevent condensation, in transformers, switchgear, switchboards, motors, and motor control centers which do not bare space heaters.

B. Shipment: The equipment furnished under this Contract shall be shipped in sealed, weather-tight, enclosed conveyances in a manner designed to protect the equipment against damaging stresses during transport.

C. Inspection

1. The Contactor shall cooperate with the District and shall provide assistance at all times for the inspection of the electrical work. Remove covers, operate machinery, or perform any reasonable work which, in the opinion of the District, will be necessary to determine the quality or adequacy of the work.

2. If any material does not conform to these specifications, the Contactor shall, within three days after being notified by the District, remove the materials from the premises.

3. Work shall not be closed in or covered before inspection and approval by the District. Cost of uncovering and making repairs where un-inspected work has been closed in shall be borne by the Contactor.

D. Supervision and Workmanship

1. The Contactor shall employ a competent electrical foreman on the job throughout the entire period of construction to see that his work is carried on without delay and completed as rapidly as possible.

E. Cleanup

1. All parts of the materials and equipment shall be thoroughly cleaned. Exposed parts shall be thoroughly cleaned of cement, plaster, and other materials. All oil and grease spots shall be removed with a non-flammable cleaning solvent. Such surfaces shall be carefully wiped and all cracks and corners scraped out.

2. During the progress of the work, the Contactor shall clean the premises and shall leave the premises and all portions of the site free of debris

1.06 Project / Site Conditions

A. General: For purposes of delineating electrical enclosure and electrical installation requirements of this project, the control panels for the chemicals shown on the Drawings shall be protected against corrosion and hazards associated with these chemicals. All conduits and electrical installation shall be protected against corrosion and conform to the referenced code requirements.

B. Seismic Consideration

1. All structures and installation shall be in accordance with the requirements of UBC and/or SEAC for the project site.
2. Each piece of equipment installed shall be anchored as required in the UBC for Seismic Zone category for the project site. No equipment shall be anchored to vertical structural elements without written approval of the District.

3. Vibration isolated equipment shall be provided with snubbers capable of retaining the equipment in its designated location without any material failure or deformation of the snubbers when exposed to a vertical or horizontal force at the contact surface equal to 100 percent of the operating weight of the equipment. Air gaps between retainer and equipment base shall not exceed 1/4 inch.

4. All raceways, ductwork, accessories, and appurtenances, furnished with equipment shall be anchored to resist a lateral seismic force specified for the project site without excessive deflection. This force shall be considered acting at the center of gravity of the piece under consideration.

5. Calculations and shop drawings shall be submitted for all anchorage details. All calculations shall be made and signed by a registered engineer in California.

C. Unclassified Field Locations

1. Field equipment located in interior areas which have not been classified as hazardous locations as defined by the National Electrical Code, Article 500, may be subjected to ambient temperatures varying from 10 degrees F and 115 degrees F and relative humidity ranging from 10 to 90 percent. Incidental quantities of hydrogen sulfide gas and dust also may be present.

2. In exterior areas, ambient temperatures may vary from 10 degrees F and 115 degrees F with strong direct radiation from the sun. Relative humidity in all exterior field areas will vary from 10 to 100 percent with condensation and icing occurring. All areas may have trace quantities of hydrogen sulfide gas with windblown dust, sand, hail, and rain occurring.

3. In exterior locations, exposed conduits shall be PVC coated Rigid Steel. Fittings shall have gasketed covers. Provisions shall be made to drain the fitting or conduit system. Threaded fastening hardware shall be stainless steel. Mounting brackets shall be galvanized steel. Attachments or welded assemblies shall be galvanized after fabrication. Where shown on the plans in outdoor locations, Instruments and control cabinets, and panels shall be "Weatherproof NEMA 3R." Enclosures shall be mounted 1/4-inch from walls to provide an air space, unless specifically shown otherwise.

D. Damp Location: Locations which are indoors and 2 feet below grade elevation or which are classified as damp locations on the Drawings shall have electrical installations which conform to the requirements for outdoor locations; except, that the air space from walls may be less than 1/4-inch and enclosures shall be stainless steel NEMA 4X. "Damp locations" shall include pipe galleries, tunnels, and basements. All rooms housing liquid handling equipment are also classified as damp locations regardless of grade elevation.

E. Splash Locations: Areas shown as splash-proof shall have electrical installations as described for "outdoor locations"; except, that NEMA 4X enclosures shall be provided for instruments and controls, panels, switchboards, and motor control centers.

F. Classified Field Locations

1. Field equipment located in hazardous areas shall comply with the National Electrical Code, Article 500.
2. Hazardous Locations: Areas shown as hazardous shall have electrical installations suitable for Class 1, Division 1, Group C and D locations as required under Cal/OSHA Safety orders (Title 8, CCR). Enclosures shall be NEMA type 7.

G. Corrosive Locations
1. Field equipment located in areas subject to dry chemical, liquid chemical spills, and corrosive fumes shall utilize materials and equipment specifically for corrosive areas.
2. Corrosive locations shall have stainless steel threaded hardware; all other electrical hardware, fittings, and raceway systems shall be PVC-coated. Enclosures shall be of fiberglass reinforced polyester or 316 stainless steel and meet NEMA 4X requirements.

1.07 Maintenance
A. Information to be provided:
1. The Contactor shall also provide the following additional information for each item of equipment in the operation and maintenance manuals:
   a. Wiring and interconnection diagrams which show terminal blocks of all distribution and control assemblies; all power, control and signal raceways; junction and pull boxes; all devices; and all interconnecting wiring. Diagrams shall show conductor tag numbers, control wire color code as applicable and power wire and cable sizes.
   b. The outgoing power and control wires shall be run as single lines representing the raceways and shall show any junction boxes or ancillary control devices that may be located in the raceway system or tapped off the raceway along the route. All raceways shall be appropriately identified showing the proposed tag inscription. Wires are to be fanned out and labeled at each point showing the terminal number of the wire and typical wire tags. For factory wired equipment, both the factory terminal numbers as well as the terminal numbers shown on the contract control diagrams shall be shown. If additional space is required, more than one sheet may be used for the connection diagram.
   c. Operation and maintenance data
   d. Maintenance manuals
   e. Installation certificates

PART 2 - PRODUCTS

2.01 Equipment and Materials
A. All material and equipment shall be new, free from defects, of current manufacture, and of the quality specified or shown, and shall be listed by the Underwriters Laboratories Inc. (UL) for the purpose for which it is to be used where such listing has been applied by UL to similar products. Each type of material shall be of the same manufacture and quality throughout the work.

B. Where more than one unit of the same class of material or equipment are required, provide products of a single manufacture. Component parts of materials or equipment of the same manufacturer are preferred.

C. All electrical equipment shall be approved by a testing laboratory recognized by the District and shall conform to all applicable requirements of the latest edition of the California Building Code.
Code. In lieu of such approval, the Contactor must submit the equipment for approval to the independent NETA certified electrical testing laboratory. This shall include the plant preferred list of equipment and components specified in the plans and specifications. The Contactor shall also include in his delivery schedule the approval time required by the independent NETA certified electrical testing laboratory for equipment without UL listing.

D. Unless otherwise indicated, provide materials and equipment which are the standard products of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturers’ latest standard design that conforms to these Specifications.

E. Equipment Finish: Provide materials and equipment with manufacturers’ standard finish system, in accordance with Division 9 Finishes. Provide manufacturers’ standard finish color, except where specific color is required by the District. If manufacturer has no standard color, finish equipment in accordance with Division 9 Finishes with ANSI No. 61, light gray color.

2.02 Control Panel Fabrication

A. Control panel enclosure shall be Saginaw Control & Engineering, SCE-72EL3024FSDA. The general fabrication requirements for the control panel shall be as specified herein.

B. Interconnecting wiring and wiring to terminals for external connection shall be MTW or SIS 16 AWG, stranded copper wire, insulated for not less than 600 volts, with a moisture-resistant and flame-retardant covering rated for not less than 90 degrees Celsius except for electronic circuits and special instrument interconnect wiring which shall be in accordance with Manufacturer requirements.

C. Panel Wiring Size:
   1. Power distribution wiring on line side of panel fuses minimum 12 AWG.
   2. Secondary Power Distribution Wiring and Wiring for Control Circuits: Minimum number 14 AWG.
   3. Annunciator and Indicating Light Circuits: Minimum 16 AWG.
   4. Electronic Analog Circuits within Instrument and Control Panels: Minimum 16 AWG twisted and shielded pairs or triads rated not less than 600 volts.

D. Low voltage DC (including, but not limited to Analog Circuits) and 120 VAC control and power circuits shall be separated as much as possible. In areas where this separation is not possible, wires should be routed in such a manner as to minimize induced voltage between circuits, i.e., circuits should not be routed parallel to each other, but should cross periodically.

E. Motor and Equipment controls containing 480 VAC components, motor starters, circuit breakers, fuses, etc. shall be physically separated from 120 VAC and low voltage DC circuits.

F. Internal Panel Wiring Colors as indicated in the drawings.

G. Surge Protection Device for Power Entrances: Nominal 120 volts AC with a nominal clamping voltage of 200 volts; non-faulting and non-interrupting design with a response time of not more than 5 nanoseconds.

H. Terminal Blocks for External Connections: Suitable for specified AWG wire, rated 30 amperes at not less than 600 volts; with marking strip, covers, pressure connectors, and labeled terminals, each conductor of external circuits plus one ground terminal for each shielded cable. Provide minimum 25 percent spare terminals. All control terminal blocks shall be of the spring cage-clamp style.
I. Group cables, and firmly support wiring to the panel. Provide minimum 8 inches clearance between terminal strips and the base of vertical panels for conduit and wiring space. Individually fuse each control loop or system, and clearly label and locate fuses or circuit breakers for maintenance.

J. Furnish and install equipment grounding conductor in accordance with NEC 250. Provide power ground lugs. Provide signal insulated and isolated ground lugs.

K. Nameplates on Internal and External Instruments and Devices: Materials approximate dimensions with legends as indicated on the Drawings made of laminated phenolic material having engraved letters approximately 3/16 inch high extending through the black face into the white layer; firmly secured to panels.

L. Fabricated Custom Panels: Thoroughly clean, sand, and apply minimum two coats of rust inhibiting primer both inside and out of panels. Apply minimum two coats of white enamel or lacquer on panel interior surfaces. Smooth exterior surfaces and apply minimum two coats of enamel, polyurethane, or lacquer finish. Furnish two quarts of finish color paint with the panels to cover future scratches.

M. Provide panels with an inside pocket to hold the panel drawings. Ship panels with one copy of accepted submittal drawings in a sealed plastic bag stored in the panel drawing pocket.

N. Panel Custom Fabrication: Dust tight, completely enclosed cubicle formed from steel structural members and steel plates. Form base of heavy channel iron, with flanges up, and with 1/2 inch holes drilled at 12 inch spacing so that the panel shall be bolted to floor. Grind smooth welds, seams, and edges on exposed surfaces. Provide lifting facilities for handling and shipment.

O. Panel Bracing: Suitably brace panel structure for sufficient strength to support equipment mounted on or within, to withstand handling and shipment, to maintain alignment, to be rigid and freestanding and resist seismic forces.

P. Fabricate tops, sides and rear from minimum 12 steel plates with stationary rear suitable for back-to-wall installation. Panels requiring rear access shall be designed with hinged rear doors. Rear doors shall be fabricated from US 14 gauge steel.

Q. Front Doors: US 12 gauge steel plate, with turned-back edges suitably braced and supported to maintain alignment and rigidity without sagging; of sufficient width to permit door opening without interference with rear projection of flush mounted instruments; essentially full height, with strong continuous piano type hinges.

R. Positive Latches: Acting from a common door handle which shall hold doors securely compressed at top, side, and bottom against gaskets.

S. Doors shall have padlock locking provisions

T. Top and bottom with nominal 1 square foot per section removable access plates which shall be drilled to accommodate external wiring and conduit. Arrange panel internal components for external conduit and piping to enter into panel either from above or below.

U. Arrange panel instruments and control devices in a logical configuration from an operator’s standpoint and as indicated on the Drawings. Center line of recorders shall fall within 36 inches and 69 inches above base of panel for convenient reading and chart replacement.

V. Locate control switches within 60 inches and 36 inches above the base of the panel. Local indicators within 36 inches and 60 inches above the base of the panels. Mount annunciators and clocks near the top of the panels.
W. Panels or panel sections shall be capable of passing through 36 inch doorways less stops.

X. Provide internal ceiling-mounted covered or guarded 1-lamp, 40 watt LED fixture spaced at approximately 30 inches and located toward the rear for illumination of panel interiors with On-Off switches near end doors.

Y. Provide duplex, grounded GFI receptacles for service and maintenance tools within the panel at spacing not greater than 5 feet throughout the length of a panel. Provide lighting and receptacle circuit from a separate power source and fuse separately from the instrumentation systems.

Z. Provide folding shelf and document holder within the panel door.

AA. Corrosion Protection

1. Unless otherwise noted, all equipment and appurtenances provided under this section shall be treated with zinc phosphate, bonderized or otherwise given a rust-preventive treatment, then primed and painted with a durable enamel finish. Minimum dry film thickness shall be 3 mils. The Contractor shall ensure that all panels or enclosures specified to be painted in this section shall match in color Plymouth Rock Gray on all exterior surfaces and flat white on all interior surfaces. Nonconforming panels shall be repainted.

2. Field painting of all equipment shall conform to the procedure or outline in applicable sections of the specifications that specify painting and finishing.

3. Galvanizing, where specified, shall conform to the applicable division of the specifications. Galvanized equipment and appurtenances shall not be shop primed or painted but shall be field painted and touched up as specified and directed by the Owner’s Representative.

BB. Special Tools: The Contractor shall provide all special tools required for operation and maintenance of the equipment. The tools shall be considered as part of the product and become the property of the Owner.

CC. Uninterruptable Power Supply

1. The UPS shall be APC Smart-UPS SMT1500 with UPS Network Management Card AP9613 and Dry Contact I/O Accessory AP9810 or equal.

2. Secure the UPS to withstand seismic forces.

3. Mount UPS such that the UPS’s HMI faces the enclosure door for easy access by the operators.

4. Hard-wire the UPS output to the Control Panel. Do not connect the UPS to the Control Panel by the plug provided by the UPS.

DD. Panel Lighting and Power

1. Receptacles - As specified herein, unless otherwise shown on the Contract Drawings:
   a. Panels less than 4 FT long:
      1) One electrical outlet
      2) One fluorescent light fixture with door activated switch and separate circuit breakers
   b. Panels or panel faces greater than 4 FT long:
      1) One electrical outlet per 6 FT of length
2) Continuous fluorescent lighting strip with door activated switches and separate circuit breakers

EE. Environmental Controls

1. Where heating from control devices results in a temperature rise which is detrimental to the contained equipment or its operation, provide louvers or forced air ventilation with air filters. When forced air ventilation is required, the cabinets shall be pressurized. Air filters shall be of commercially available types and sizes.

2. Over-temperature switches shall be utilized to provide cooling if required to maintain operating temperatures within the manufacturer's specified range. Saginaw Control & Engineering, SCE-TEMNC/SCE-TEMNO.

3. Air conditioning applications shall include means of preventing moisture condensation.

4. For panels or control cabinets located outside, or in area classification requiring a NEMA 4 or 4X rating:
   a. Provide printed circuit boards with "Humiseal" conformal coating, covering entire components on both side of board except not covering adjustable components.
   b. Furnish gold plated edge connectors on circuit board and socket contacts.
   c. Install thermostatically controlled condensation protection heaters or 10 CU IN desiccant packs in enclosures housing electronic equipment.
      1) Provide one pack for each 10 CU FT of panel capacity.

2.03 Motor Starters

A. General:

1. Provide each motor with a suitable controller and devices that will function as specified for the respective motors and meeting IEC, the NEC, and UL. Each motor control shall consist of a manually operated circuit protective device and controller mounted in a common enclosure, complete with control power transformer, if required and auxiliary devices for control of the circuit as indicated.

2. Operating handle of the circuit protective device shall physically indicate "on", "off", and "tripped" positions. Handle shall accept three padlocks with heavy duty, industrial type shackles. Cover shall be interlocked with the operating handle to prevent opening with in the "on" position. A method shall be provided for releasing the interlock for inspection purposes when the switch is "on".

