

# EAST BAY MUNICIPAL UTILITY DISTRICT

## REQUEST FOR QUOTATION (RFQ) No. 2505 for BALLASTED FLOCCULATION EQUIPMENT AND SERVICES

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For complete information regarding this project, see RFQ posted at <https://www.ebmud.com/business-center/materials-and-supplies-bids/current-requests-quotation-rfqs/> or contact the EBMUD representative listed above. Please note that prospective bidders are responsible for reviewing this site during the RFQ process, for any published addenda regarding this RFQ.

**Bids Due**  
by  
**1:30 p.m.**  
on  
**March 12, 2025**

All bid submissions hand delivered or mailed (USPS, FedEx, UPS, etc.) to the address or PO Box noted below and must be received no later than 1:30 p.m. on the bid due date.

<b>RESPONSE DELIVERED BY SERVICE</b> (UPS, FedEx, DHL, etc., during business hours: 8:00 AM – 4:00 PM only) to:  EBMUD–Purchasing Division RFQ 2505 – Ballasted Flocculation Equipment and Services 375 11 <sup>th</sup> Street Oakland, CA 94607	<b>RESPONSE DELIVERED BY MAIL</b> (U.S. Postal Service) to:  EBMUD–Purchasing Division RFQ 2505 – Ballasted Flocculation Equipment and Services P.O. Box 24055 Oakland, CA 94623	<b>RESPONSE HAND-DELIVERED</b> (during business hours: 8:00 AM – 4:00 PM only)  EBMUD–Purchasing Division RFQ 2505 – Ballasted Flocculation Equipment and Services Purchasing Office 375-11 <sup>TH</sup> Street, 1 <sup>st</sup> Floor Oakland, CA 94607
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# EAST BAY MUNICIPAL UTILITY DISTRICT

RFQ No. 2505

for

Ballasted Flocculation Equipment and Services

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## ATTACHMENTS

EXHIBIT A – RFQ RESPONSE PACKET

EXHIBIT B – INSURANCE REQUIREMENTS

EXHIBIT C – GENERAL CONDITIONS AND SUPPLEMENTARY GENERAL CONDITIONS

EXHIBIT D – IRAN CONTRACTING ACT CERTIFICATION

EXHIBIT E – TECHNICAL SPECIFICATIONS AND DRAWINGS

EXHIBIT F – ASSIGNMENT ASSUMPTION & CONSENT (Will be issued in Addendum 1)

EXHIBIT G – BALLASTED FLOCCULATION BID FORM AND WORKBOOK

EXHIBIT H – BONDS FORMS

## I. STATEMENT OF WORK

### A. SCOPE

It is the intent of these specifications, terms, and conditions to describe ballasted flocculation equipment and services for the Walnut Creek Water Treatment Plant (WTP) as part of the Spec. 2200 Walnut Creek WTP Pretreatment Project. The ballasted flocculation process includes coagulant mixing, microsand and polymer injection and mixing, independent flocculation, sand ballasted flocculation, settling, sludge removal, sand recycle, and clarification via plate settlers. The Walnut Creek WTP ballasted flocculation system shall consist of two (2) ballasted flocculation trains with a total effluent design capacity of 88 million gallons per day (MGD).

East Bay Municipal Utility District (District) intends to award a contract to the lowest cost bidder(s) whose response meets the District's requirements. The lowest cost bidder shall be selected based on the ballasted flocculation system total costs, inclusive of construction and 20-year annual operating costs outlined in Exhibit G.

The District intends to assign the contract that is awarded pursuant to this RFQ to a construction general contractor (Assignee). By submitting an RFQ response the bidder acknowledges this intent and agrees to such an assignment on terms set forth in the attached Assignment and Assumption Agreement (Exhibit F), or other similar terms.

All mentions of Ballasted Flocculation System Supplier (BFSS), supplier, and/or contractor in this RFQ contract documents shall refer to the Bidder, while the Walnut Creek WTP Pretreatment Project general contractor shall be referred to as the Assignee.

### B. BIDDER QUALIFICATIONS

#### 1. Bidder Minimum Qualifications

- a. Bidders shall have designed, procured the equipment for, and supplied a minimum of five (5) ballasted flocculation systems for installation at municipal facilities in the United States and/or Canada. One (1) of the referenced ballasted flocculation systems shall be designed for drinking water treatment plants with a system capacity of greater than 20 MGD. The referenced systems shall have been in successful operation for a minimum of two years within the previous ten (10) years as of this RFQ date. Bidder shall provide references on the form included in Exhibit A.
- b. Bidder's Project Manager, start-up personnel, and training personnel who will be assigned to this Project and will be responsible for all specified deliverables shall have successfully completed a minimum of two projects of comparable scope of supply and complexity to this Project within the

last five years. The resume of the Bidder's Project Manager, start-up, and training personnel shall be provided in the RFQ response.