3. Provide each motor controller with thermal overload protection in all ungrounded phases. Use protection consisting of thermal overload relays which are sensitive to motor current and mounted within the motor controller, or a combination of thermal protectors embedded within the motor windings and controller-mounted overload relays, as indicated. Use overload protection devices of the inverse-time current characteristic type.

4. Provide controller-mounted overload relays of the manual-reset type with externally operated reset button when used without motor thermal protectors; when used in conjunction with thermal protectors, provide the automatic reset type. Select and install overload relay heaters after the actual nameplate full-load current rating of the motor has been determined.

5. If power factor correction capacitors are connected on the load side of the overload relays, incorporate the resulting reduction in line current in the selection of overload relay heaters.
6. Install and connect any required thermal protector monitoring relay provided by motor manufacturer in motor-control circuit and provide manual reset function.

B. Full Voltage Magnetic Starters

1. Provide starters meeting IEC 60947, UL508, with the rating and enclosure shown. Starters shall be full voltage, non-reversing horsepower rated, and providing combined protection against running and stalled overloads. Thermal overload relays on all phases shall be temperature compensated bimetallic type with manual reset and inherent single phasing prevention.


2.04 Motor Starter Components and Accessories

A. Magnetic Contactors: Magnetic contactors shall be capable of closing and holding when a minimum voltage of 85 percent is applied to the operating coil. All contactors and relays shall be equipped with at least two normally open and two normally closed auxiliary contacts.

B. Overload Elements:

1. Unless noted elsewhere in the specification, overload elements shall be bimetallic ambient temperature compensated overload relays. Magnetic contactors for all 3-phase motor starters shall be equipped with overload relays on each phase.

2. Single phase motor starters shall contain one overload trip element for 120 volt applications and two overload trip elements for 208 volt, 240 volt, or 480 volt applications.

C. Circuit Breakers:

1. Motor circuit protectors shall be rated 65,000 AIC symmetrical at 480V and 42000 AIC symmetrical at 240V. The motor circuit protectors shall provide adjustable magnetic protection and be provided with pin insert to stop magnetic adjustment at 1300% motor nameplate full load current to comply with NEC requirements. All HMCP combination starter units shall have a “tripped” position on the unit disconnect and a push-to-test button on the HMCP. The motor circuit protectors shall include transient override feature for motor inrush current. Allen Bradley 140M series, no equal.

2. Molded case circuit breakers on combination type starters shall be fully magnetic with instantaneous trip adjustments. The breakers shall have continuous ratings to match the motor nameplate horsepower shown on the single line diagrams. The circuit breakers shall have a minimum of six trip adjustment points. Circuit breakers shall also have provisions for manual tripping. This trip device shall provide mechanical simulation of overcurrent tripping through activation of linkages and latch surfaces that are not operated by the circuit breaker handle.

3. Magnetic circuit breakers shall have a current limiting fuse where indicated or when the short circuit rating is higher than the basic interruption rating.

4. Combination units without current limiting fuses shall be rated for 65,000 amperes rms; units with current limiting fuses shall be rated for 200,000 symmetrical rms amperes.

5. The circuit breaker shall be designed so the loss of any one or more fuses shall trip the breaker automatically. The external operating handle of the circuit breaker shall have provisions for installing a padlock in the open position. The circuit breakers shall comply with the requirements of sections of these specifications that specify overcurrent protective devices.
2.05 Raceways, Fittings and Supports

A. All raceways shall be PVC coated rigid galvanized steel conduit unless otherwise indicated on the Drawings or in these specifications. With the exception of raceways with non-linear loads, underground raceways shall be polyvinyl chloride (PVC) Schedule 40. Raceways installed in stud walls shall be electrical metallic tubing (EMT). All raceways installed indoor and exposed shall be rigid galvanized steel. Flexible metal conduit shall be employed for connections to lighting fixtures. Final raceway runs to electrical equipment on machinery requiring flexibility or that is subject to vibration shall be liquid-tight flexible metal conduit. Minimum size of all conduits shall be 3/4-inch.

B. Rigid Steel Conduit

1. Comply with Underwriter's Laboratories UL-6 specification, ANSI C80.1-77 and Federal specification WW-C-581E (77 APR 04) or latest revisions. Rigid steel conduit shall be zinc coated both inside and outside after fabrication by hot-dip galvanizing. The threads shall also be hot-dip galvanized.

2. Use rigid steel conduit, including bushings, couplings, elbows, nipples, and other fittings, galvanized by hot-dipping, and meeting the requirements of ANSI C80.1 and ANSI C80.4, UL.

3. Do not use setscrew type couplings, bushings, bends, nipples, and other fittings, unless approved by the District or the Inspector. Factory bends are not permitted unless approved by the District or the Inspector. Conduit bending radius shall not be less than the minimum cable bending radius of the cable to be installed.

C. Electrical Metallic Tubing (EMT):

1. Comply with Underwriter's Laboratories UL 797, ANSI C80.3-77 and Federal Specification WW-C-563 (73 DEC 04) or latest revisions. EMT shall be galvanized.

D. PVC Conduit:

1. Nonmetallic conduit shall be high impact polyvinyl chloride (PVC), Schedule 40 unless otherwise noted in this Specification Section or where shown otherwise on the contact drawings. The nonmetallic conduit shall be corrosion resistant. Minimum tensile strength shall be 6000 psi, and minimum compressive strength shall be 9000 psi. The material shall have a smoke emission rate of not more than 5.1 grams/100 grams by the Arapahoe smoke chamber test.

2. Use rigid PVC Schedule 40 conduit, UL listed for concrete-encased, underground direct burial, concealed and direct sunlight exposed use, and UL listed and marked for use with conductors having 90 degrees C insulation. Use conduits, couplings, bushings, elbows, nipples, and other fittings meeting the requirements of NEMA TC 2 and TC 3, Federal Specification W-C-1094, UL, NEC, and ASTM specified tests for the intended use.

E. PVC Coated Rigid Steel

1. PVC coated conduit shall be hot-dip galvanized including the threads. The interior and exterior surfaces shall be coated with 2 mils thick urethane. The exterior of the conduit shall be PVC coated to a minimum 40-mil thickness. The PVC coating shall be permanently bonded to the conduit. The coating shall have a minimum tensile strength of 3500 psi. The interior shall be coated with a urethane coating no more than 7 mils thick. Plasti-Bond by RobRoy Industries, no other equal.
2. A PVC coated coupling shall be furnished with each length of conduit. The PVC sleeve of the coupling shall equal the outside diameter of the coated conduit and shall extend 1-1/2 inches from each end of the coupling.

3. Prior to coating, the galvanized conduits and fittings shall be UL listed. Use PVC coated fittings with the same interior and exterior coating requirements. PVC coated fittings and sleeves shall be completely watertight to prevent moisture from penetrating the interior of the conduits and fittings.

4. The PVC coating shall be resistant to ultra-violet rays when installed outdoors. The conduit and fittings shall meet all the requirements of NEMA RN-1 1989.

F. Flexible Metal Conduit

1. Flexible metal conduit shall be formed from spirally wound galvanized steel strip with successive convolutions that are securely interlocked. Minimum size of the flexible metal conduit shall be 3/4 inch. Fittings shall be of the compression type. Lengths shall not exceed 60 inches. Flexible metal tubing shall include a code size insulated green ground conductor.

G. Flexible Metal Conduit, Liquid-Tight

1. Use UL listed liquid-tight flexible metal conduit consisting of galvanized steel flexible conduit covered with an extruded PVC jacket and terminated with nylon bushings or bushings with steel or malleable iron body and insulated throat and sealing O-ring.

2. Provide external grounding connector and appropriately sized grounding conductor to assure ground continuity.

3. Minimum size shall be 2 inch.

H. Wireways

1. All wireways and auxiliary gutters shall be JIC sectional flange oil-tight type with hinged covers. Minimum size shall be 8 inches by 8 inches unless otherwise noted. All wireways shall be painted.

2. Provide outdoor, rain-tight steel-enclosed wireway and auxiliary gutter where indicated. Utilize wireways and fittings that are UL listed, and have a cover that can easily be removed. Manufacturers and types: Saignaw Controls & Engineering ELJ Trough Enclosure.

I. Use cable sealing fittings forming a watertight nonslip connection to pass cords and cables into conduit. Size cable sealing fitting for the conductor OD. For conductors with OD's of ½-inch or less, provide a neoprene bushing where the conductor enters the connector. Use Crouse-Hinds CGBS, Appleton CG Series, or equal, cable sealing fittings.

J. Fittings for Rigid Steel

1. Fittings used with rigid galvanized steel conduit shall be hot-dip galvanized. Locknuts shall be extra heavy galvanized steel for sizes through 2 inches. Locknuts larger than 2 inches shall be galvanized malleable iron. Bushings shall be galvanized malleable iron with insulating collar. Grounding bushings shall be of the locking type and shall be provided with feed-through compression lugs for securing the ground cable. Unions shall be galvanized ferrous alloy types UNF or UNY. Thread-less fittings shall not be utilized with rigid galvanized steel conduits.
2. Expansion fittings in embedded runs shall be of the watertight type and shall be provided with an internal bonding jumper. The expansion material shall be neoprene and shall allow for 3/4-inch movement in any direction.

3. Use insulated throat bushings of metal with integral plastic bushings rated for 105 degrees C.

4. For insulated throat bushings for rigid steel conduit, use Thomas & Betts Nylon Insulated Metallic Bushings, or O.Z. Gedney Type B, or equal.

5. Use Myers Scru-Tite, or equal hubs for rigid steel conduit.

6. Use conduit bodies for rigid steel conduit of metal and sized as required by the NEC (NFPA 70-2008). Use Appleton Form 35 threaded Unilets; Crouse-Hinds Mark 9 or Form 7 threaded condulets; Killark Series O Electrolets; or equal, for normal conduit bodies for rigid steel conduit. Where conduit bodies for rigid steel conduit are required to be approved for hazardous (classified) locations, use conduit bodies manufactured by Appleton, Crouse-Hinds, or Killark, or equal.

7. Use only couplings for rigid steel conduit supplied by the conduit manufacturer.

8. Use Appleton Type EYF, EYM, or ESU; Crouse-Hinds Type EYS or EZS; Killark Type EY or EYS; or equal, sealing fittings for rigid steel conduit. Where condensate may collect on top of a seal, provide a drain by using Appleton Type SF Crouse-Hinds Type EYD or EZD, or equal Drain Seal.

9. Use Appleton Type ECDB, Crouse-Hinds ECD, or equal drain fittings for rigid steel conduit.

K. Fittings for PVC Conduit

1. Fittings used with PVC conduits shall be of the PVC solvent-weld type and shall be of the same material as the conduit.

2. Expansion fittings shall be provided as recommended by the manufacturer.

L. Fittings for PVC Coated Rigid Steel Conduit

1. Fittings with PVC coated rigid steel conduit shall be PVC coated in a manner similar to the conduit. The exterior of the fittings shall be coated with 2-mil thick urethane prior to the application of the 40-mil exterior PVC coat. Interior of the fittings shall have a 2-mil urethane finish. The fittings shall have ribbed finish to assist in the installation of fittings. Plasti-Bond by RobRoy Industries, no other equal.

2. Thread-less fittings shall not be used with PVC coated rigid steel conduit.

3. Bushings and ground bushings shall be as specified for rigid galvanized steel conduits.

M. Fittings for Flexible Metal Conduit

1. Fittings used with flexible metal conduit shall be compression type, cadmium-plated malleable iron body with locknut and bushing.

2. Where applicable, 45- and 90-degree fittings shall be used.

N. Fittings for Liquid-Tight Flexible Conduit

1. Fittings used with liquid-tight conduit shall have cadmium-plated malleable iron body and gland-nut, brass grounding ferrule threaded to engage conduit. These fittings shall also use spiral and "O" ring seals around the conduit, the box connection and insulated throat. The insulated throat connectors for liquid-tight flexible metal conduit of metal will have an
integral plastic bushing rated for 105 degrees C, and of the long design type extending outside of the box or other device at least 2-inches.

2. Use Thomas & Betts Super-Tite Nylon Insulated Connectors or equal

3. Where applicable, 45- and 90-degree fittings shall be used

O. Raceway Supports

1. General: Raceway support systems shall be designed to provide a factor of safety of no less than five.

2. Conduit Supports: Conduit supports shall be one-hole galvanized malleable iron pipe straps used with galvanized clamp backs and nesting backs where required. When used with PVC coated rigid steel conduit, the conduit supports shall be 40 mils thick PVC coated.

3. Ceiling Hangers: Ceiling hangers shall be adjustable stainless steel pipe hangers. Straps or hangers of plumber’s perforated type will not be acceptable. Trapeze, rod type hangers shall not be loaded in excess of 700 pounds per rod. Where loading exceeds this value, rigid frames shall be provided.

4. Racks: Racks shall be constructed from framing channel. Channels and all associated hardware shall be stainless steel. Channels attached directly to building surfaces shall be 14-gage minimum material 1-5/8 inches wide by 13/16 inch deep. All other channels shall be 12-gage minimum material 1-5/8 inch wide by 1-5/8 inch minimum depth. Racks shall be designed to limit deflection to 1/360 of span. All exposed ends of framing channel shall be covered with manufacturer’s standard plastic inserts.

P. Raceway Tags

1. Provide permanent, nonferrous metal markers with raceway designations pressure stamped, embossed, or engraved onto the tag.

2. Tags relying on adhesives or taped-on markers are not acceptable.

3. Attach tags to raceways with noncorrosive wire.

Q. Warning Tape:

1. Provide heavy-gauge, yellow plastic tape of 6-inch minimum width for use in trenches containing electric circuits. Utilize tape made of material resistant to corrosive soil. Use tape with printed warning that an electric circuit is located below the tape. Manufacturers and types: ITT Blackburn Type YT or RT; Griffolyn Co. Terra-Tape; or equal

2.06 Junction and Device Boxes and Fittings

A. Junction boxes; device boxes; fixture support boxes; and oblong, round and rectangular conduit fittings shall be hot-dip galvanized cast ferrous alloy. Integrally cast threaded hubs or bosses shall be provided for all conduit entrances and shall provide for full 5-thread contact on tightening. Drilling and threading shall be done before galvanizing. The cover plate shall be of similar hot-dip galvanized cast ferrous alloy material. A full body neoprene gasket and Type 316 stainless steel screws shall be provided for all covers. Hubs for connection of conduit to sheet steel junction, device or terminal boxes shall be made of cast ferrous alloy, electroplated with zinc, and shall have insulating bushings. The hubs shall utilize a neoprene "O"-ring and shall provide a watertight connection.
B. Outlet and Switch Boxes: Outlet and switch boxes shall be FD boxes as manufactured by Crouse-Hinds, Appleton, or equal. Boxes shall be provided with blank covers for all unused openings.

C. Ganged Boxes: Outlet and device boxes shall be ganged where two or more devices are located together. Device covers shall be ganged for gang boxes and shall be gasketed with suitable neoprene gaskets to fit the devices and box used.

D. Sheet Steel Boxes: Boxes larger than FD boxes shall be fabricated from code gage steel, finished inside and out as specified for terminal cabinets. Before finish is applied, a grounding pad drilled for two bolted grounding lugs or a grounding stud shall be welded to the inside of the box. All hardware shall be Type 316 stainless steel. Boxes shall, as a minimum, meet NEMA 12 and JIC requirements and shall be NEMA 4X where exposed to the weather or dripping water.

E. Boxes in Corrosive Areas: Boxes and fittings located in corrosive areas shall be NEMA 4X. This material shall be fiberglass reinforced polyester with minimum properties as follows:
   1. Compressive strength: 28,000 psi.
   2. Flexural strength: 15,000 psi per ASTM D790 and D675.
   3. Tensile strength: 12,000 psi per ASTM D638.
   4. Flame-resistant and self-extinguishing per ASTM D635

F. All conduit entries shall use ferrous alloy hubs with 40 mil epoxy coating. All conduit entering plastic boxes and any exposed metal on plastic boxes which is not isolated from the interior of the box shall be bonded together with a suitable grounding conductor. Corrosive areas shall be as shown on the drawings.

2.07 Manholes, Handholes & Pullboxes

A. Manufacturers: Christy Concrete Products; Jensen Precast, Inc.; Brooks Products, Inc.; or equal.

B. Equipment and Materials

C. Concrete
   1. The structural concrete shall conform to the requirements of Division 3 of these specifications.
   2. The aggregate shall be free of deleterious substances causing reaction with hydrogen sulfide.
   3. The cement shall be Portland cement conforming to ASTM C150, Type II. Cement content shall be sufficient to produce a minimum strength of 3000 psi.

D. Reinforcing Steel
   1. All reinforcing steel including welded wire mesh shall be as shown. All reinforcing shall be sufficiently tied to withstand any displacement during placement of concrete. All bars shall be hard grade billet steel conforming to ASTM A15. Bars 1/4-inch round and smaller shall be deformed in accordance with ASTM A305.
   2. Design loads shall consist of dead load, live load, impact and, in addition, loads due to water table and any other loads which may be imposed on the structure.
   3. Live loads shall be for H-20 loading per AASHO standards for highway and bridges.
E. Box dimensions shall be the minimum sized as shown on Contract drawings and in accordance with size, quantity of conductors, and conduit clearances per NEC Article 314 requirements.

F. Manholes: Manholes may be of single- or multiple-section construction. Multiple sections shall be fitted to form watertight joints using tongue and groove joint with flexible plastic adhesive sealing compound.

G. Covers
   1. Manholes, handholes and pull boxes shall be provided with cast iron or galvanized steel covers and mounting rings reinforced for H-20 loading.
   2. Pull boxes, 4 feet square and less than 4 feet 6 inches deep shall have a two-piece rectangular cover. Pull boxes, 2 feet by 3 feet in size shall have a one-piece rectangular cover. All other pull boxes, manholes, and handholes shall have a 30-inch diameter ring cover as shown. Covers shall be bolted down with recessed bolt heads.
   3. Each manhole, handhole and pull box cover shall be identified by a cast in label. The cover shall be inscribed with the cast letters ELECTRICAL for electrical service or SIGNAL for communication or instrumentation. In addition, the identification number of the manhole or pull box shall be installed by means of bead weld in letters not less than 1 inch high.
   4. Where located in streets or other heavy traffic bearing areas, covers shall be of the heavy street traffic type. When located in sidewalks or other non-vehicular traffic areas and with the approval of the construction manager covers may be of the parkway type.
   5. Utilize heavy-duty type frames and covers made of cast iron, suitable for H-20 loading, and having machined bearing surfaces. Provide indented type covers, solid top design, with two drop handles each. On the upper side of each cover, cast or burned by welder, in integral letters not less than 2-inches high appropriate titles, ELECTRICAL, SIGNAL or TELEPHONE.

H. Inserts
   1. Concrete inserts for cable racks shall be provided in the walls of each manhole and pull box, one in a 4-foot wall and two in a 6-foot or 8-foot wall.
   2. Cable pulling eye bolts shall be provided opposite each conduit entry area, and the inserts shall be designed to provide a minimum of 5,000 pounds tensile strength to accommodate all cable pulls.

I. Conduit Entrances
   1. Entries of conduits through walls shall be terminated in a bell flush with the interior wall.
   2. Conduit wall penetrations shall be repaired with non-shrink grout.
   3. Provide raceway entrances on all four sides. For raceways installed under this Contract, knockout panels or precast individual raceway openings may be used. On sides where no raceways are installed under this Contract, provide knockout panels for future raceway installation.
   4. Slope floors toward drain points, leaving no pockets or other non-draining areas.
   5. Utilize maintenance hole and handhole hardware of steel, hot-dip galvanized after fabrication

J. All prefabricated maintenance holes shall be shop inspected before delivery to the site.
K. The location of pull boxes, manholes and vaults are shown on Contract drawings to be at their approximate location. The contractor shall adjust these locations to avoid conflicts with other underground utilities.

L. Limit the number of directional changes to the conduit to total no more that 270 degrees in any run between pull points. Where required to ease pulling and as necessary to meet the NEC requirements, the Contactor shall supply and install pull boxes, manholes or vaults, even though not shown on the Drawings at no additional cost to the District.

M. Preparation

   1. The pre-cast base section shall be placed on a prepared base of 12 inches of sand or gravel for even distribution of load before leveling. A plastic preformed joint sealant shall be applied between sections. The joint sealant compound shall be impermeable to water, have a high immediate bonding strength, and maintain permanent plasticity. The assembly shall be so located that surrounding paving shall slope up 1 inch above finish to prevent water settling on the cover. In unpaved areas, the slope shall be up 3 inches.

   2. Conduit runs between two vaults, manholes, or pull boxes shall be limited to a maximum of 300 feet or less 50 feet for every 90 degrees of conduit change in direction

N. Installation

   1. The location of manholes, handholes, and pull boxes are shown on the Contract Drawing at their approximate location. The Contractor shall adjust the location of these manholes, handholes, and pull boxes to avoid conflict with other underground utilities at no additional cost to the District. Provide excavation, shoring, bracing, backfilling, grading, etc., in accordance with requirements specified elsewhere in these Contract Documents.

   2. Make installation so that raceways enter manholes, handholes or pullboxes at nearly right angles and as near as possible to one end of a wall, unless otherwise indicated.

   3. Pull Boxes, Manholes and Vaults shall be installed accurately to match the surrounding building outline, pavement or sidewalk grade. Set pullboxes parallel or perpendicular to adjacent structures.

   4. Install one ground rod in each manhole and handhole. Connect all noncurrent-carrying metal parts in the manholes and any metallic raceway grounding bushings to this ground rod with No. 6 AWG (minimum) copper conductor.

   5. Vault, Manhole and Pull Box Entry: Conduits entering underground pull boxes and vaults shall be horizontal, except when required otherwise by Power or Telephone Utility Standards. Conduit shall not enter through the bottom of boxes unless boxes are located above grade.

   6. Install covers flush within finished paved or concrete surfaces. In unfinished areas, install covers one inch (1") above finished grade.

O. Field Quality Control

   1. Keep boxes, vaults and manholes closed at all times when not being accessed to prevent entry of foreign matter. Cover to protect them against dirt, paint, water, chemical or mechanical damaged products prior to final acceptance.

   2. Clean and remove all debris from maintenance holes and handholes whether new or existing.

   3. At the contractor’s discretions and with approval of the District, the Contractor may provide additional manholes, handholes and pull boxes, at no additional cost to the District.
2.08 Wire and Cables, 600 Volts and Below

A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only. Products of other manufacturers will be considered in accordance with the General Requirements.

B. Building wire, power and control cable:

1. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   a. Alpha Wire Corporation
   b. American Insulated Wire Corporation
   c. Belden Wire and Cable
   d. Carol Cable Company
   e. General Cable

2. Conform to UL 444, Communications Cable, NEC type CMP, tinned copper conductors, 100 percent shield coverage, single TSP, Teflon insulated with Teflon jacket in all applications except small diameter.

3. Multiple conductors, small diameter instrumentation cable shall be used where existing conduits limit conduit space as called out on drawings:
   a. Plenum type single or multi paired, twisted pairs, overall shield with drain wire
   b. FEP or FPR insulation and jacket
   c. Moisture and flame resistance
   d. Jacket thickness 0.015 IN minimum
   e. Maximum outside diameter:
      1) 1 PR – 0.125 IN
      2) 2 PR – 0.180 IN

4. Telephone cable:
   a. Solid conductors, tinned copper, No. 24 AWG
   b. 150 volt, vinyl insulated
   c. UL listed 2576

C. Unless otherwise indicated, provide stranded conductors, except provide solid conductors where No. 10 AWG and No. 12 AWG are designated for branch circuit power wiring in lighting and receptacle circuits.

D. For all direct burial and aerial conductors and cables, provide conductors with UL labeling "TYPE USE" and RHW insulation with heavy-duty, black, neoprene sheath meeting the physical requirements and minimum thickness requirements of ICEA S-19-81 and NEMA WC 3.

E. Where flexible cords and cables are specified, provide Type SO, 600-volt, with the number and size of copper conductors indicated.
F. Insulation
1. All conductors shall be rated at 600 Volts unless noted otherwise within this specification section.
2. All wiring shall be type XHHW-2 unless otherwise noted within this specification section.
3. All conductors shall be sized for operation at 75 degrees C maximum operating temperature.
4. For power conductors, provide all single conductors and individual conductors of multi-conductor power cables with integral insulation pigmentation of the designated colors, except conductors larger than No. 6 AWG may be provided with color coding by applying a heat shrink tube of the appropriate color.

G. Conductors
1. Unless specifically noted otherwise herein, all conductors for general wiring shall be a minimum of 98% conductivity, stranded, soft drawn copper. Aluminum or aluminum alloys are not acceptable.
2. 120 Volt control, indicator, signal and metering conductors may be #14 AWG, and shall be stranded.

H. Instrumentation Signal Cables
1. Instrumentation signal cables shall be of the type used for process control with twisted shielded pairs or triads with polyvinyl jacket an overall shield over the multiple pairs or triads.
2. The instrumentation cable shall be rated 600 Volts at 90 degrees C or better.
3. The size of the instrumentation cable shall be AWG No. 16 with seven strands minimum.
4. All instrumentation cables shall be UL listed. Belden 8719 (Pairs), Belden 8618 (Triads) or equal.

I. PLC Communications Cables
1. Communication cables if required for remote I/O connections and for PLC high speed data communications shall be as recommended by the manufacturer of the PLC equipment.

J. Ethernet Communications Cables
1. Ethernet communication cables shall be Industrial Grade Cat 5e, Shielded Twisted Pair (STWP) for building interiors, Belden DataTuff 7933A or equal.
2. Ethernet communication cables shall be Industrial Grade gel filled outdoor rated Cat 5e, shielded Twisted Pairs for site and building exteriors and no more than 50 feet into building interiors, Belden DataTuff 7937A or equal.

K. Portable Cable:
1. Cord shall be NEMA Type SOW-A flexible cord rated at -50 deg C to 105 deg C. All cords shall contain an equipment grounding conductor. Cord shall be rated for use as a fully submersible cable.
2. Conductors: Bunch or rope stranded, uncoated annealed copper conforming to UL and CSA requirements. A suitable separator is applied over the conductor.
3. Insulation: Ethylene Propylene (EPDM) conforming to UL Standard 1581 and CSA requirements. Minimum average wall thickness is 45 mils for 14 AWG, 12AWG, and 10 AWG; and 50 mils for sizes 8 AWG through 2 AWG.

4. Color code: Insulation colored as follows:
   a. 2 Conductors - Black, White
   b. 3 Conductors - Black, White, Green
   c. 4 Conductors - Black, White, Red, Green
   d. 5 Conductors - Black, White, Red, Green and Orange

5. Cable assembly: The applicable number of insulated conductors are cable together with elastomeric fillers, as necessary, and with a suitable lay.

6. Jacket: Black or Yellow special thermosetting compound conforming to UL and CSA requirements.

7. Marking: Jacket surface is printed in accordance with requirements of UL, CSA and MSHA.

8. Portable cord for supply to permanent installations, such as pumps, cranes, hoists and portable equipment shall have a wire mesh cord grip of flexible stainless steel wire to take the tension from the cable termination. Weatherproof strain relief fittings shall be used for all connections. To prevent unnecessary strain on cords, 45-degree and 90-degree connectors shall be used where applicable. Flexible cords feeding submersible non-wicking neoprene construction.

9. Manufacturer shall be American Mustang, York Wire & Cable or equal.

L. Control Cable:
   1. Control cable shall be Type SO extra flexible and shall consist of No. 16 copper conductors insulated for 600 volt service. The overall jacket shall consist of 7/64-inch neoprene minimum. The number of conductors shall be as shown on the drawings.

M. Grounding Wire
   1. Ground wires, no. 1/0 AWG or larger tinned stranded bare copper cable. All smaller ground wires shall be insulated with green color insulation.

N. Connections
   1. Wire nuts for joints, splices and taps for conductors #8 and smaller shall consist of a cone shaped expandable coil spring insert, insulated with a Teflon or plastic shell. Threaded or crimp types will not be accepted. Use "Skotchlock", "Hydent", or equal.
   2. Terminals for stranded conductors #8 and smaller shall be a pre-insulated crimp type.
   3. Lugs and connectors for conductors #6 and larger shall be compression types of one piece tubular construction with flat rectangular tongues. Two-hole lugs shall be used for sizes 4/0 and larger. Fittings for copper conductors shall be tin-plated copper.

O. Wire and Cabling Termination and Splicing
   1. The following manufacturers are acceptable.
      a. Burndy Corporation
      b. Ideal
c. Minnesota Mining and Manufacturing Co  
d. Penn Union  
e. Thomas and Betts  
f. Or Equal  

2. Splicing of cables and wires in the manholes and handholes shall be kept at a minimum. Where it is possible to pull cables or wires directly through the manholes or handholes, splicing shall be moisture-proof and encapsulated using insulating sealing compound. Splicing kits similar to 3M Company 82A or 8500 Series shall be utilized.

P. Labeling  
1. Provide complete power and control conductor identification system so that after installation, circuits can be easily traced from origin to final destination.

2. Conductor labels shall be white PVC tubing with machine printed black marking. Tubing shall be sized to fit conductor insulation. Adhesive strips are not acceptable. Machine printed markings, directly on conductors, will be accepted. Panduit, Thomas & Betts, or equal.

3. **Wire Tag Identification Example:**

**Analog Input Device**

![Analog Input Device Diagram]

Wire Tag:  
(Source, Function:Wire Number) to (Source, Function:Wire Number)

EQPLC – AI-0+:200  
To  
EQB-0101-LIT:200

**Discrete Output Device**

![Discrete Output Device Diagram]

EQPLC-DO-6:CR-6:14–117  
To
4. Sleeves shall be yellow or white tubing, sized to fit the conductor insulation, with machine printed black marking capable of accepting 24 machine printed character per sleeve label. Adhesive strips are not acceptable.

Q. Pulling Lubricant
1. All cables shall be properly coated with pulling compound recommended by the cable manufacturer before being pulled into conduits so as to prevent mechanical damage to the cables during installation.
2. Other lubricants to be substituted must be accompanied by a statement from the cable manufacturer as to its acceptable use with the cable being installed.

R. Electrical Tape
1. Pressure sensitive vinyl
2. Premium grade
3. Heat, cold, moisture, and sunlight resistant
4. UL listed
5. Thickness, depending on use conditions: 7, 8.5, or 10 mil
6. For cold weather or outdoor location, tape must also be all-weather rated
7. Comply with UL 510

S. Color Coding and Labeling. Provide color coding throughout the entire network of feeders and circuits (600 volts and below) as follows:

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>PHASE/CODE LETTER</th>
<th>WIRE OR TAPE COLOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>480 V, 3 PHASE</td>
<td>A</td>
<td>BROWN</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>ORANGE</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>YELLOW</td>
</tr>
<tr>
<td>208/120 V, 3 PHASE, 4 WIRE</td>
<td>A</td>
<td>BLACK</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>RED</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>BLUE</td>
</tr>
<tr>
<td>240/120V, 3 PHASE, 4 Wire</td>
<td>A</td>
<td>BLACK</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>ORANGE (if High Leg)</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>BLUE</td>
</tr>
<tr>
<td>240 / 120 V, 1 PHASE</td>
<td>L1</td>
<td>BLACK</td>
</tr>
<tr>
<td></td>
<td>L2</td>
<td>RED</td>
</tr>
<tr>
<td>120 VAC UPS POWER</td>
<td>L1</td>
<td>ORANGE</td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>PHASE/CODE LETTER</td>
<td>WIRE OR TAPE COLOR</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>24VDC POWER</td>
<td></td>
<td>PINK</td>
</tr>
<tr>
<td>24VDC COMMON</td>
<td></td>
<td>BLACK/WHITE</td>
</tr>
<tr>
<td>PLC DI AND DO, 24VDC</td>
<td></td>
<td>LIGHT BLUE</td>
</tr>
<tr>
<td>12VDC POWER/CONTROL</td>
<td></td>
<td>DARK BLUE</td>
</tr>
<tr>
<td>12VDC COMMON</td>
<td></td>
<td>BLACK/WHITE</td>
</tr>
<tr>
<td>NEUTRAL (120/208/240VAC)</td>
<td>N</td>
<td>WHITE</td>
</tr>
<tr>
<td>NEUTRAL (480/277VAC)</td>
<td>N</td>
<td>GREY</td>
</tr>
<tr>
<td>GROUND</td>
<td>G</td>
<td>GREEN</td>
</tr>
<tr>
<td>UNSPECIFIED FOREIGN</td>
<td>+</td>
<td>YELLOW</td>
</tr>
<tr>
<td>SHIELDED PAIR</td>
<td></td>
<td>CLEAR</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>BLACK</td>
</tr>
<tr>
<td>PLC DI AND DO, 120 VAC</td>
<td></td>
<td>RED (NOTE 1)</td>
</tr>
<tr>
<td>LOW VOLTAGE CONTROL</td>
<td></td>
<td>VIOLET (NOTE 2)</td>
</tr>
</tbody>
</table>

Note 1 - Low voltage control electrically direct connected to PLC DI or DO points. Only the wire between the PLC DI or DO and its first landing point shall be RED. Wire between this point and other terminations or field devices shall be VIOLET.