- c. Bidder shall possess all permits, licenses, and professional credentials necessary to supply product and perform services as specified under this RFQ.
2. Bidders shall be one of the following or pre-approved equal:
    - a. Veolia Water Technologies, INC, Cary, NC
    - b. WesTech Engineering, LLC, Salt Lake City, UT
  3. Pre-approval requirements:
    - a. Bidders other than the two listed above shall submit a proposal for "pre-approval or equal" to be received by the District at least 21 days prior to the proposal date for evaluation of compliance with the qualifications listed herein.
    - b. Proposals for "pre-approved or equal" substitutions requested during the bidding period shall be furnished in writing to:

Purchasing Division  
East Bay Municipal Utility District  
P. O. Box 24055  
Oakland, CA 94623-1055
    - c. Proposals shall be accompanied by complete technical and descriptive data necessary to determine equality of the material including shop drawings and supporting documents for all the equipment supplied for the referenced ballasted flocculation projects. Samples shall be provided when requested. The burden of proof as to availability, comparative quality, suitability, and performance of the proposed substitution shall be upon the bidder. The bidder will not be reimbursed for any work and costs necessary for making the substitution workable. Proposals will be evaluated and deemed accepted, rejected, or incomplete by the District; the District will be the sole judge as to such matters. If the pre-approval is accepted, Bidders will be notified by addenda no later than ten days prior to the RFQ response date.

## C. SPECIFIC REQUIREMENTS

### 1. **Ballasted Flocculation System**

Ballasted Flocculation System Supplier (BFSS) shall provide process design, equipment sizing, equipment procurement, and testing and commissioning required for the ballasted flocculation system as defined in Exhibit E – Technical Specifications and Drawings.

The Work shall be provided in two phases and shall include, but not be limited to, the requirements generally summarized by phase as follows:

**Phase 1:** Design Support Services – The Seller shall provide design support services, including design collaboration with District and Engineer (Part A) and preparation of Shop Drawings and Submittals for the Ballasted Flocculation system (Part B).

**Phase 2:** Construction-Phase Services – Following issuance of the Notice to Proceed for the construction contract by the District to the Assignee, the BFSS will provide services and equipment to the Assignee, for the pre-selected Ballasted Flocculation equipment and services during construction (Phase 2).

The ballasted flocculation system design requirements and design criteria, summary of roles and responsibilities between BFSS, District, and Walnut Creek WTP Pretreatment Project general contractor (Assignee), and BFSS scope of supply are outlined in Specification Section 46 44 10. BFSS' scope of supply, per Specification Section 46 44 10 Attachment A.

All products shall be in new and unused condition and shall be of the most current and up to date model.

Materials in Contact with Drinking Water.

1. All materials, equipment, or products that will be in contact with drinking water (potable water) shall be tested and certified as meeting the specifications of NSF/ANSI 61 Standard in accordance with California Code of Regulations, Title 22, Section 64591. Examples include, but are not limited to, valves, pumps, flow meters, protective materials (coatings, linings, liners), joining and sealing materials, pipes, tanks, pipe fittings, filters, cleaning chemicals, and lubricants.
2. All materials, equipment, or products that will be in contact with drinking water (potable water) shall be tested and certified as "lead-free" per California Health and Safety Code Section 116875 and NSF 61 Annex G or NSF 372.
3. All chemicals that will be in contact with drinking water shall be certified by NSF to NSF/ANSI Standard 60.

4. For materials:
  - a. Documentation which demonstrates current NSF/ANSI Standard 61 certification shall be submitted by the bidder in their bid package.
  - b. If awarded, BFSS is responsible for informing the District within 5 days, if and when their certification lapses or expires. Failure to inform the District within the allotted time will be sufficient grounds for immediate termination of the contract.
  
5. For chemicals:
  - a. Documentation which demonstrates current NSF/ANSI Standard 60 certification shall be submitted by the bidder in their bid package.
  - b. If awarded, BFSS is responsible for informing the District, within 5 days, if and when their certification lapses or expires. Failure to inform the District within the allotted time will be sufficient grounds for immediate termination of the contract.

D. DELIVERABLES / REPORTS

Goods and services to be furnished by the BFSS include, but are not limited to, the following:

1. Vertical shaft mixer assemblies.
2. Microsand recirculation pumps.
3. Sludge/sand gear drive and scraper assembly.
4. Hydrocyclones.
5. Lamella settling equipment, effluent collection troughs, and anti-vortex baffles.
6. Vendor supplied control panels.
7. Miscellaneous instruments, valves, and other process and control equipment indicated on the drawings and/or indicated in the technical specification sections.
8. Adequate support systems, structures, and bracing to all equipment and structures to be BFSS provided.
9. Engineering and design assistance, and review of drawings and design deliverables.
10. Preparation of shop drawings and submittals.

11. Programming support.
12. Testing, training, commissioning, and supervision of ballasted flocculation equipment installation.
13. Special tools and spare parts.
14. Operation and maintenance manuals.
15. Warranties.
16. Bonds and Insurance.
17. Delivery of equipment to the project sites within the specified timeframes.

BFSS shall supply all equipment, documentation, submittals, O&M manuals, and all other requirements as detailed in Exhibit E - Technical Specifications and Drawings.

All equipment shall be delivered to the following location:

Walnut Creek Water Treatment Plant  
2201 Larkey Lane  
Walnut Creek, CA 94597

### **Milestones**

Dates for the following milestones are based upon District award to the BFSS and/or award for the Walnut Creek WTP Pretreatment Project general contractor (Assignee):

- a. Milestone 1: Begin design support services (Part A) within 30 days after District issues Notice to Proceed to the BFSS
- b. Milestone 2: Submit Shop Drawings and Submittals (Part B) required in the Contract documents within 45 days after District issues Notice to Proceed to BFSS for Part B services. Resubmittals may be required to ultimately obtain a favorable review by the District Engineer. Resubmittals shall be provided within 30 days of receiving District comments on preceding submittal.
- c. Milestone 3: District will assign the BFSS contract to the Walnut Creek WTP Pretreatment Project General Contractor (Assignee). Complete and sign Assignment and Assumption Agreement (Exhibit F) within 10 days of Notice of Intent to Award the Walnut Creek WTP Pretreatment Project Contract.

- d. Milestone 4: Unless otherwise agreed or requested in writing by the District, begin delivery of equipment to Walnut Creek WTP within 180 days of Assignee Notice to Proceed.
- e. Milestone 5: Complete successful start-up and operational testing as specified in Specification Section 01 75 17 no later than 90 days after submission of Manufacturer’s Certificate of Proper Installation.
- f. Milestone 6: Complete all testing, training, and submit final approved Operation and Maintenance (O&M) Manuals required in Exhibit E no later than 10 days after completion of operational testing.

**E. INSPECTION**

The District will inspect material after its arrival at the delivery point. If the rejection rate of a sample of components is 10% or higher, all components will be rejected. BFSS is solely responsible for ensuring the material arrives at the District’s ship-to location free of defects and manufactured in strict conformance with the specifications.

In the case that an item or lot is rejected, District Inspectors will provide BFSS, Assignee, and the EBMUD Purchasing Division with an Inspectors Job Report which will itemize the product deficiencies and required corrective action.

The District reserves the right-of-access to the BFSS’ facility to verify conformance to this specification at the District’s expense.

**F. FAILURE TO MEET SPECIFICATIONS**

In the event any shipment or shipments of a BFSS’ product do not meet the specification or delivery requirements, the District may reject the shipment or shipments and, at its option, may purchase this material from any supplier on the open market who can meet the District’s specification requirements, or the District may demand immediate replacement by Contractor of the non-conforming product. Any costs over and above the original contract price will be charged back to the BFSS. In addition, BFSS shall bear the costs of removal and disposition for any delivery which fails to conform to the specifications.

**II. CALENDAR OF EVENTS**

EVENT	DATE/LOCATION
RFQ Issued	February 6, 2025
Deadline For Submission of Questions	February 12, 2025
Response Due	March 12, 2025 by 1:30 p.m.



	At this time all bids will be opened publicly in the EBMUD Board Room at 375 Eleventh St., Oakland, CA 94607*
<b>Anticipated Contract Start Date</b>	April 29, 2025

**Note:** All dates are subject to change by District.

Bidders are responsible for reviewing <https://www.ebmud.com/business-center/materials-and-supplies-bids/current-requests-quotation-rfqs/> for any published addenda. Hard copies of addenda will not be mailed out.

**III. DISTRICT PROCEDURES, TERMS, AND CONDITIONS**

**A. RFQ ACCEPTANCE AND AWARD**

1. RFQ responses will be evaluated to determine that they are responsive, responsible, and that they meet the specifications as stated in this RFQ.
2. The District reserves the right to award to a single or to multiple Contractors, dependent upon what provides the lowest overall cost to the District.
3. The District has the right to decline to award this contract or any part of it for any reason.
4. Any specifications, terms, or conditions, issued by the District will be incorporated into any purchase order or contract that may be awarded as a result of this RFQ.
5. Award of contract. The District reserves the right to reject any or all proposals, to accept one part of a proposal and reject the other, unless the bidder stipulates to the contrary, and to waive minor technical defects and administrative errors, as the interest of the District may require. Award will be made, or proposals rejected by the District as soon as possible after bids have been opened.

**B. BRAND NAMES, APPROVED EQUIVALENTS, DEVIATIONS, AND EXCEPTIONS**

Any references to manufacturers, trade names, brand names, and/or catalog numbers are intended to be descriptive, but not restrictive, unless otherwise stated, and are intended to indicate the quality level desired. Bidders may offer an equivalent product that meets or exceeds the specifications.

The District reserves the right to be the sole judge of what shall be considered equal and/or acceptable and may require the bidder to provide additional information and/or samples. If the bidder does not specify otherwise, it is understood that the brand and/or product referenced in this RFQ will be supplied.

**Taking exception to the RFQ, or failure on the part of the bidder to comply with all requirements and conditions of this RFQ, may subject the RFQ response to rejection. If no deviations are shown, the bidder will be required to furnish the material exactly as specified. The burden of proof of compliance with the specifications will be the responsibility of the bidder.**

This RFQ is subject to acceptance only on the terms and conditions stated in this RFQ. Any additional or different terms and conditions proposed by the bidder are hereby rejected and shall be of no force or effect unless expressly assented to in writing by the District.

RFQ responses based on equivalent products must:

1. Use Exhibit A "Exceptions, Clarification and Amendments" to clearly describe the alternate offered and indicate specifically how it differs from the product specified in this RFQ.
2. Include complete descriptive literature and/or specifications as proof that the proposed alternate will be equal to or better than the product named in this RFQ.

C. PRICING

1. All prices are to be F.O.B. destination. Any freight/delivery charges are to be included.
2. All prices quoted shall be in United States dollars.
3. Price quotes shall include any and all payment incentives available to the District.
4. Bidders are advised that in the evaluation of cost, if applicable, it will be assumed that the unit price quoted is correct in the case of a discrepancy between the unit price and extended price.
5. Prevailing Wages:

All Contractors bidding on a public works project and all Subcontractors of any tier shall be registered with the State Department of Industrial Relations pursuant to Section 1725.5 of the Labor Code.