Note 2 - Low voltage control FIELD WIRING not electrically direct connected to PLC DI or DO points. Low voltage includes 120 volts AC or DC and below. Control wiring includes wires, which follow control devices such as switches, or relays and which are not directly connected to power sources, fuses or circuit breakers.

2.09 Wiring Devices

A. Make like items of equipment the end products of one manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts and manufacture’s service. Wiring devices shall be of the manufacturer and model numbers described in this specification section.

B. General: All wiring devices shall be industrial extra heavy duty specification grade with provisions for back wiring and side wiring with captive-held binding screws. All receptacles shall be of the grounding type.

1. Corrosion-Resistant Receptacles: Corrosion-resistant receptacles shall be of yellow nylon construction with all metal parts of Monel or Cupro-nickel complying with Federal Specification W-C-596d. Corrosion resistant receptacles shall be Cooper 5362GR Series, Hubbell HBL53CM62 Series, or equal.

2. Special Purpose NEMA Configuration Receptacles: Special purpose NEMA configuration receptacles shall be industrial grade, corrosion resistant and shall be as follows:
   a. Provide Manufacturer and Model Number, noted below, or approved equal.
   b. Non-locking 125/250 volt, 20 to 60 amperes ratings shall be NEMA 14-20 through 14-60 series:
### Electrical Provisions

<table>
<thead>
<tr>
<th>Ampere Rating</th>
<th>NEMA Rating</th>
<th>Cooper</th>
<th>Hubbell</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>14-20R</td>
<td>5479</td>
<td>HBL8410</td>
</tr>
<tr>
<td>30</td>
<td>14-30R</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>50</td>
<td>14-50R</td>
<td>5759</td>
<td>HBL9450A</td>
</tr>
<tr>
<td>60</td>
<td>14-60R</td>
<td>AH5754AP</td>
<td>HBL9460A</td>
</tr>
</tbody>
</table>

c. Non-locking 250 volt, 3 phase, 15 to 60 ampere ratings shall be NEMA 15-15 through 15-60 series:

<table>
<thead>
<tr>
<th>Ampere Rating</th>
<th>NEMA Rating</th>
<th>Cooper</th>
<th>Hubbell</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>15-15R</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>20</td>
<td>15-20R</td>
<td>n/a</td>
<td>HBL8420</td>
</tr>
<tr>
<td>30</td>
<td>15-30R</td>
<td>8430N</td>
<td>HBL8430A</td>
</tr>
<tr>
<td>50</td>
<td>15-50R</td>
<td>8450N</td>
<td>HBL8450A</td>
</tr>
<tr>
<td>60</td>
<td>15-60R</td>
<td>8460N</td>
<td>HBL8460A</td>
</tr>
</tbody>
</table>

d. Locking 120/208 volt, 3 phase, 20 or 30 ampere ratings shall be NEMA L21-20 and L21-30:

<table>
<thead>
<tr>
<th>Ampere Rating</th>
<th>NEMA Rating</th>
<th>Cooper</th>
<th>Hubbell</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>L21-20R</td>
<td>CWL2120R</td>
<td>HBL2510SW</td>
</tr>
<tr>
<td>30</td>
<td>L21-30R</td>
<td>CWL2130R</td>
<td>HBL2610SW</td>
</tr>
</tbody>
</table>

e. Locking 250 volt, 3 phase receptacles shall be NEMA L15-20 or L15-30 as applicable:

<table>
<thead>
<tr>
<th>Ampere Rating</th>
<th>NEMA Rating</th>
<th>Cooper</th>
<th>Hubbell</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>L15-20R</td>
<td>CWL1520R</td>
<td>HBL2420SW</td>
</tr>
<tr>
<td>30</td>
<td>L15-30R</td>
<td>CWL1530R</td>
<td>HBL2720SW</td>
</tr>
</tbody>
</table>

### C. Device Plates

1. General
   
a. Stainless steel device plates shall be engraved directly with the service legend. Engraving shall be 1/8 inch high with black filling. Cast ferrous metal plates shall be provided with engraved laminated phenolic nameplates with 1/8-inch white characters on black background. Nameplates for switches shall identify the panel and the circuit number and the area served. Nameplates for receptacles shall identify circuit and voltage, if other than 120 volts single phase. Engraving schedule shall be submitted for review prior to engraving.

b. Device plates located in areas with suspended ceilings and stud walls shall be Type 304 stainless steel, satin finish, and 0.40-inch minimum thickness. Device plates in all other areas shall be cast ferrous metal with neoprene gasket and corrosion-resistant hardware. Receptacle covers exposed to weather shall be provided with while-in-use covers.
c. Device covers for corrosion-resistant applications shall be yellow thermoplastic or aluminum construction with a spring-closed cover for the outlet. The receptacle cover shall be Hubbell 52CM22, or Cooper 7879FSCR or equal.

2. Receptacle Covers: Receptacle covers shall be heavy cast copper-free aluminum with a gasketed spring floor cover over each outlet. The receptacle cover shall have all exposed metal surfaces factory coated with a durable epoxy coating. Stainless steel screws and a neoprene gasket shall be provided with each receptacle cover.

2.10 Pilot Devices

A. Control Stations: For non-classified areas, control stations shall be heavy-duty industrial units, NEMA 12 oil-tight and dust-tight cast aluminum enclosures unless otherwise specified or shown. Control stations exposed to weather or located in corrosive environments shall be NEMA 4X of fiberglass reinforced high impact plastic, Allen Bradley 800 H series.

1. Legend Plates - ("STOP", "AUTO", etc.) shall be as shown on the plans and nameplates shall be as shown on the plans.

2. Nameplates – Nameplates shall be as shown on the plans.

B. Pushbuttons: Pushbuttons shall be heavy-duty oil-tight type; lockout-stop buttons shall be equipped with integral locking device and shall additionally be capable of receiving one 3/8-inch shackle padlock. Contact shall be rated as specified for selector switches. Unless otherwise shown, pushbuttons for field stations shall be provided with a watertight boot if the pushbutton is mounted on the outer surface of the enclosure.

C. Selector Switches: Selector switches located in motor control centers, field stations (generally for HAND-OFF-AUTO or LEAD-FOLLOW operations) shall be heavy-duty oil-tight type.

1. Switches shall be provided complete with cover, front escutcheon, handle and with the legend plate engraved by the switch manufacturer in accordance with the drawings. The manufacturer’s standard contact development diagram shall be submitted for each different switch arrangement required. The development diagram shall identify each switch it describes and shall call out all special operating features in addition to providing the standard contact status for each switch position.

2. Where no callout is given, the Contactor shall use the diagrammatic symbol to determine the type of selector to apply in conformance with the electrical symbols drawings.

D. Elapsed Time Meters: Elapsed time meters shall be of the 2-1/2-inch square case type for flush panel mounting. The totalizing type meter shall have 6-digit register with the last digit indicating tenths of an hour.

E. Indicating Lamps: Indicating lamps shall be oil-tight units. Appropriate lens caps shall be provided. Allen Bradley 800H LED Standard Push-To-Test, dual input, 12-130VAC/DC. Allen Bradley 800H-QRTH2_ (Colors: A=Amber, B=Blue, C=Clear, G=Green, R=Red, W=White, Y=Yellow)

F. Control Transformers: Control transformers shall be of the volt-ampere rating required to supply the coil and device loads in the control circuit, but not less than the size if shown, without exceeding their rating or overheating.

1. Control transformers will be required on each starter unless otherwise indicated and shall be connected to terminals on the load side of the branch circuit breaker. Control transformers shall be rated for 480 to 120 volts.
G. Control Circuit Protection: Draw-out indicating fuse holders and fuses shall be provided as shown for the protection of all control circuits. Fuse holders for service at 150 volts or less shall be MIL-F019207/2, Type FHL 11U with 1/4 x 1-1/4 inch ceramic tube fuse rated to interrupt 25,000 amperes at 125 volts.

1. Fuse holders for service at over 150 volts but less than 600 volts shall be MIL-F-19207/3, Type FHL 12U with 13/32 by 1-1/2 inch ceramic tube fuse rated to interrupt 100,000 amperes at 600 volts.

2. Fuse holders for the protection of a control circuit transformer which is also provided with an indicating secondary fuse shall be of the double porcelain type having a barrier between the fuses and shall accept the 13/32 by 1-1/2 inch ceramic fuse specified above.

3. Each control circuit transformer shall be protected by two primary fuses and one secondary fuse as a minimum.

H. Nameplates: Each individual controller, control station, field panel, and control device shall have a nameplate designating the function of the device and its identifying number. All relays, pressure switches, solenoid valves and similar devices mounted outside of their associated motor controller cubicle shall be identified with nameplates. All numbered instruments and devices shall be identified with nameplates.

1. Nameplates shall be made of 1/16-inch thick machine-engraved laminated phenolic having white letters not less than 5/32 inch high on black background. Equipment titles shall be completely spelled out on nameplates as shown on the drawings. The name plate schedules shall be submitted for review and acceptance prior to inscription. Nameplates on steel panels shall be secured with stainless steel drive screws.

I. Nameplates for identifying relays and devices that are located inside of panels may be of the sandwich phenolic type described above or they may be of white fiber strips marked with the identification in India ink. In large relay panels, relays may be identified with painted designation in clear space adjacent to the relay. Relays shall be identified with number as shown on control diagram and the equipment number which it controls.

J. Relays, Pilot Devices and Related Control Accessories

1. Relays: Control relays shall be of the heavy-duty solenoid type with contacts having an A600 rating by NEMA standards. Control relays shall have a minimum of four reversible poles at four universal or double-throw poles.

2. Relays rated 300 volts AC may be used only as control circuit interposing relays where voltages are less than 150 volts AC and the 300 volt relay is specified.

3. All control relays shall be rated to "make" 60 amperes and "break" 6 amperes at 120 volts AC and 0.35 power factor lagging and shall be rated 2.0 amperes at 125 volts DC.

K. Time Delay Relays: Time delay relays shall be electro-pneumatic with appropriate ranges and fully adjustable within the range by a readily accessible control. Snap action switch assemblies shall have contacts rated for more than 10 million operations at 15 amperes, 120 volts AC.

L. Terminal Blocks: The terminal blocks shall have ample size and capacity to accommodate required loads and shall be of the solderless compression lug type. All terminals shall be numbered and shall be provided with white fiber marking strips. Phoenix Contact, 3003020(Terminal Block End Barrier), 3004249(120VAC Fused Terminal Block), 3004265(24VDC Fused Terminal Block), 3004362(24-10AWG Terminal Block), 3004524(24-
2.11 Overcurrent Protective Devices

A. Molded Case Circuit Breakers

1. Molded case circuit breakers shall be fully enclosed in a molded case and circuit breakers with non-interchangeable trips shall have their covers sealed. Contacts shall be made from a non-welding silver alloy. Arc extinction shall be accomplished by means of arc chutes that consist of a metal grid mounted in an insulated support.

2. Molded case circuit breakers with current limiting fuses shall be one complete assembly consisting of a molded circuit breaker and current limiting fuse. The above current limiting fuses shall be coordinated with the circuit breaker element for selective operation. The circuit breaker shall not reset until current limiters which have functioned have been replaced and covers fastened. The current limiters shall have visual indicators to indicate which unit needs replacement.

3. The circuit breakers shall be provided with an adjustable Trip Unit. The adjustment shall provide instantaneous trip settings in the range of 700 percent to 1300 percent of the lowest full load current for which the unit is rated. Each unit shall be adjusted to the circuit breaker manufacturer's recommended setting for the particular full load current. All other characteristics shall be in accordance with the specifications for molded case circuit breakers. The interrupting rating shall be not less than 65,000 amperes symmetrical. Where short circuit current exceeds 65,000 amperes an integrally mounted current limiter shall be provided. Refer to one-line diagrams for available short circuit duties.

B. Ground Fault Circuit Interrupters

1. Ground fault circuit interrupters (labeled GFI on diagrams) shall be provided in the locations as shown in the panelboards. The circuit interrupters shall be UL listed for the application and shall trip at 5 milli-amperes to protect personnel from electrical shock hazard. The unit shall be of the plug-in type and shall be of the same manufacturer and shall match the other circuit breakers in the panelboard in space requirements and general appearance, except that a test pushbutton shall be provided on the face of each unit and be accessible from the front (similar to the accessibility of the circuit breaker toggle handle).

2. The neutral for each circuit that is ground fault protected shall be individually brought back with the live leg of the circuit and connected to the neutral pigtail or terminal of the interrupter unit. All wiring in GFI circuits shall be 3/64-inch insulated THWN/XHHW No. 12 AWG minimum. In general, the GFI monitored circuits will be those feeding receptacles in the shop, laboratory, restrooms, operating and outdoor areas of the plant or station and as otherwise noted.

2.12 Disconnects

1. Disconnect switches shall be heavy duty type, shall be horsepower rated, quick-make, quick-break construction. Switch blades shall open all ungrounded conductors and shall be single throw, unless otherwise noted. Eaton, no equal.

2. Rating: 600 volts AC or DC, number of poles and amp rating as shown on the Drawings.
3. Fusible disconnects shall be as specified above with fuse space and clips to accept Class R fuses. Fusible disconnects shall only be utilized where required by equipment manufacturer to meet UL installation requirements.

4. Installation
   a. Switches shall be mounted at locations shown on plans. Installation shall be in accordance with the following methods:
      1) Mounting: Disconnects shall be fastened securely to supporting structure at wall and stands:
         a) Machine bolt to metal framing or metal plates
         b) Expansion anchors to concrete wall where approved by the Engineer
            (i) Provide one inch spacers to set enclosure out from concrete wall
         c) Expansion toggle wing bolts or sleeve anchors to hollow block where approved by the Engineer.
            (i) Provide one inch spacers to set enclosure out from hollow block wall
         d) Provide equipment mounting rack per NEC or as indicated on the drawings.
         e) Wood screws or lag screws to wood boards or timbers where approved by the Engineer.
      2) Stands and Supports: Disconnect stands and support shall be constructed of and secured by:
         a) Corrosion-resistant materials and finishes
         b) Stainless steel Unistrut-type materials for fabrication
         c) Machine bolt to metal framing or metal plates
         d) Metal backing plate for mounting units
         e) Wood screws or lag screws to wood boards or timber where approved by the Engineer
         f) Fasten stand securely to floor
         g) Dimensions as required by equipment to be mounted
      3) Arrangement: Disconnects shall be arranged for driven equipment use or function:
         a) Similar units adjacent
         b) Adequate space for operation and servicing
      4) Mounting Height: Disconnect mounting height:
         a) Center of handle shall be 4 feet 6 inches above the finished floor or work platform.
      5) Enclosure: Stainless Steel

2.13 Grounding
A. Ground Rods: Ground rods shall be one piece, 3/4-inch in diameter by 10 feet in length and shall be copper clad steel. The copper exterior shall be molten welded to the steel core. The rod heads shall be chamfered to prevent mushrooming during driving.
B. Ground Wires: Ground wires shall be bare copper wires with Class B stranding. Size shall be as shown.

C. Connections

1. All ground connections below grade for copper shall be made by the exothermic weld process. They shall be Cadweld, Thermoweld, or equal, made with Cadweld, Thermoweld, or equal, molds and clamps. All connections in the ground wells shall be made with a bolted ground clamp and shall be Copperweld Type "AB" with hex head set screw, Weaver Type W, or equal.

2. All connections above grade to equipment ground buses and flat copper bars shall have a 2 bolt pad and shall be bolted with nonferrous hexagon head bolts and nuts with spring lock washers. They shall be Burndy Type "QA-B," Thomas & Betts Lock-Tite, or equal. All connections to motor shall be as shown.

3. Connections to miscellaneous boxes, cabinets, panels, etc., shall be Burndy type "KC" servitposts, Thomas & Betts split bolt connector, or equal.

D. The utility service entrance switchboard ground bus shall be tied to an area ground grid consisting of a ground ring with ground rods as shown on the drawings.

E. The grounding system shall be as shown and as required by codes and regulations and shall include the following as applicable:

1. Metallic conduits supplemented with a ground wire installed in the conduit for all circuits except control circuits.

2. An equipment grounding conductor installed in all nonmetallic conduit carrying power to any equipment.

F. All ground conductors entering handholes, manholes, pull boxes, terminal boxes, or any other enclosure shall be bonded together and shall be bonded to the enclosure if it is metallic and to all metallic raceways within or terminating at the enclosure. An insulated grounding bushing shall be installed with a code size equipment grounding conductor bonded to the equipment frame for all conduits terminating under an enclosure containing no metal floor plate, or at sheet metal panels which are not fastened to the equipment frame solidly enough to provide an effective ground connection. This will commonly be the case with switchgear, switchboards and MCCs.

G. Cable shielding, metallic conduits, wireways, metal enclosure of bus ways, cable boxes, electrical equipment housings, and all noncurrent-carrying metallic parts of the installation shall be grounded. The conduit system shall be used for equipment and enclosure grounding but not as a system ground conductor. A code sized green insulated copper grounding conductor shall be included in all nonmetallic and flexible conduits.

H. System neutral conductors shall be grounded at the point of service ahead of the main disconnect to a grounding electrode and to a domestic cold water main as required by code. Transformer neutral shall be grounded from the neutral bushing and solidly grounded to earth. If metallic domestic water system is greater than 100 feet remote, furnish a system ground conductor in conduit to the established system grounding electrode.

I. All conduit stub-ups shall be grounded, and where multiple stub-ups are made within an equipment enclosure, such as a service pedestal, they shall be equipped with grounding bushings and bonded together and to the enclosure and the enclosure ground bus.
J. All services and feeder runs (and branch circuit wiring excluding light circuits) in nonmetallic or flexible conduit shall carry one green THWN/XHHW insulated code sized ground conductor per conduit.

K. Bonding devices, fittings, or jumpers shall be provided at expansion fittings, isolation sections, or wherever continuity of ground is broken.

L. Grounding Techniques

1. The grounding electrode shall consist of a combination of the following systems as required to accomplish a resistance to ground not to exceed 5 ohms.
   a. The utility service entrance switchboard ground bus shall be tied to an area ground grid consisting of a ground ring with ground rods as shown on the drawings.
   b. Bare Wire under Foundations
      1) The preferred method shall be a 20-foot length of bare No. 4/0 copper wire extended its full length below ground level and embedded along the bottom of the concrete foundation footing which is in direct contact with the earth and supported in such a manner that it cannot be less than 3 inches from the bottom or side of the concrete when the foundation concrete is poured. A loop at the approximate center of this grounding electrode shall be brought out at the top of the foundation and a No. 4/0 copper ground conductor shall be connected to this loop with a pressure-type solderless connector and extended to the service equipment and to the metallic cold water system and properly connected thereto.

PART 3 - EXECUTION

3.01 Installation

A. All grounding system components shall be installed in accordance with the drawings, NEC, and the manufacturer’s recommendations and instructions.

B. Provide a separate grounding conductor in each raceway, securely grounded to equipment at each end of the raceway.

C. Contractor shall not cover or conceal any ground connections until the District or Engineer has established that every grounding connection conforms to the Drawings and Specifications. Contractor shall provide a form to sign off each grounding connection and shall obtain signature from either the District or the Engineer.

D. Electrical Equipment Grounding

1. Metal conduits shall be bonded together to the enclosure grounding bus.

2. Lightning arresters or suppressors shall be directly connected to the ground system using copper conductors sized in accordance with NEC requirements.

3. The secondary neutrals of transformers shall be directly connected to the ground system using copper conductors sized as per NEC or as indicated on the drawings.

4. All motors shall be grounded by bonding the grounding conductor within the raceway to the motor frame. Motors as shown on the drawings shall also have a supplemental grounding conductor bonded to the ground grid in the immediate area of the motor.
E. Each panelboard shall have a ground bus that is secured to the interior of the enclosure. The bus shall be equal to panelboard neutral bus amp rating and shall have adequate lug quantity of lugs. No more than two grounding conductors shall be installed per lug.

3.02 Field Quality Control

A. Performance Tests

1. The existing and new grounding system components shall be tested per this specification section.

2. The Contractor shall test each ground rod, ground mat and water pipe, structure or other major system grounding connection to determine the ground resistance. The grounding check shall be made by the "fall of potential" method utilizing a commercial ground test instrument such as the Biddle Model 593 "megger" ground check or the Associated Research Vibroground Model 225, or equal. A plot of ground resistance readings for each isolated ground rod or ground mat shall be submitted to the Resident Engineer. The current reference rod shall be driven at least 100 feet from the ground rod or grid under test, and the measurements shall be made at 10-foot intervals beginning 15 feet from the test electrode and ending 75 feet from it, all in direct line between the ground rod or center of grid and the current reference electrode.

3. Any grounding system that shows greater than 5 ohms resistance for the flat portion of the plotted data shall be considered inadequately grounded. The Contractor shall add additional parallel connected ground rods and/or deeper driven rods until the ground resistance measurements meet the 5 ohms requirement. Use of salts, water or compounds to attain the specified ground resistance is forbidden.

3.03 Fabrication

A. Corrosion Protection

1. Unless otherwise noted, all equipment and appurtenances provided under this section shall be treated with zinc phosphate, bonderized or otherwise given a rust-preventive treatment, then primed and painted with a durable enamel finish. Minimum dry film thickness shall be 3 mils. The Contractor shall ensure that all panels or enclosures specified to be painted in this section shall match in color Plymouth Rock Gray on all exterior surfaces and flat white on all interior surfaces. Nonconforming panels shall be repainted.

2. Field painting of all equipment shall conform to the procedure or outline in applicable sections of the specifications that specify painting and finishing.

3. Galvanizing, where specified, shall conform to the applicable division of the specifications. Galvanized equipment and appurtenances shall not be shop primed or painted but shall be field painted and touched up as specified and directed by the District.

B. Special Tools: The Contractor shall provide all special tools required for operation and maintenance of the equipment. The tools shall be considered as part of the product and become the property of the District.

3.04 Source Quality Control

A. Hazardous Locations: Provide materials and equipment acceptable to the regulatory authority having jurisdiction for the Class, Division, and Group of hazardous area indicated.
PART 4 - EXECUTION

4.01 Preparation
A. Maintain continuity of electric service to all functioning portions of the process or buildings during hours they are normally in use. Temporary outages will be permitted during cutover work at such times and places as can be prearranged with District and the electric utility company providing service to the facility. Such outages shall be kept to a minimum number and minimum length of time. Make no outages without prior written authorization of the District. Include all costs for temporary wiring and overtime work required in the Contract price. Remove all temporary wiring at the completion of the work.

4.02 Installation
A. For all areas designed as hazardous areas, install all materials and equipment in a manner acceptable to the regulatory authority have jurisdiction for the Class, Division and Group of hazardous area indicated.

B. Follow manufacturers' installation instructions explicitly, unless otherwise indicated. Wherever any conflict arises between the manufacturers' instructions, codes and regulations, and these Contract Documents, follow District’s decision. Keep copy of manufacturers' installation instructions on the jobsite available for review at all times.

C. Use appropriate conduit and conductor entry fittings with enclosures which maintain the specified enclosure environmental capability after proper installation.

D. Relocation or Removal of Materials and Equipment:
   1. For existing materials and equipment that are to be relocated, remove all materials no longer used such as studs, straps, conduits and wire. Where not required for use in the relocation, remove or cut off concealed or embedded conduit, boxes or other materials and equipment to a point at least 3/4-inch below the final finished surface.

   2. For existing materials and equipment that are to be removed, remove all materials no longer used such as studs, straps, conduits and wire. Remove or cut off concealed or embedded conduit, boxes or other materials and equipment to a point at least 3/4-inch below the final finished surface. Any equipment to be removed that is currently in working condition, shall be returned to the District unless otherwise noted in the Contract Documents.

   3. Repair affected surfaces to conform to the type, quality, and finish of the surrounding surface in a neat and workmanlike manner. Follow any specific instructions given under Division [9], Finishes. Utilize skilled craftsmen of the trades involved.

4.03 Field Quality Control
A. Each item of equipment provided as a part of this project shall be installed, aligned and tested by skilled workmen to the tolerances recommended by the equipment manufacturer. Provide
work which has a neat and finished appearance. Carry out work in accordance with NECA Standard of Installation unless otherwise specified.

B. Allow materials, equipment, and workmanship to be inspected at any time by the Engineer or the District. Correct work, materials, or equipment not in accordance with these Contract Documents or found to be deficient or defective in a manner satisfactory to the Engineer and the District.

C. Testing and Start-Up

1. General
   a. The Contactor shall furnish all labor, materials, instruments and tools to make all connections for testing. All electric power, fuel, water, supplies, and utilities required for all tests shall be provided by the Contactor.
   b. During checkout and startup of the various plant systems, provide a crew of skilled craftsmen to be available for checkout and troubleshooting activities as required by the District. Since coordination with other crafts and Contractors will often be required, the craftsmen assigned to checkout must be available outside normal working hours when necessary.
   c. All equipment shall be demonstrated as operating properly prior to the acceptance of the work.
   d. These tests shall be made in the presence of the District and the results will be recorded by the District. All deficiencies or unsatisfactory conditions, as determined by the District or inspecting authorities, shall be corrected by the Contactor in a satisfactory manner at the Contactor’s expense.

2. Protective Devices: All protective devices shall be properly set and operative during the testing period. Before testing and energizing a system, all necessary precautions shall be taken to ensure the safety of personnel and equipment. All conductors and all electrical equipment shall be properly insulated and enclosed. All enclosures for conductors and equipment shall be properly grounded. Insulation resistance measurements must have been made and approved on all conductors and energized parts of electrical equipment.

3. Inspection of Joints: Joints and connections in conductors No. 6 AWG and larger shall be inspected by the District after the joints have been made and prior to application of any tape.

4. Preliminary Testing: After the visual inspection of joints and connections and the application of tape and other insulating materials, all sections of the complete system of wiring shall be thoroughly tested for shorts and grounds. The Contactor shall correct all defects.

5. Insulation Resistance Tests:
   a. Wire and Cable: All wires and cables to be used as feeders, branch circuit wiring, control circuits and other wiring shall be tested with an insulation resistance tester rated 1000 volts D.C. and capable of measuring 2000 megohms or higher. Single-conductor wires and cable shall have a resistance to ground not less than 200 megohms, and conductors of multiple-conductor cables shall have a resistance to ground not less than 100 meg-ohm. Solid state device circuits shall not be meggered directly. Solid state devices shall be disconnected prior to resistance tests.
   b. Tests: The insulation resistance of each circuit phase-to-phase and phase-to-ground shall be measured for the following:
1) Motor feeders shall be measured with the motor disconnected.
2) Control circuits shall be measured with pushbuttons, interlocking relays, instruments, overcurrent devices, and the like connected.
3) Lighting feeders to panelboards shall be measured with the branch circuit breakers open.
4) The test shall be made with the branch breakers closed, and with receptacles and fixtures mounted, but before lamping.
5) Power feeders shall be measured with switches and circuit breakers in place.

6. Equipment Tests
   a. The following tests shall be performed
      1) The main bus and all power and control circuits shall be meggered.
      2) The wire terminals shall be checked and the connections shall be cleaned.
      3) All control switches, alarm devices, and indicating instruments shall be checked for proper operation under normal and simulated abnormal conditions.
      4) The thermal-overload heaters and the reset mechanism for each motor shall be checked.

7. Circuit Breakers: The following tests shall be performed:
   a. Inspect each circuit breaker.
   b. Check for loose connections.
   c. Operate each circuit breaker manually.
   d. Set the adjustable trips to the values specified.

8. Thermal Overload Protective Devices
   a. For each motor, the Contactor shall compile the following data in neatly tabulated form. Data shall be obtained from the equipment provided on the job:
      1) Equipment driven
      2) Nameplate amperes
      3) Service factor
      4) Overload device catalog number. Overload device current range and setting

4.04 Adjusting / Cleaning / Protection
A. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The District reserves the right to require minor changes in location of outlets or equipment, prior to roughing in, without incurring any additional costs or charges.
B. Throughout this Contract, provide protection for materials and equipment against loss or damage in accordance with provisions elsewhere in these Contract Documents. Throughout this Contract, follow manufacturers' recommendations for storage. Protect everything from the effects of weather. Prior to installation, store items in clean, dry, indoor locations. Store in clean, dry, indoor, heated locations items subject to corrosion under damp conditions, and items containing electrical insulation, such as transformers, conductors, motors, and controls.
Provide temporary heating, sufficient to prevent condensation, in transformers, switchgear, switchboards, motors, and motor control centers which do not have space heaters.

C. Following installation, protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation. When equipment intended for indoor installation is installed at the Contactor's convenience in areas where it is subject to dampness, moisture, dirt, or other adverse atmosphere until completion of construction, ensure that adequate protection from these atmospheres is provided that is acceptable to the District and the Inspector. Cap conduit runs during construction with manufactured seals. Keep openings in boxes or equipment closed during construction. Energize all space heaters furnished with equipment.

D. Cleaning and Touchup Painting: Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove all materials, scraps, and debris from premises and from interior and exterior of all devices and equipment. Touch up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency, and type of surface of the original finish. If extensive damage is done to equipment paint surfaces, refinish the entire equipment in a manner that provides a finish equal to or better than the factory finish, that meets the requirements of the Specifications, and that is acceptable to the District and the Inspector.

**END OF SECTION**
PART 1 - GENERAL

1.01 Summary
A. This Section specifies the work necessary to test, commission and demonstrate that the electrical work satisfies the criteria of these Specifications and functions as required by the Contract Documents.

B. The work of this Section includes furnishing the labor, equipment and power required to support the testing specified in other Divisions of these Specifications. Electrical testing specified herein, and functional testing of all power and controls. Instrumentation and Control shall be completed before commencement of plant start-up. This scope may require the Contractor to activate circuits, shutdown circuits, and run equipment, make electrical measurements, replace blown fuses, install temporary jumpers, etc.

1.02 References
A. NETA Latest Edition

1.03 Submittals
A. Test Reports and Procedures

1.04 Quality Assurance
A. The following test requirements are intended to supplement test and acceptance criteria that may be stated elsewhere.

1. Lighting:
   a. Switching, including remote control, as shown.
   b. Circuitry is in accordance with panel schedules.
   c. Lighting fixtures located to minimize obstruction of illumination by mechanical equipment or building structural elements.

2. Demonstrate mechanical and/or electrical interlocking by attempting to subvert the intended sequence.

3. Activate ground fault tripping by operating test features provided with ground current protective systems and by injecting a known, and reasonable, current in the ground current sensor circuit. In general, ground fault tripping should occur at a ground current equivalent to 20 percent of phase current. Current injection is not required of circuit 400 amperes or less.

4. Cable Testing:
   a. 480-volt circuits shall be tested for insulation resistance with a 2000-volt megohm meter.
   b. Testing shall be done after the 480-volt equipment is terminated.
c. Test results shall be submitted for review 30 days prior to plant operation and any system testing. Equipment which may be damaged during this test shall be disconnected.

d. Perform tests with all other equipment connected to the circuit. In order to be acceptable, the cable must withstand the test high voltage without breakdown, have steady or decreasing leakage current during the high potential test, and have satisfactory comparable megger readings in each megger test.

e. Test results shall be submitted to the engineer and shall state equipment used and time of test.

f. Cable testing and report submittal shall be performed by an organization sanctioned by the Manufacturer of the cable to be tested.

g. Testing shall verify the quality of cable terminations.