The Contractor shall post a copy of the general prevailing rate of per diem wages at the jobsite pursuant to Section 1773.2 of the Labor Code of the State of California.

Pursuant to the provisions of Division 2, Part 7, Chapter 1, Article 2, and any amendments thereof of the Labor Code of the State of California, the Contractor,

and any Subcontractor under pay not less than the specified prevailing rate of wages to all workers employed in the execution of the contract.

The Contractor shall, as a penalty to the State or the District, forfeit Twenty-Five (\$25.00) Dollars for each calendar day, or portion thereof, for each worker paid less than the stipulated prevailing rates for any work or craft in which such worker is employed under the contract by the Contractor or by any Subcontractor. The difference between such stipulated prevailing wage rates and the amount paid to such worker for each calendar day or portion thereof for which each worker was paid less than the stipulated prevailing wage rate shall be paid to each worker by the Contractor. The provisions of Section 1776 of the Labor Code of the State of California shall be complied with by the Contractor. For all classes of work not specified herein, the minimum wage shall be that specified for general laborer.

The specified wage rates are minimum rates only and the District will not consider and shall not be liable for any claims for additional compensation made by the Contractor because of payment by Contractor of any wage rate in excess of the general prevailing rates. All disputes in regard to the payment of wages in excess of those specified herein shall be adjusted by the Contractor at his own expense.

The holidays upon which such rates shall be paid shall be all holidays recognized in the collective bargaining agreement applicable to the particular craft, classification, or type of worker employed on the project.

D. NOTICE OF INTENT TO AWARD AND PROTESTS

At the conclusion of the RFQ response evaluation process, all entities who submitted a bid package will be notified in writing by e-mail or USPS mail with the name of the Bidder being recommended for contract award. The document providing this notification is the Notice of Intent to Award.

Protests must be in writing and must be received no later than seven (7) workdays after the District issues the Notice of Intent to Award. The District will reject the protest as untimely if it is received after this specified time frame. Protests will be accepted from bidders or potential bidders only.

If the protest is mailed and not received by the District, the protesting party bears the burden of proof to submit evidence (e.g., certified mail receipt) that the protest was sent in a timely manner so that it would be received by the District within the RFQ protest period.

Bid protests must contain a detailed and complete written statement describing the reason(s) for protest. The protest must include the name and/or number of the bid, the name of the firm protesting, and include a name, telephone number, email address and physical address of the protester. If a firm is representing the protester, they shall include their contact information in addition to that of the protesting firm.

Protests must be mailed, hand delivered, or emailed to the Manager of Purchasing, Mailstop 102, East Bay Municipal Utility District, 375 Eleventh Street, Oakland, CA 94607 or P.O. Box 24055, Oakland, California 94623. Facsimile and electronic mail protests must be followed by a mailed or hand delivered identical copy of the protest and must arrive within the seven workday time limit. Any bid protest filed with any other District office shall be forwarded immediately to the Manager of Purchasing.

The bid protester can appeal the determination to the requesting organization's Department Director. The appeal must be submitted to the Department Director no later than five workdays from the date which the protest determination was transmitted by the District, to the protesting party. The appeal shall focus on the points raised in the original protest, and no new points shall be raised in the appeal.

Such an appeal must be made in writing and must include all grounds for the appeal and copies of the original protest and the District's response. The bid protester must also send the Purchasing Division a copy of all materials sent to the Department Director. The Department Director will make a determination of the appeal and respond to the protester by certified mail in a timely manner. If the appeal is denied, the letter will include the date, time, and location of the Board of Directors meeting at which staff will make a recommendation for award and inform the protester it may request to address the Board of Directors at that meeting.

The District may transmit copies of the protest and any attached documentation to all other parties who may be affected by the outcome of the protest. The decision of the District as to the validity of any protest is final. This District's final decision will be transmitted to all affected parties in a timely manner.

#### E. METHOD OF ORDERING

1. Written POs may be issued upon approval of written itemized quotations received from the Contractor.
2. POs and payments for products and/or services will be issued only in the name of Contractor.
3. Any and all change orders shall be in writing and agreed upon, in advance, by Contractor and the District.

F. TERM / TERMINATION / RENEWAL

1. The term of the contract, which may be awarded pursuant to this RFQ, is estimated to be (3) years for design support services. At completion of the design phase, the contract will be assigned to the Assignee. Refer to Exhibit F for the Assignment and Assumption Agreement to be executed.
2. This Agreement may be terminated for convenience by the District provided the Contractor is given written notice of not less than 30 calendar days. Upon such termination, the District shall pay the Contractor the amount owing for the products ordered and satisfactorily received by the District. This shall be the sole and exclusive remedy to which the Contractor is properly entitled in the event of termination by the District.
3. This Agreement may be terminated for cause at any time, provided that the District notifies Contractor of impending action.