5. Test ground fault interrupter (GFI) receptacles and circuit breakers for proper operation by methods sanctioned by the receptacle Manufacturer.

6. A functional test and check of all electrical components is required prior to performing subsystem testing and commissioning. Components and equipment shall be cleaned as required by other provisions of these Specifications before commencement of functional testing. Functional testing shall comprise:

a. Visual and physical check of cables, buss work, circuit breakers, transformers, and connections associated with all new and modified equipment.

b. Setting of protective relays in conformance with results of the Protective Devices Coordination Study and testing of relays to assure that relays will operate at the current value and time required by the Study.

c. Circuit breakers which are specified with adjustable time or pick-up settings for ground current, instantaneous overcurrent, short-time overcurrent, or longtime overcurrent, shall be field adjusted by a representative of the circuit breaker Manufacturer. Time and pickup setting shall correspond to the recommendations of the Protective Devices Coordination Study. Setting shall be tabulated and proven for each circuit breaker in its installed position; test results shall be certified by the tester and transmitted to the Engineer (7 copies).

B. Subsystem testing shall occur after the proper operation of alarm and status contacts has been demonstrated or otherwise accepted by the Engineer and after process control devices have been adjusted as accurately as possible. It is intended that the Contractor will adjust limit switches and level switches to their operating points prior to testing and will set pressure switches, flow switches, and timing relays as dictated by operating results.

C. After initial settings have been completed, each subsystem shall be operated in the manual mode and it shall be demonstrated that operation is in compliance with the Contract Documents. Once the manual mode of operation has been proven, automatic operation shall be demonstrated to verify such items as proper start and stop sequence of pumps, proper operation of valves, proper speed control, etc.

D. Motor operated valves shall be tested after having been phased and tested for correct motor rotation and after travel and torque limit switches have been adjusted by a representative of the valve Manufacturer. Tests shall verify status indication, proper valve travel, and correct command control from local and remote devices.
E. Start-up commissioning shall not be attempted until all subsystems have been found to operate satisfactorily. Start-up shall only be attempted as a function of normal plant operation in which plan process flows and levels are routine and equipment operates automatically in response to flow and level parameters shall be considered only upon receipt of a written request by the Contractor.

F. The motor current tabulation required by Section 16011, "Short Circuit and Coordination Report", shall reflect the values occurring during start-up. The indications of all switchboard ammeters and kilowatt meters shall be recorded every half-hour during commissioning.

PART 2 - (NOT USED)

PART 3 - EXECUTION

3.01 Field Quality Control

A. Conductors Field Test, Conductors Rated 600 Volts or Less:

1. Perform insulation resistance testing of all power and control circuits 600 volts and less with a 2000-volt megger.

2. Prepare a written test report of the results and submit to the Engineer prior to final inspection.

3. Minimum acceptable value for insulation resistance is 100 mega-ohm.

4. Disconnect equipment that might be damaged by this test. Perform tests with all other equipment connected to the circuit.

5. Conductors Field Test, Instrumentation Cables

6. After instrumentation cable installation and conductor termination by the instrumentation and control supplier, perform tests witnessed by the Engineer to ensure that instrumentation cable shields are isolated from ground, except at the grounding point. Remove all improper grounds.

B. Motor Control, Factory Tests:

1. The motor control centers and their components shall be given manufacturer's standard electrical and mechanical production tests and inspections with complete test reports; submitted to the Engineer for approval. These tests shall be conducted in conformance with the requirements of IEEE, NEMA, UL and ANSI Standards. The results of tests shall verify that the complete motor control centers with their components comply with all performance requirements specified.

2. As a minimum, motor control centers and their components shall be subjected to the following tests.

3. All motor control centers shall be tested in accordance with NEMA ICS-2.

4. Production dielectric tests on motor control center assemblies shall be made at the power frequency in accordance with NEMA ICSI-109.

5. Motor control center performance tests shall meet the requirements of NEMA ICS 2-324.
6. Mechanical operation tests to assure proper functioning of components and the interchangeability of all identical components and plug-in modules within and between motor control centers.

7. Each motor control center shall be given factory standard inspection and tests which shall include, but not be limited to electrical continuity check, dielectric tests for each circuit and inspection for proper functioning of all components, including control protective, monitoring, metering, and alarm devices.

8. All system components shall be tested in accordance with the procedures and requirements of the following standards; NEMA SG-2, NEMA FU-1, NEMA ICS-2, and ANSI-C37.20.

C. Motor Control, Field Tests:

1. Functional Test: Prior to plant startup, all equipment shall be inspected for proper alignment, proper connection, proper operation of control and instrumentation, proper rotation, and satisfactory starting operation of the indicated motor.

2. Test all starters for proper contactor action, proper interlocks and permissive operation, and proper indication prior to applying power to motor.

3. Approval of Engineer prior to energizing motors is required;

4. All functional and field tests are required to be performed in the presence of the Engineer or Owner's Representative.

5. Transformers, Field Tests

6. No equipment is to be energized until testing has been completed to the satisfaction of the Engineer. The following minimum tests and checks shall be made before the transformers are energized:
   a. Insulation resistance tests shall be performed between each winding to every other winding, and to ground.
   b. Insulating oil shall be sampled. Sample shall be laboratory tested for:
      1) Moisture Content
      2) Dielectric strength
      3) Acid neutralization
      4) Interfacial tension
      5) Color
      6) Power Factor
      7) Moisture Content
      8) Winding resistance test results shall compare within 1% of the design value
      9) AC high-potential test voltage shall not exceed 75% of the factory test voltage for a one minute duration. Evaluation shall be on a go/no-go basis, per ANSI C57.98.
      10) Impedance test results shall be within +7.5% of design value for 2-winding transformers

D. Uninterruptible Power System, Factory Tests
1. The UPS shall be tested in accordance with the following test procedures. A test report showing that the equipment has passed the factory tests and has demonstrated the capability to support the load, as required by this specification, shall be available promptly after completion of the tests. A test battery shall be available for assuring proper operation of the UPS with a battery.

2. System Log: Establish a log to record all tests performed and results, and record any failures and corrections made during test, should any occur.

3. Visual Inspection:

4. Check for all Quality Assurance Stamps

5. Inspect Interior

6. Dielectric Tests:

7. Check for charger shorts

8. Check for dc shorts

9. Efficiency Test: Measure module efficiency by dividing inverter output power by the charger input power with a fully charged battery connected and float charger. Verify compliance with specifications under the following loads:

10. Half load, 1.0 power factor

11. Full load, 1.0 power factor

E. Uninterruptible Power System, Field Tests

1. Demonstrate that upon finish of initial charge, and after having been on float charge for at least 72 hours, that individual cells, or monoblocks (each individual battery), are within the manufacturer’s specifications.

2. Demonstrate that the DC bus is supplying voltage within manufacturer’s specifications and is compatible with battery manufacturer’s specifications.

3. Demonstrate the external bypass switch removes the UPS from the system without dropping out any loads.

4. Same as #3 above with the internal bypass switch.

5. Demonstrate the UPS will remain on line for a minimum of 8 hours under full load conditions without tripping to static bypass.

6. Demonstrate, upon removal of AC input power, the UPS will power all UPS loads automatically, without interruption.

7. Measure the run time of the UPS, with loss of AC input power, under full rated load conditions until lower battery limit is reached. This time shall comply with battery size and rating. If connected load is less than UPS full rated load Contractor shall provide external loads.

8. ELECTRIC MOTORS


**END OF SECTION**
PART 1 - GENERAL

1.01 Summary:

A. Scope: General requirements for Instrumentation and Control System (ICS) design, procurement, delivery, and implementation as shown on the Contract Drawings (Drawings) and as specified in these Specifications.

B. The Contractor shall provide System Integrator services. The System Integrator will assemble, configure, prepare submittal material and prepare Operations and Maintenance Manuals all of the components that make up the ICS. In addition, the System Integrator will assemble, configure, prepare submittal material and prepare Operation and Maintenance Manuals for the Electrical and Control Panels. The System Integrator shall conduct associated Factory Acceptance Testing, Site Acceptance Testing, Protective Device Coordination Study & Arc Flash Analysis and programming.

C. Interpretation of Drawings

1. General: Any error or omissions of details in either the Drawings or Specifications shall not relieve the System Integrator from correctly installing all materials necessary for a complete and operating ICS.

2. Site Verification: The System Integrator shall inspect the project site and verify all measurements and conditions and shall be responsible for the correctness of final installation. No extra compensation will be allowed because of differences between work shown on the Drawings and measurements at the site.

3. Drawings: The Instrumentation Drawings are diagrammatic, but shall be followed as closely as existing conditions and work of OTHERS will permit. All deviations from the Drawings required to make the work conform to structures as constructed, and to the work of OTHERS, shall be made at the System Integrator's own expense.

4. Coordination: The System Integrator shall examine the architectural, structural, mechanical and manufacturer's drawings for all equipment to coordinate and determine the exact routing and final terminations of all conduits and cables. Conduits shall be stubbed up as near as possible to equipment enclosure.

5. Accessibility: The Drawings do not show the exact locations of equipment. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The District reserves the right to require minor changes in location of outlets or equipment, prior to roughing in, without incurring any additional costs or charges.

D. Manufacturer's Directions

1. Manufacturer's directions shall be followed in all cases where manufacturers furnish instructions covering points not shown on the Drawings or specified in these Specifications.

E. Inspection

1. The System Integrator and Contractor shall cooperate with the Construction Manager and shall provide assistance at all times for the inspection of the instrumentation work. Remove covers, or perform any reasonable work, which in the opinion of the Construction Manager will be necessary to determine the quality or adequacy of the work.

2. If any material does not conform to these Specifications the Contractor shall, within three (3) days after being notified by the Construction Manager, remove the materials from the premises.
3. Work shall not be closed in or covered before inspection and approval by the Construction Manager. Cost of uncovering and making repairs where un-inspected work has been closed in shall be borne by the Contractor.

F. Cooperative Work with Others

1. The System Integrator and Contractor shall cooperate with others, with due regard to their work, towards promotion of rapid completion of project. If any cooperative work must be altered due to lack of proper supervision of such, or failure to make proper provision in time by System Integrator or the Contractor, then it shall bear expense of such changes as necessary to be made in work of others.

2. Labor and materials, including templates, sleeves, anchors, concrete inserts and the like shall be furnished in ample quantities at such times as necessary to ensure uninterrupted progress of work.

3. The Contractor shall cease work at any particular point temporarily and transfer its operations to such points or execute such portions of work as directed, when in the judgment of the Construction Manager it is necessary to do so.

G. Quality of Materials

1. All instrumentation components used on this project shall be new and free from defects.

2. All instrumentation components used on this project shall conform where applicable, to the Codes and Standards in Section 1.02, References.

3. Each type of material shall be of the same manufacturer and quality throughout the work.

H. Substitutions

1. No substitutions shall be allowed unless specifically noted as "or equal" or as "or approved equal." Specific brand names and catalog numbers are used to describe materials in order to establish standards of performance and quality.

2. The decision of the Engineer or Construction Manager shall govern as to what is equal to the item specified. Equality will be judged on the basis of the following:
   a. Conformance to description or performance required
   b. Equality in quality
   c. Comparable in appearance and artistic effect where these are considerations
   d. Comparable operation, maintenance and performance
   e. Equal in longevity and service under conditions of climate and usage
   f. Conformance with space allocations and requirements for operations from mechanical or electrical services provided without necessitating changes in details and construction or related work

3. If the Engineer considers it necessary, tests to determine the quality of the proposed materials shall be made, at the expense of the Contractor, by an unbiased laboratory, satisfactory to the Engineer.

4. Any material, article, or method judged by the Engineer equal to that specified will be approved, provided the Contractor submit a single written request, in triplicate, to the Construction Manager, within 30 days after contract award, with the following information for each item:
   a. Complete data substantiating compliance of proposed substitution with Contract Documents.
b. Product Identification including trade or brand name including type, model, style, and/or catalog number

c. Manufacturer's literature marked to indicate specific model, type, size, and options to be considered

d. Size or capacity rating

e. Names and addresses of a minimum of three (3) references for similar installations to this Contract

f. Manufacturers’ statements that proposed products are equal or superior in all respects to that specified.

5. The System Integrator assumes full responsibility for including complete and correct data in its request for substitution. The System Integrator shall also attach complete referenced diagrams and technical data sheets for the Engineer's review and determination of equality or suitability of any substitution item. Only one such request may be submitted. The Engineer's rejection of any substitute shall automatically require the System Integrator furnish the specified item without further discussion or delay.

1.02 References

A. General: The work shall comply with the most recent Codes and Standards as published at the date of the Contract and as listed in the Specifications.

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<thead>
<tr>
<th>Reference</th>
<th>Title</th>
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<tr>
<td>NFPA 70</td>
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<td></td>
<td>Local Mechanical and Electrical Codes</td>
</tr>
<tr>
<td></td>
<td>Any additional codes effective at the job site</td>
</tr>
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</table>
B. Additional Requirements: The System Integrator shall furnish without extra charge any additional material and labor which may be required for compliance with these laws, rules, and regulations, even though the work is not mentioned in the Specifications or shown on the Drawings.

1.03 System Description

A. General: Furnish all necessary labor, materials, equipment and incidentals required to install a complete and operational Instrumentation and Control System in accordance to the intent of these Specifications and Drawings.

B. Itemized Work: The following list shall be considered major work items, but not an inclusive and complete description of the scope of work. The Drawings in conjunction with the Specifications shall be used to determine the complete ICS work. The general scope of work includes the furnishing, installing, programming, testing, and commissioning of the following items:

1. Instrumentation and Control System. This Item includes:
   a. Programming and configuration of the existing Programmable Logic Control (PLC) systems, Communication system.
   b. Programming and configuration of the new instruments.
   c. Establish communication with existing Control and SCADA systems.
   d. Coordination with the District to integrate new control system to existing Control and SCADA systems.
   e. The District shall provide software modification of existing PLC and SCADA system.

2. Coordination with vendors or subcontractors (others) to interface with the control systems provided by others. This Item includes all interconnection wiring required for interfacing with such control systems to the pump station PLC as shown on the contract drawing P&IDs.

3. All supports, bases, anchors, sleeves, hangers, conduit seals, and the like.

4. Shop Drawings and Operation and Maintenance (O&M) manuals.

5. Control Panels including all control components required for proper operation of the control system.

6. All power supplies, transformers, pushbuttons, pilot lights and selector switches.

7. Instrumentation system including but not limited to level transmitters, level switches, and flow meters.

8. Interconnection wiring diagrams.

9. Factory Acceptance Tests

10. Site Acceptance Tests

11. Throughout this Contract, provide protection for materials and equipment against loss or damage in accordance with provisions specified elsewhere in these Specifications.

12. Throughout this Contract, follow manufacturer’s recommendations for storage. Protect everything from the effects of weather. Prior to installation, store items in indoor locations that are clean and dry. Items that are subject to corrosion under damp conditions and items containing electrical insulation, such as control panels, conductors, instrumentation and controls, shall be stored in clean, dry, indoor, heated locations. Energize all space heaters furnished with equipment. Provide temporary heating, sufficient to prevent condensation, in control panels, and instrumentation which do not have space heaters.

13. Following installation, protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation. Energize all space heaters furnished with equipment.
1.04 Submittals

A. General: Submittals for all ICS equipment shall be prepared and submitted in accordance to Section 01340 and as described herein.

B. Requirements: The submittal package for each individual equipment or groups of related equipment shall include all the required data and information and shall be complete. As a condition to the review of submittals required under these specifications, the System Integrator shall furnish the manufacturer’s statement for the equipment accepting the unit responsibility. The purpose of this provision is to ensure compatibility of all components specified under the specific Technical Specifications; and to provide sole source responsibility for system performance and maintenance. Notwithstanding these provisions, however, the System Integrator is not relieved of his responsibility for the indicated portions of the work. The following submittal data shall be provided for each item of equipment. Additional data specific to individual equipment specified under individual Specifications shall be submitted in addition to the following.