G. WARRANTY

1. For any contract awarded pursuant to this RFQ, Contractor expressly warrants that all goods furnished will conform strictly with the specifications and requirements contained herein and with all approved submittals, samples and/or models and information contained or referenced therein, all affirmations of fact or promises, and will be new, of merchantable quality, free from defects in materials and workmanship, including but not limited to leaks, breaks, penetrations, imperfections, corrosion, deterioration, or other kinds of product deficiencies. Contractor expressly warrants that all goods to be furnished will be fit and sufficient for the purpose(s) intended. Contractor expressly warrants that all goods shall be delivered free from any security interest, lien, or encumbrance of any kind, and free from any claim of infringement, copyright or other intellectual property violation, or other violation of laws, statutes, regulations, ordinances, rules, treaties, import restrictions, embargoes or other legal requirements. Contractor guarantees all products and services against faulty or inadequate design, manufacture, negligent or improper transport, handling, assembly, installation or testing, and further guaranties that there shall be strict compliance with all manufacturer guidelines, recommendations, and requirements, and that Contractor guaranties that it will conform to all requirements necessary to keep all manufacturer warranties and guarantees in full force and effect. These warranties and guarantees are inclusive of all parts, labor, and equipment necessary to achieve strict conformance, and shall take precedence over any conflicting warranty or guarantee. These warranties and guaranties shall not be affected, limited, discharged, or waived by any examination, inspection, delivery, acceptance, payment, course of dealing, course of performance, usage of trade, or termination for any reason and to any

extent. In the absence of any conflicting language as to duration, which conflicting language will take precedence as being more specific, Contractor's aforesaid warranties and guarantees shall be in full force and effect for a period of two years from the date of acceptance by the District but shall continue in full force and effect following notice from District of any warranty or guarantee issue, until such issue has been fully resolved to the satisfaction of District.

#### H. INVOICING

1. Following the Districts acceptance of product(s) meeting all specified requirements, and/or the complete and satisfactory performance of services, the District will render payment within thirty (30) days of receipt of a correct invoice.

Payment for equipment shall be made according to the following schedule:

- a. Ten (10) percent upon approval of design submittals as outlined in Specifications provided in Exhibit E.
- b. Eighty (80) percent upon acceptance of the delivered equipment as outlined in Specifications provided in Exhibit E.
- c. Five (5) percent upon acceptance of the Certificate of Proper installation as outlined in Specifications provided in Exhibit E.
- d. Five (5) percent upon acceptance of all O&M manuals as outlined in Specifications provided in Exhibit E.

For Design support services, BFSS shall submit Applications for Payment for Bid Item 1.01.A in accordance with the District standards. Applications for payments will be processed by the District within thirty (30) days of receipt of a correct application.

2. The District shall notify BFSS of any invoice adjustments required.
3. Invoices shall contain, at a minimum, District purchase order number, invoice number, remit to address, and itemized products and/or services description.
4. The District will pay BFSS in an amount not to exceed the total amount quoted in the RFQ response.

#### I. LIQUIDATED DAMAGES

1. A deduction for liquidated damages will be assessed for not meeting District-specified performance requirements as prescribed in this RFQ with the following schedule:

<b>Contract Time</b>	<b>Description</b>	<b>Liquidated Damages</b>
Milestone 1	Failure to begin design support services and/or failure to provide technical assistance by the time frame specified.	\$500 per day
Milestone 2	Failure to submit and obtain favorable review by District Engineer of all shop drawings required in the Contract Documents within the time frame specified.	\$500 per day
Milestone 3	Failure to execute the Assignment and Assumption Agreement within the time frame specified	\$500 per day
Milestone 4	Failure to deliver ballasted flocculation system to Walnut Creek WTP within the time frame specified	\$2,000 per day
Milestone 5	Failure to successfully perform ballasted flocculation system start-up and operational testing per Section 01 75 17	\$1,000 per day
Milestone 6	Failure to provide training and/or submit final approved O&M Manuals	\$500 per day

2. It being impracticable or extremely difficult to fix the actual damage, the amount set forth above is hereby agreed upon as liquidated damages and will be deducted from any money due under the agreement arising from this RFQ.
3. In the event performance and/or deliverables have been deemed unsatisfactory, the District reserves the right to withhold future payments until the performance and/or deliverables are deemed satisfactory.

**J. BONDS**

1. The successful bidder will be required to post and maintain the following bonds included in Exhibit H for 100 percent (100%) of the Total Lump Sum Bid Cost (Exhibit G - Item 1.01.A) in the Bid Form with the District. Bonds must be on District forms attached to this RFQ as Exhibit H – Bond Forms.
  - a. Payment bond
  - b. Faithful Performance bond

2. Refer to Article 9 of the General Conditions for additional requirements.

#### IV. RFQ RESPONSE SUBMITTAL INSTRUCTIONS AND INFORMATION

##### A. DISTRICT CONTACTS

All contact during the competitive process is to be through the contact listed on the first page of this RFQ. The following persons are to be contacted only for the purposes specified below.