C. Contract Drawings: The Drawings are generally diagrammatic unless detailed or dimensioned. Structural conditions, physical interference and locations of terminations of equipment shall govern the exact locations and routing of wiring, conduit and pipe. The Contractor and System Integrator shall examine the architectural, structural, mechanical, electrical and instrumentation plans and shop drawings for the equipment to determine the exact routing and final terminations of conduit, cables and pipes. Conduits and pipes shall be stubbed as near as possible to equipment terminals.

D. Deviations from Specifications: Should the System Integrator's proposed system specifications deviate from these Specifications, such deviation shall be documented and submitted to the Engineer for approval. All deviations shall be stated on the submittal transmittal sheet.

E. Organization and Binding of Submittals: The initial and subsequent submittals of drawings and data for review shall be organized and bound so that eventually they may be used as guides for preparing the required maintenance manuals. The submittal shall be organized in three (3) parts, not including preliminary administrative material such as table of contents, as follows:

1. Part 1 shall consist of a series of sections, one for each process control system. Each section shall be divided by a tab and shall include the material specified below.

2. Part 2 shall include outline dimension drawings for panels, cabinets, consoles and the like, as specified below.

3. Part 3 shall include data on miscellaneous parts and accessories not included in Part 1.

F. Data Sheets: Data sheets shall be in a standardized format and shall include the following:

1. Components name used herein and on the drawings,

2. Manufacturer’s model number or other product designation,

3. Project tag number,

4. System of which the component is a part,

5. Location or assembly at which the component is to be installed,

6. Input and output characteristics,

7. Scale range and units (if any) and multiplier (if any),

8. Requirements for electric supply (if any),

9. Requirements for air supply (if any),

10. Materials of component parts to be in contact with, or otherwise exposed to, process media,

11. Reference to manufacturer's descriptive technical bulletin or brochure,
12. References to other features so that all specified features are stated on the data sheet,

13. Following each data sheet, a technical product bulletin, or brochure (or clear photocopy thereof) shall be inserted; this shall provide amplifying technical information on the construction, characteristics, and capabilities of the component described in the related data sheet. Elaborate and extensive technical details shall not accompany these bulletins. All bulletins shall be of the most recent issue,

14. Part 2 of the submittal shall include outline and dimension drawings for all enclosed assemblies including cabinets, panels, consoles and the like. These drawings shall show the arrangements of panel-mounted and internally mounted components to scale and shall include enough details to clearly establish the style and overall appearance of each assembly, and

15. Part 3 of the submittal shall consist of a series of data sheets for accessory components together with supporting catalog pages or bulletins (or clear photocopies thereof). These shall be arranged in a logical sequence and shall cover such items as:
   a. Control circuit devices, components and wiring
   b. Pneumatic components, fittings and tubing

16. Operation and Maintenance Manuals
   a. Content: A set of manuals shall include all the drawings and required data and shall be organized and bound as specified for the review submittals. These drawings and data shall be supplemented with installation, connection, operation, troubleshooting, maintenance and overhaul instructions in complete detail. This shall provide the District with comprehensive information on all systems and components to enable operation, service, maintenance and repair. Exploded or other detailed views of all instruments, assemblies and accessory components shall be included together with complete parts lists and ordering instructions.
   b. Format: In addition to the requirements set forth elsewhere, the O&M manuals shall consist of at least the following:
      1) Table of contents,
      2) Manufacturer’s or its representative’s contact information,
      3) Equipment complete model number for ordering,
      4) Spare parts with model numbers,
      5) Special tools with model numbers,
      6) System block and schematic diagrams,
      7) Component schematic diagrams, and
      8) Written step-by-step operating, troubleshooting and calibrating instructions for each of the systems and each of the components of each system

1.05 Quality Assurance

A. Performance and Design Requirements
   1. Manufacturer’s Qualifications: The equipment furnished under this division shall be the product of firms regularly engaged in the design and manufacture of the type of item specified, possessing the required technical competence, skill, resources and ability to complete the work specified herein with the requisite degree of quality in a timely and efficient manner. The Contractor shall be prepared to adequately document the qualifications of the manufacturers nominated to provide the equipment specified under this division. All documentation shall be submitted to the District prior to design fabrication and shipment of any component specified
herein. Nothing contained within these provisions shall be construed as relieving the Contractor of his responsibility for any portion of the work covered by this Section.

2. Arrangement: The drawings are generally diagrammatic and the location of instruments and control panels are approximate unless detailed or dimensioned. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences and the location of electrical terminations on equipment.

3. The Contractor shall examine the structural and mechanical plans and shop drawings for the various equipment to determine exact routings and final terminations for all raceways and cables. Conduits shall be stubbed up as near as possible to field instruments and shall be within the concrete base for the equipment or a separate concrete curb.

4. All conduit, instruments and control panels shall be installed in such a manner as to avoid all obstructions and to preserve head room and keep openings and passageways clear. Control Panels, metering, transmitters and similar items shall be located within finished rooms, as shown. Where the Drawings do not indicate exact locations, the Contractor shall submit proposed locations to the Engineer for review. Where equipment is installed without instruction and must be moved, it shall be moved without additional cost to the District.

5. All work, including installation, connection, calibration, testing, and adjustment, shall be accomplished by qualified, experienced personnel working under continuous, competent supervision. The completed installation shall display competent work, reflecting adherence to prevailing industrial standards and methods.

6. Allowance has been made in the design for the number of raceways, cables and conductors considered adequate for feeding the various instruments and control panels. These circuits and diagrams are based on available data pertaining to the particular design of equipment and portray the systems, which the District has chosen to effect the required operation and level of control. Equipment provided by the Contractor (even though of the make and model specified) may differ in detail, arrangement, or connections from that shown. If the Contractor uses equipment which differs from the equipment shown in major aspects and requires modifications to power, control or other electrical service, the District's acceptance of the equipment will be based upon the Contractor providing the modifications required, and they shall be of the same quality as shown and shall be provided at no additional cost to the District.

7. Protection of Equipment and Materials: The Contractor shall provide adequate means for and shall fully protect all finished parts of the materials and equipment against damage from any cause during the progress of the work and until acceptable by the District.

8. All materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. All moving parts shall be kept clean and dry.

9. The Contractor shall replace or have refinshed by the manufacturer, all damaged materials or equipment, including face plates of instruments and control panels, at no expense to the District.

10. Tests: The Contractor shall make all tests required by the District or other authorities having jurisdictions as per applicable standards. All such tests shall be performed in the presence of the District. The Contractor shall furnish all necessary testing equipment and pay all costs of tests, including all replacement parts and labor necessary due to damage resulting from damaged equipment or from test and correction of faulty installation. Operational testing shall be performed on all equipment furnished and/or connected in other Sections of Division 16. Electrical and all other divisions specifying electrical items including furnishing of support labor for testing.
11. Standard test reports for mass-produced equipment shall be submitted along with the shop
drawing for such equipment. Test reports on testing specifically required for individual pieces
of equipment shall be submitted to the District for review prior to final acceptance of the
project.

12. Any test failure shall be corrected in a manner satisfactory to the District

13. The Contractor shall furnish without extra charge any additional material and labor which may
be required for compliance with these laws, rules, and regulations, even though the work is not
mentioned in these particular specifications or shown on the drawings.

14. The Contractor shall apply and pay for all permits required by any of the legally constituted
public authorities for the installation or construction of the work included under this Division.
The Contractor shall arrange and pay for any inspections or examinations so required and
deliver certificates of all such inspections to the District. When these specifications call for
materials or construction of a better quality or larger sizes than required by the above
mentioned rules and regulations, the provisions of the specifications shall take precedence.

1.06 Delivery, Storage, and Handling

A. Throughout this Contract, provide protection for materials and equipment against loss or damage
in accordance with provisions elsewhere in these Contract Documents. Throughout this Contract,
follow manufacturer's recommendations for storage. Protect everything from the effects of
weather. Prior to installation, store items in clean, dry, indoor locations. Store in clean, dry,
indoor, heated locations items subject to corrosion under damp conditions, and items containing electrical
insulation, such as instruments, conductors, and control panels. Energize all space heaters
furnished with equipment. Provide temporary heating, sufficient to prevent condensation, in control
panels which do not bare space heaters.

B. Shipment: The major equipment items listed in this provision and furnished under this contract
shall be shipped in sealed, weather-tight, enclosed conveyances in a manner designed to protect
the equipment against damaging stresses during transport.

C. Inspection

1. The Contractor shall cooperate with the District and shall provide assistance at all times for the
inspection of the electrical work. Remove covers, operate machinery, or perform any
reasonable work which, in the opinion of the District, will be necessary to determine the quality
or adequacy of the work.

2. If any material does not conform to these specifications, the Contractor shall, within three days
after being notified by the District, remove the materials from the premises.

3. Work shall not be closed in or covered before inspection and approval by the District. Cost of
uncovering and making repairs where un-inspected work has been closed in shall be borne by
the Contractor.

1.07 Project / Site Conditions

A. The ICS shall be installed in a water treatment facility which will be subjected to environmental
conditions where temperatures may vary from 10 degrees F and 115 degrees F; relative humidity
may vary from 10 to 100 percent; and trace quantities of moisture and dust may be present.
PART 2 - PRODUCTS

2.01 Manufacturers

A. These specifications describe equipment of a specific manufacturer and are not designed to limit competition. Unless noted as a "sole source," "no or equal," or "no substitutions allowed"; the naming of the manufacturer on which the specifications and plans are based is not an endorsement of that manufacture, but is instead intended to describe a level of quality and demonstrate the functionality of the system.

1. If an equipment is noted at "sole source;" "no or equal;" or "no substitutions allowed"; then that equipment is currently used elsewhere in San Juan Water District facilities as a District Standard.

B. The ICS components specified in these Specifications and shown on the Drawings are based on the use of equipment, devices and panels manufactured by the companies specified in the following Sections of these Specifications.

C. The use of substitute or "or approved equal" equipment will be considered. Such equipment will be acceptable only on the basis that any revisions in the engineering, design and/or construction of the structure, piping, appurtenant equipment, electrical work, etc., required to accommodate such a substitution, shall be made at no additional cost to the Owner.

2.02 Equipment and Materials

A. All furnished ICS components shall be as specified in these Specifications. Equals or exceptions shall be approved by ENGINEER prior to procurement.

B. All products shall be new and approved for the specific applications shown on Contract Drawings or specified in these Specifications.

C. Same products shall be of a single manufacturer.

D. Products installed in classified areas shall be approved for that classification and meet all the pertinent Standards and Code requirements. Classified areas are indicated on the Drawings.

E. Float Switches

1. Type
   a. Mercury free float switch.

2. Function/Performance
   a. Differential: Less than 8 inch.
   b. Switch Rating: 13 amps at 120/240 VAC
   c. Provide NO or NC type contact for fail-safe operation or as shown on the Drawings.

3. Physical
   b. Totally encapsulated switch.
   c. Cable shall be heavy-duty, PVC or equivalent jacketed integral to float.

4. Options/Accessories Required
   a. Provide stainless steel hardware.
   b. Lead wire shall be a waterproof cable of sufficient length so that no splice or junction box is required.
5. Manufacturer(s)
   a. Warrick Controls Model MYELXXW, no equal.

6. Schedule:

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<th>Drawing Reference</th>
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<td>E252</td>
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<td>LSH-152</td>
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<tr>
<td>LSL-151</td>
<td>Level Low Cutout</td>
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F. Ultrasonic Level Measurement:

1. General
   a. The non-contact ultrasonic measurement system is to have the capability to measure level, volume, open channel flow, and control up to 2 pumps.
   b. Auto-mapping software shall continuously scan, monitor and automatically map out all false echoes.
   c. Integrated keypad and display.
   d. A PC software program shall be available to allow viewing of raw echoes, auto masking interpretation, and programming.

2. Transceiver Specification
   a. Power: 18 – 36V DC.
   b. Relay Outputs: 3 Form “C” (SPDT) relays rated 5A at 240V AC.
   c. Outputs: 0/4 - 20 mA configurable as flow, head, level, volume, distance, space, upstream level, or downstream level.
   d. Certification: Available with UL / CuL certification.
   e. Display: Back lit LCD, 6 digit display of level, volume, flow and 8 digit totalizer.
   f. Electronics Temp: -4°F to +140°F (-20°C to +60°C)
   g. Enclosure Rating: Provide a Fascia mount for mounting in the control panel.
   h. Programming: Integral keypad, PC software or handheld programming
   i. The programming of the microprocessor shall be an “Easy Prompt” menu-driven system for quick start-up calibration.
   j. The microprocessor shall provide 24V DC to the transducer.

3. Transducer Specification
   a. Range: 1 ft to 10ft
   b. Transducer Temp: minimum of -22°F to +176°F (-30 to +80°C)
   c. Beam Angle: The ultrasonic pulse will produce a focused 3° Effective Beam Angle to the monitored surface,
   d. Enclosure Rating: NEMA 6P.
   e. Enclosure Material: PVDF version for harsh chemical environments,
f. Return Echo: A digital current signal *(for eliminating electrical noise)* and returned back to the microprocessor for signal processing,

g. Area Classification: FM: Class 1, DIV 1 as standard, with the option of an Intrinsically Safe alternative transducer where deemed necessary. (Transceiver should always be mounted outside the hazardous area)

h. Splicing with a twisted shielded pair will not affect the system performance.

i. The ultrasonic pulse will produce a focused 3° Effective Beam Angle to the monitored surface.

j. The return echo is to be converted into a digital current signal *(for eliminating electrical noise)* and returned back to the microprocessor for signal processing.

k. The system transducer must be certified for FM: Class 1, DIV 1 as standard, with the option of an Intrinsically Safe alternative transducer where deemed necessary. (Transceiver should always be mounted outside the hazardous area)

4. Application Specific Performance

   a. Level or Volume:
      1) Accuracy: 0.25% of range or 0.24 inches (6mm), whichever is greater.
      2) Resolution: 0.1% of span or 0.08 inches (2 mm), whichever is greater.
      3) Complete with all built in vessel volumetric calculations.

   b. Open Channel Flowmeter:
      1) Accuracy: +/-0.04 inches (1mm)
      2) Resolution: 0.02 inches (0.5mm)
      3) Optional data logging module & software that logs up to 100,000 flow records.
      4) Complete with all built-in flow calculations including the K factor and Exponent.

5. Pump Controller:

   a. Accuracy: 0.25% of range or 0.24 inches (6mm), whichever is greater.

   b. Resolution: 0.1% of span or 0.08 inches (2 mm), whichever is greater.


   d. Control up to 3 pumps, 3 alarms, or a mixture of 3 pumps and alarms.

6. Signal Processing

   a. Auto-mapping software shall continuously scan, monitor and automatically map out all false echoes.

   b. The microprocessor shall use a signal processing to select and verify the true echo using the following algorithms:
      1) First echo: The first validated echo.
      2) Largest echo: The largest (tallest) validated echo.
      3) Amplification: An electronic amplification or gain shall be applied to all echoes past the breakpoint and proportional to the distance from the transducer. Thus, the further the distance, the larger the gain applied breakpoint.
4) Echo Movement: The echo moving in a linear fashion shall be monitored and tracked closely.

7. Manufacturer
   a. The continuous ultrasonic level system shall be a Endress & Hauser FMU90 Transceiver (controller) with a FDU91 transducer (sensor) with submergence shield. No substitutes allowed.

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<th>Process Stream</th>
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<td>Lift Station Well Level</td>
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<td>E253</td>
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PART 3 - EXECUTION

3.01 Installation
   A. Field instruments shall be mounted on 2-inch pipe stands unless shown adjacent to a well or otherwise noted. Instruments attached directly to concrete shall be spaced minimum two inches from the mounting surface by use of phenolic spacers or framing channel. Expansion shields or cast-in-place inserts shall be used for securing equipment or supports to concrete surfaces. Unless otherwise noted, field instruments shall be mounted between 48 and 60 inches above the floor or work platform. All instruments shall be installed so that taps, parts, and the like, are available for in-place calibration and test without removal.

   B. Flow Meter Transmitters –Future Flow Transmitter shall be panel mounted in Lift Station Control Panel.

   C. Level Transmitters –Level Transmitter shall be panel mounted in Lift Station Control Panel

3.02 Field Quality Control
   A. Tests and Instrument Calibration
      1. Individual Component Calibration: Each instrument and final element shall be field calibrated in accordance with the manufacturer’s recommended procedure.