TECHNICAL SPECIFICATIONS:

Attn: Sarah Plummer  
 EBMUD-Design Division  
 E-Mail: [sarah.plummer@ebmud.com](mailto:sarah.plummer@ebmud.com)  
 PHONE: (510) 287-2099

CONTRACT EQUITY PROGRAM:

Attn: Contract Equity Office  
 PHONE: (510) 287-0114

AFTER AWARD:

Attn: Sarah Plummer  
 EBMUD-Design Division  
 E-Mail: [sarah.plummer@ebmud.com](mailto:sarah.plummer@ebmud.com)  
 PHONE: (510) 287-2099

##### B. SUBMITTAL OF RFQ RESPONSE

1. Responses must be submitted in accordance with Exhibit A – RFQ Response Packet, including all additional documentation stated in the “Required Documentation and Submittals” section of Exhibit A.
2. Late and/or unsealed responses will not be accepted.
3. All RFQ responses must be SEALED and received by 1:30 p.m. on the due date specified in the Calendar of Events. Any RFQ response received after that time/date, or at a place other than the stated addresses, cannot be considered and will be returned to the bidder unopened. The EBMUD mailroom and Purchasing Division timestamp shall be considered the official timepiece for the purpose of establishing the actual receipt of RFQ responses.
4. **Proposers must also submit an electronic copy of their RFQ response, with their hardcopy RFQ response Package.** The file must be on a USB flash drive and enclosed with the sealed original hardcopy of the RFQ response. The electronic copy shall be in a single file (PDF) format, with exception of the ‘Bid Form



Workbook.xlsx' spreadsheet, and shall be an **exact** scanned image of the original hard copy Exhibit A – RFQ Response Packet, Exhibit G – Ballasted Flocculation Bid Form, Contract Equity Program forms and all additional documentation stated in the “Required Documentation and Submittals” section of Exhibit A.

5. RFQ responses are to be addressed/delivered as follows:

Mailed (USPS):

East Bay Municipal Utility District  
Ballasted Flocculation Equipment  
RFQ No. 2505  
EBMUD–Purchasing Division  
P.O. Box 24055  
Oakland, CA 94623

Hand Delivered, delivered by courier or package delivery service (UPS, FedEx, DHL, etc.):

East Bay Municipal Utility District  
Ballasted Flocculation Equipment  
RFQ No. 2505  
EBMUD–Purchasing Division  
375 Eleventh Street, First Floor  
Oakland, CA 94607

**Bidder's name, return address, and the RFQ number and title must also appear on the mailing package.**

6. All costs required for the preparation and submission of an RFQ response shall be borne by the bidder.
7. California Government Code Section 4552: In submitting an RFQ response to a public purchasing body, the bidder offers and agrees that if the RFQ response is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2, commencing with Section 16700, of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the RFQ response. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder.
8. Bidder expressly acknowledges that it is aware that if a false claim is knowingly submitted (as the terms “claim” and “knowingly” are defined in the California False Claims Act, Cal. Gov. Code, §12650 et seq.), the District will be entitled to civil remedies set forth in the California False Claim Act.

9. The RFQ response shall remain open to acceptance and is irrevocable for a period one hundred eighty (180) days.
10. It is understood that the District reserves the right to reject any or all RFQ responses.
11. RFQ responses, in whole or in part, are NOT to be marked confidential or proprietary. The District may refuse to consider any RFQ response or part thereof so marked. RFQ responses submitted in response to this RFQ may be subject to public disclosure. The District shall not be liable in any way for disclosure of any such records.



**EXHIBIT A**  
**RFQ RESPONSE PACKET**  
**RFQ No. 2505 Ballasted Flocculation Equipment and Services**

To: The EAST BAY MUNICIPAL UTILITY District (“District”)

From: \_\_\_\_\_

(Official Name of Bidder)

**RFQ RESPONSE PACKET GUIDELINES**

- **BIDDERS ARE TO SUBMIT ONE (1) ORIGINAL HARDCOPY RFQ RESPONSE WITH ORIGINAL INK SIGNATURES, CONTAINING THE FOLLOWING IN THEIR ENTIRETY:**
  - **EXHIBIT A – RFQ RESPONSE PACKET**
    - **INCLUDING ALL REQUIRED DOCUMENTATION AS DESCRIBED IN “EXHIBIT A-REQUIRED DOCUMENTATION AND SUBMITTALS”**
  - **EXHIBIT G – BALLASTED FLOCCULATION BID FORM AND WORKBOOK**
- **ALL PRICES AND NOTATIONS MUST BE PRINTED IN INK OR TYPEWRITTEN; NO ERASURES ARE PERMITTED; ERRORS MAY BE CROSSED OUT AND CORRECTIONS PRINTED IN INK OR TYPEWRITTEN ADJACENT AND MUST BE INITIALED IN INK BY PERSON SIGNING THE RFQ RESPONSE.**
- **BIDDERS THAT DO NOT COMPLY WITH THE REQUIREMENTS, AND/OR SUBMIT AN INCOMPLETE RFQ RESPONSE MAY BE SUBJECT TO DISQUALIFICATION AND THEIR RFQ RESPONSE REJECTED IN TOTAL.**
- **IF BIDDERS ARE MAKING ANY CLARIFICATIONS AND/OR AMENDMENTS, OR TAKING EXCEPTION TO ANY PART OF THIS RFQ, THESE MUST BE SUBMITTED IN THE EXCEPTIONS, CLARIFICATIONS, AND AMENDMENTS SECTION OF THIS EXHIBIT A – RFQ RESPONSE PACKET. THE DISTRICT, AT ITS SOLE DISCRETION, MAY ACCEPT AMENDMENTS/EXCEPTIONS, OR MAY DEEM THEM TO BE UNACCEPTABLE, THEREBY RENDERING THE RFQ RESPONSE DISQUALIFIED.**
- **BIDDERS SHALL NOT MODIFY DISTRICT LANGUAGE IN ANY PART OF THIS RFQ OR ITS EXHIBITS, NOR SHALL THEY QUALIFY THEIR RFQ RESPONSE BY INSERTING THEIR OWN LANGUAGE OR FALSE CLAIMS IN THEIR RESPONSE. ANY EXCEPTIONS AND CLARIFICATIONS MUST BE PLACED IN THE “EXCEPTIONS/ CLARIFICATIONS” PAGE, NOT BURIED IN THE PROPOSAL ITSELF.**