      2. Loop Tests: Each instrument loop shall be treated as an integrated system. This test shall be designed to verify that all components within the loop operate correctly and that the loop functions correctly.

      3. Notify District in writing 48 hours in advance of testing for witness by District Inspector.

      4. Submit written report of testing results to District

   B. System Start-Up
      1. General: When all systems and components have been successfully calibrated and tested, a date for the Plant start-up involving the District shall be scheduled and agreed upon.

      2. Procedure: The ICS shall be rechecked to verify proper operation. Final adjustments shall be made as required.

      3. Report: Provide a written report to the Engineer verifying the operation of the ICS. Note any problems or concerns in this report.
C. Operator Training

1. General: Operator training shall be provided for the ICS after the System Startup has been successfully executed.

2. Format: The Plant operating personnel shall be instructed in the functions and operation of each system and shall be shown the various adjustable and set point features which may require readjustment, resetting, or checking and re-calibration by them from time to time. The O&M manuals in addition to the System Integrator’s prepared materials shall be used for this training.

3.03 SCADA System, PLC Strategies:

1. The SCADA system is an existing system that will be modified by the designated CIP. The CIP shall modify the existing SCADA program including the SCADA Screens to integrate the SCADA and PLC programming requirements associated will implementing SCADA features of Lift Station specified hereinafter.

2. The SI shall program the PLC and run dry tests and simulations to confirm implementation of all control strategies.

3. CIP shall program the existing SCADA for remote ‘Manual Control’ and ‘Auto Control’ of the Lift Station processes and equipment.

4. CIP shall program the existing SCADA for monitoring status and alarms of the Lift Station processes and equipment.

5. Automatic control of the Lift Station processes and equipment shall be selectable from either SCADA or the Local Control Panel CP-LS.

3.04 Control Strategy

A. Basic Operating Control Strategies:

1. The following “Control Strategy” descriptions define the key features associated with the Lift Station controls, status and alarms. These control strategies provide the System Integrator and CIP with an overview of the operation parameters that shall be implemented in design of the PLC programs and existing SCADA graphics.

2. These control strategies in conjunction with the Control Diagrams and P&IDs provide the System Integrator the required information to design the Control Panel, and other associated control circuits.

3. The SI shall confirm that the hardware necessary to implement these control strategies are in place and can be implemented via the I/O structure of the PLC.

B. Motors:

1. Where the P&IDs define that a motor load is controlled by a PLC, all of the status and alarm functions shall be displayed on the SCADA screens. Both a PLC automatic based control strategy and a manual overall control via SCADA shall be provided for each motor. All setpoints shall be accessible and modifiable via SCADA screens.

C. Lift Station Alarms:

1. Equipment failure, low-low state, low state, high state, high-high state, communications failures, normal power failures shall be shown on the SCADA screens.

D. Lift Station Status and Controls:

1. All instrumentation analog values, in actual engineering units shall be accessible from the SCADA screens.
2. Equipment and process status and alarms shall be accessible from the SCADA screens.

E. Instrumentation:

1. Where the P&IDs show that an instrumentation is monitored by the PLC, all status and alarm functions shall be displayed on the SCADA screens.

2. All instrumentation having an analog value shall have a PLC based High-High, High and Low alarms that can be monitored by SCADA. Each alarm shall have a PLC-based set point that can be adjusted via SCADA. Each alarm shall have a means to be enabled or disabled via SCADA and Local Control Panel.

3. All instrumentation having an analog value shall be trended historically and shall be available for staff to trend and perform analysis via the SCADA.

F. Control Strategy – Lift Station

1. The Lift Station will be a duplex alternating pump system using two (2) equally sized Full Voltage Starters for pump control.

2. The pumps shall be programmed to alternate operation.

3. When the first pump is called to run, the pump will start and run its normal cycle.

4. The level transmitter shall start and stop the pumps during normal operations via the local CP-BWPS PLC.

5. The level switches shall operate the pumps should the level transmitter or the local PLC fail. The pumps will start with the High Wetwell Level (HWL) and stop with the Low Level Wetwell Level (LLWL). A failure alarm shall be indicated on the Control Panel CP-LS when the High-High Wetwell Level has been initiated. This operation scheme provides Hardwired Backup controls to ensure that the wetwell will not be flooded.

6. The LLWL also designated as Low Level Cutout, shall stop the pumps in both automatic control and manual control to prevent pump cavitation.

7. The PLC/SCADA and Local Control Panel CP-LS shall show flow data including instantaneous, non-resettable total, resettable total, current day, and previous day flows.

8. The pumps may be monitored and controlled locally or remotely through SCADA.

9. The Control Panel CP-LS shall have an entry alarm with spring wound timer and operator reset.

G. Control Strategy – SCADA

1. General: The existing SCADA system provides communications to the various remote sites and shall be modified to add the new PLC based control system as described in these specifications. Modifications to the SCADA and the CP-BWPS PLC will be provided by the CIP.

2. SCADA Screens
   a. Overview1: Revise the existing SCADA screens to include the new control system for the Lift Station.
   b. SCADA Screens: Create new SCADA screens that will be used to control and monitor the various operations associated with the new Lift Station control and monitoring processes. The following minimum features shall be provided on the new SCADA Screen:
      1) Provide a graphical display of the Lift Station that also shows the piping and process relationships per the Contract Drawing P&IDs.
      2) Lift Station Wet Well:
a) Wet Well Level including Common Alarm
b) Wet Well Level Float Alarms – High-High and High Alarms

3) Pumps Status and Alarms for P-110 and P-120:
   a) Run Status
   b) Stop Status
   c) Pump Failure
   d) Pump Selector Switch in Automatic
   e) Pump Selector in Hand

4) Lift Station Flow

   c. Maintenance Alarm Bypass System
      1) On/Off Command
      2) Maintenance Alarm Bypass Status – On/Off
      3) Alarm Bypass Timer Setpoint

3. SCADA Pop-Up Screen – Lift Station Control Folder

   a. Page “A” – Pumps: This page will provide primary control, status, and alarms associated with the pumps controlled by the local PLC including:
      2) Pump P-110 and P-120 Run Status: On, Off.
      4) Pump P-110 and P-120 Control Timer Functions: Backspin Timers, Report Back Timer, Pump Starts Sequence Delay, and Pump Alarm Delay
      5) Pump P-110 and P-120 Alarm Status
         a) Pump High Temperature Alarm
         b) Pump Leak Alarm
         c) Failure to Start Pump

   b. Page “B” – Level: This page will provide control, status, and alarms associated with any level instrumentation associated with the Pump Station including:
      1) Wet Well Level
      2) Wet Well Level Alarm Status: High-High, High, Low
      3) Wet Well Level Float Switch Alarms: High-High, High
      4) Wet Well Level Setpoints:
         a) High-High Alarm and Time Delay
         b) High Alarm and Time Delay
         c) Start Lead Pump
         d) Start Lag Pump
         e) Stop Pump
5) Wet Well Override Control: Alarm Enable/Disable

c. Page “C” – Flow: This page will provide control, status, and alarms associated with any flow instrumentation associated with the Pump Station including:
   1) Discharge Flow
   2) Flow Meter Alarm Status: High-High, High, Low, Low-Low
   3) Flow Meter Setpoints:
      a) High-High Alarm and Time Delay
      b) High Alarm and Time Delay
      c) Flow Control Setpoint
      d) Low Alarm and Time Delay
      e) Low-Low Alarm and Time Delay
   4) Flow Meter Override Control: Alarm Enable/Disable

d. Page “G” – Pump Control: This page will provide secondary control, status, and alarms associated with the pumps controlled by the local PLC including:
   1) Wet Well Level
   2) Pump P-110 and P-120 Control Status:
      a) Pump Sequence Code
      b) Selected Pump Alternation Scheme
   3) Pump P-110 and P-120 Control Functions:
      a) Select Automatic Pump Rotation
      b) Select Pump 1 Lead/Pump 2 Lag
      c) Select Pump 2 Lead/Select Pump 1 Lag
   4) Pump P-110 and P-120 Control Setpoints
      a) Start Lag Pump, Level Setpoint
      b) Start Lead, Level Setpoint
      c) Stop Lag Pump, Level Setpoint
      d) Stop Lead Pump, Level Setpoint

e. Page “H” – Run Times: This page provides operational runtime data regarding the Pump Station including:
   1) Daily Runtimes: Provide the total running time over a 24 hour period. Automatically resets to 0 at the end of the 24 hour period.
      a) Pump P-110
      b) Pump P-120
   2) Total Runtimes: Provide a total running time.
      a) Pump P-110
      b) Pump P-120
   3) Average Runtimes: Provide the average runtime over a 24 hour period, based on the total daily runtime and the total number of starts in the same 24 hour period.
a) Pump P-110
b) Pump P-120

4) Number of Starts: Provide the number of starts that occur during a 24 hour period
   a) Pump P-110
   b) Pump P-120

H. Control Strategy – Lift Station Wetwell

1. General: The Lift Station Wet Well will receive influent flow and when the level in the wet well rises the pumps will be used to discharge flow from the wetwell. The wet well is equipped with an ultrasonic level transmitter that will serve as the primary means for pump control. A secondary means for pump control is provided that allows control of the discharge flow from the Wet Well. In the event that the PLC fails, the level transducer fails, or if the level in the wet well just continues to rise, a set of level switches will provide backup control of the sewage pumps and will operate them independently from PLC based control.

   a. When the Pumps are set for automatic, then Pump 1 and Pump 2 will operate in a lead/lag manner with automatic operation.

      1) The PLC Alternator can be set to Automatic Alternation, Pump1-Lead/Pump 2-Lag, or Pump 2-Lead/Pump 1-Lag. Pump alternation will occur when the level in the wet well falls to the Pumps Off level setpoint.

         a) If the Lead Pump Failure Alarm Occurs or Fails to Start then the PLC alternate will make the Lag Pump the Lead Pump and start the pump.

         b) If the Lead Pump is running and a Lag Pump Failure Occurs or Fails to start, then a Lag Pump Failure Alarm is issued to SCADA and the Local Control Panel CP-LS.

      2) Provide via SCADA the means to designate “automatic alternation” or ‘no alternation”. If “no alternation” is selected designate which pump is “Lead” and which Pump is “Lag”.

      3) Pump Automatic Control Mode: When the Sewage Pumps are under PLC based control, an operator can call the Pump Automatic Control Mode from either the Local Control Panel CP-LS or from SCADA. The selected control mode will remain in effect, under an operator elects to choose another Control Mode. The control modes are as follows:

         a) Level Based Control: If this control mode is selected, the pumps will operate in a lead-lag manner to maintain the desired level setpoint in the Wet Well.

            (i) When the wet well level rises to the Start Lead Pump Level Setpoint, after an operator adjustable time delay, the Lead Pump will run.

            (ii) If the wet well level continues to rise to the Start Lag Pump Level Setpoint, after an operator adjustable time delay, the Lag Pump will run.

            (iii) When the wet well level falls to the Stop Lag Pump Level Setpoint, after an operator adjustable time delay, the Lag Pump will stop.

            (iv) If the wet well level continues to fall to the Start Lead Pump Level Setpoint, after an operator adjustable time delay, the Lead Pump will stop.

            (v) Note that if the Lead Pump runs continuously for a predetermined period of time (operator adjustable from SCADA or the OIT), then the PLC will automatically shut down the Lead Pump and when the wet well level rises to the Start Lead Pump Level Setpoint, the other pump will start as the Lead Pump.
b) SCADA Manual Control: If this control mode is selected, then each pump is manually controlled by an operator. The operator can choose one or two pumps to operate. The pumps will continue to run in the mode until another control mode is selected or the level in the Wet Well falls to the Stop Pump Level Setpoint.

b. The following control set points shall be provided:
   1) High-High Level Set Point
   2) High Level Set Point
   3) Lag Pump Start Level Setpoint
   4) Lead Pump Start Level Setpoint
   5) Lag Pump Stop Level Setpoint
   6) Lead Pump Stop Level Setpoint
   7) Low Level Set Point

c. Provide at SCADA elapsed runtime displays for each pump
   1) Daily
   2) Total

d. Provide at SCADA, level alarms based on the level switches.
   1) High-High Float Level Alarm
   2) High Float Level Alarm

e. If the pumps are set to automatic (any one or both), and the level rises to the high level switch, then any pump set to automatic will be called to run via hardwired controls independent of the PLC, if the PLC is running PLC based automatic control will be suspended. The pump(s) will then run for a predetermined amount of time (the time interval will be adjustable via a timing relay mounted in the Control Panel) and then the pump(s) will shut down. If the level in the wet well rises and the PLC is operational, then PLC control of the pumps will resume based on the control loop that was in operation prior to the wetwell level rising to the high level switch or via the level switches.

2. Pump No. 1
   a. Typical of Pump No. 2
   b. Function: Pump No. 1 is one of two pumps that control the flow out of the Wet Well.
   c. Local Control: The pumps are controlled with full voltage starters.
      1) Selector Switch – Hand/Off/Automatic: At the Local Control Panel CP-LS, plant personnel can select between Hand-Off-Automatic Operation via a selector switch.
         a) When the selector switch is in the Hand Position, the pump will run.
         b) When the selector switch is set in the Off Position, the pump will not run and is not available for automatic operation, manual operation, or level switch override operation.

d. Remote Control: When the Hand/Off/Automatic Selector Switch is in the Automatic Position, the pump operation is controlled by the Pump Station PLC.
   1) SCADA Selection: From SCADA, Pump Station PLC control can be placed in either Remote Manual Control or Automatic Control.
2) Remote Manual Control: When Remote Manual Mode is selected at SCADA, the pump shall be capable of manual control from SCADA. The pump operations are “Start” and “Stop”.

3) Automatic Control: When the Automatic Control Mode is selected at SCADA, the pump operations shall be as described previously.

e. Pump Alarm: Provide Four separate alarms for the pump – Pump Failure to Start, Pump Failure, Pump High Temperature, and Pump Moisture High. When any of these Pump Failure Alarms are issued from the Local Control Panel to the PLC, a corresponding pump failure alarm will be generated at SCADA.

1) Pump Failure to Start:
   a) If the PLC issues a command to start a pump and pump running contact fails to close then a failure to start alarm is issued to SCADA.

2) Pump High Temperature: A submersible pump relay mounted in the Local Control Panel will monitor the Pump Windings. If a High Temperature Alarm occurs, the pump will be issued a stop command. The Pump High Temperature Alarm will require on site inspection, correction and resetting of the pump failure alarm.

3) Pump Moisture High: A submersible pump relay mounted in the Local Control Panel will monitor the Pump Casing for moisture or leakage. If a Moisture High Alarm occurs, the pump will be issued a stop command. The Pump High Temperature Alarm will require on site inspection, correction and resetting of the pump failure alarm.

f. Pump Running Status: The PLC shall provide SCADA with the following information:

1) Daily Runtime for a 24-hour period
2) Total Runtime
3) Average Daily Runtime

3. Level Measurement System:
   a. Level Transmitter – LIT 154
      1) Function: A level transmitter will monitor the level in the Wet Well. This level signal is monitored by the Station PLC. This level signal is used in the automatic PLC based control of the Pumps and alarms:
         a) High-High Level Alarm for Wet Well
         b) High Level Alarm for Wet Well
         c) Low Level Alarm for Wet Well.
         d) Start and Stop Automatic Control of Lead Pump and Lag Pump.
      2) This level signal will provide the following data and alarms that will be available via SCADA:
         a) Level
         b) High-High Level Alarm
         c) High Level Alarm
         d) Low Level Alarm
   b. Float Type Level Switches – LSH 152 and LSL 151
1) Function: The level switches provide alarm status regarding the wet well level as well as backup hardwired control of the Sewage Pumps in the event of either a failure of the PLC or the level transducer.

4. Lift Station Discharge Flow (FUT):
   a. Function: A magnetic flow meter will monitor the discharge flow from the Pumps. This flow signal is for monitoring only. This flow signal will provide the following data and alarms that will be available via SCADA:
      1) Discharge Flow
      2) High-High Discharge Flow Alarm
      3) High Discharge Flow Alarm
      4) Low Discharge Flow Alarm
      5) Low-Low Discharge Flow Alarm

**END OF SECTION**