## BIDDER INFORMATION AND ACCEPTANCE

1. The undersigned declares that all RFQ documents, including, without limitation, the RFQ, Addenda, and Exhibits, have been read and that the terms, conditions, certifications, and requirements are agreed to.
2. The undersigned is authorized to offer, and agrees to furnish, the articles and services specified in accordance with the RFQ documents.
3. The undersigned acknowledges acceptance of all addenda related to this RFQ.
4. The undersigned hereby certifies to the District that all representations, certifications, and statements made by the bidder, as set forth in this RFQ Response Packet and attachments, are true and correct and are made under penalty of perjury pursuant to the laws of California.
5. The undersigned acknowledges that the bidder is, and will be, in good standing in the State of California, with all the necessary licenses, permits, certifications, approvals, and authorizations necessary to perform all obligations in connection with this RFQ and associated RFQ documents.
6. It is the responsibility of each bidder to be familiar with all of the specifications, terms, and conditions and, if applicable, the site condition. By the submission of an RFQ response, the bidder certifies that if awarded a contract it will make no claim against the District based upon ignorance of conditions or misunderstanding of the specifications.
7. Patent indemnity: Contractors who do business with the District shall hold the District, its Directors, officers, agents, and employees, harmless from liability of any nature or kind, including cost and expenses, for infringement or use of any patent, copyright, or other proprietary right, secret process, patented or unpatented invention, article, or appliance furnished or used in connection with the contract or purchase order.
8. Insurance certificates are not required at the time of submission. However, by signing Exhibit A – RFQ Response Packet, the bidder agrees to meet the minimum insurance requirements stated in the RFQ. This documentation must be provided to the District prior to execution of an agreement by the District and shall include an insurance certificate which meets the minimum insurance requirements, as stated in the RFQ.
9. The undersigned acknowledges that RFQ responses, in whole or in part, are NOT to be marked confidential or proprietary. The District may refuse to consider any RFQ response or part thereof so marked. RFQ responses submitted in response to this RFQ may be subject to public disclosure. The District shall not be liable in any way for disclosure of any such records.
10. The undersigned bidder hereby submits this RFQ response and binds itself on award to the District under this RFQ to execute in accordance with such award a contract and to furnish the bond or bonds and insurance required by the RFQ. The RFQ, subsequent Addenda, bidder's Response Packet, and any attachments, shall constitute the Contract, and all provisions thereof are hereby accepted.
11. The undersigned acknowledges **ONE** of the following (please check only one box):

- Bidder is not an SBE and is ineligible for any bid preference; **OR**
- Bidder is an SBE or DVBE as described in the Contract Equity Program (CEP) and Equal Employment Opportunity (EEO) Guidelines, is requesting a 7% bid preference, and has completed the CEP and EEO forms at the hyperlink contained in the CEP and EEO section of this Exhibit A.

For additional information on SBE bid preference, please refer to the Contract Equity Program and Equal Employment Opportunity Guidelines at the above referenced hyperlink.

Official Name of Bidder (exactly as it appears on Bidder's corporate seal and invoice): \_\_\_\_\_

Street Address Line 1: \_\_\_\_\_

Street Address Line 2: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Webpage: \_\_\_\_\_

Type of Entity / Organizational Structure (check one):

- Corporation
- Limited Liability Partnership
- Limited Liability Corporation
- Other: \_\_\_\_\_
- Joint Venture
- Partnership
- Non-Profit / Church

Jurisdiction of Organization Structure: \_\_\_\_\_

Date of Organization Structure: \_\_\_\_\_

Federal Tax Identification Number: \_\_\_\_\_

Department of Industrial Relations (DIR) Registration Number: \_\_\_\_\_

Primary Contact Information:

Name / Title: \_\_\_\_\_

Telephone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_

E-mail Address: \_\_\_\_\_

Street Address Line 1: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

**SIGNATURE:** \_\_\_\_\_

Name and Title of Signer (printed): \_\_\_\_\_

Dated this \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_



## REQUIRED DOCUMENTATION AND SUBMITTALS

All of the specific documentation listed below is required to be submitted with the Exhibit A – RFQ Response Packet. Bidders shall submit all documentation, in the order listed below, and clearly label each section of the RFQ response with the appropriate title (i.e. Table of Contents, Letter of Transmittal, Key Personnel, etc.).

1. **Description of the Proposed Equipment:** RFQ response shall include a description of the proposed equipment/system, as it will be finally configured during the term of the contract. The description shall specify how the proposed equipment/system will meet or exceed the requirements of the District and shall explain any advantages that this proposed equipment/system would have over other possible equipment/systems. The description shall include proposed operational strategy and any disadvantages or limitations that the District should be aware of in evaluating the RFQ response. The description shall include general arrangement drawings. Finally, the description shall describe all product warranties provided by bidder.
2. **Implementation Plan:** The RFQ response shall include an implementation plan. The plan for implementing the proposed equipment/system and services shall include an Acceptance Test Plan. In addition, the plan shall indicate how the bidder will ensure adherence to the timetables for the final equipment/system and/or services.
3. **Sustainability Statement:** Bidders shall submit a statement regarding any sustainable or environmental initiatives or practices that they or their suppliers engage in. This information can be in relation to the specific products procured under this RFQ or in relation to the manufacture, delivery, or office practices of your firm.

If applicable, please also provide any information you have available on the below:

- a. Has your firm taken steps to enhance its ability to assess, track and address issues regarding Greenhouse Gas (GHG) Emissions in answer to recent legislations such as the [Buy Clean California Act](#)? If so, please attach any data you can on the embedded greenhouse gas emissions in the production and transport of the products and/or services which will be provided via this RFQ. If this is not available, please describe the approach you plan to take in order to gather and report this information in the future. For further information in this topic, please see: <http://www.ghgprotocol.org/scope-3-technical-calculation-guidance>.
4. **Bid Form – Additional Evaluation:**
    - (a) Bidders must use the Exhibit G “Bid Form Workbook” spreadsheet template provided with the RFQ to provide construction costs (Item 1.01.B) and operational costs (Item 1.01.C) estimates.

- (b) Bidders to provide digital copy of the spreadsheet with submission of the RFQ Response Packet. The file, in native Microsoft Excel format, must be on a USB flash drive and enclosed with the sealed original hardcopy of the RFQ Response.
- (c) **BIDDERS MUST CONTACT THE FOLLOWING PERSON TO RECEIVE A COPY OF THE EXHIBIT G “BID FORM WORKBOOK” SPREADSHEET TEMPLATE:**

Attn: Sarah Plummer  
E-Mail: [sarah.plummer@ebmud.com](mailto:sarah.plummer@ebmud.com)  
PHONE: (510) 287-2099

5. **Escalation/De-Escalation Program:**

- (a) Bidders to complete “Escalation/De-Escalation Program” section of this Exhibit A – RFQ Response Packet.
  - Bidders to indicate if they elect to participate or not participate in the Escalation/De-Escalation Program.
  - If electing to participate in the Escalation/De-Escalation Program, Bidders to select up to five (5) commodity indices for material or equipment from Table 9 of the Bureau of Labor Statistics Producer Price Indexes (PPI) and complete the table provided in the “Escalation/De-escalation Program” section.

6. **References:**

- (a) Bidders must use the templates in the “References” section of this Exhibit A – RFQ Response Packet to provide references.
- (b) References should have similar scope, volume, and requirements to those outlined in these specifications, terms, and conditions.
  - Bidders must verify the contact information for all references provided is current and valid.
  - Bidders are strongly encouraged to notify all references that the District may be contacting them to obtain a reference.
- (c) The District may contact some or all of the references provided in order to determine Bidder’s performance record on work similar to that described in this RFQ. The District reserves the right to contact references other than those provided in the RFQ response.

7. **Exceptions, Clarifications, Amendments:**

- (a) The RFQ response shall include a separate section calling out all clarifications, exceptions, and amendments, if any, to the RFQ and associated RFQ documents, which shall be submitted with Bidder’s RFQ response using the template in the “Exceptions, Clarifications, Amendments” section of this Exhibit A – RFQ Response Packet.



- (b) **THE DISTRICT IS UNDER NO OBLIGATION TO ACCEPT ANY EXCEPTIONS, AND SUCH EXCEPTIONS MAY BE A BASIS FOR RFQ RESPONSE DISQUALIFICATION.**

8. **Contract Equity Program:**

- (a) Every bidder must fill out, sign, and submit the appropriate sections of the Contract Equity Program and Equal Employment Opportunity documents located at the hyperlink contained in the last page of this Exhibit A. Special attention should be given to completing Form P-25, "Contractor Employment Data and Certification". Any bidder needing assistance in completing these forms should contact the District's Contract Equity Office at (510) 287-0114 prior to submitting an RFQ response.



## ESCALATION/DE-ESCALATION PROGRAM

- 1.01 The contract price for this scope of work shall include costs for the component materials and equipment. It is recognized that market prices for some materials and equipment may be volatile, and sudden price increases or decreases could occur. The District desires competitive pricing that avoids significant risk-based pricing due to potential volatility. The Bidder agrees to use their best efforts to obtain the lowest possible prices from available material, equipment, or energy suppliers but, between the bid and purchase order date (or release date), there could be an increase or decrease in the prices of some materials or equipment for use in this construction project. Bidder may elect to participate in the following escalation program.
- 1.02 Adjustment of the contract amount will be determined in three steps: (1) establishment of indices and basis of estimate, (2) merit confirmation, and (3) adjustment of contract.
- A. Establishment of indices and basis of estimate - Bidder may, in its bid, select up to five (5) commodity indices for material or equipment from Table 9 of the Bureau of Labor Statistics Producer Price Indexes (PPI). Within 30 days of notice of award, Bidder shall, for each material or equipment, provide a detailed quantity, the associated unit of measurement, and the quote(s) indicating the bid price per unit (dated prior to the bid date). This information will establish the basis of estimate.
- B. Determination of merit - An increase or decrease of more than five percent (5.00%) of a selected commodity index from step 1 shall be considered merit. The baseline commodity index shall be the most recently published index prior to the bid date. The comparative commodity index shall be the most recently published index prior to the date of releasing the materials for fabrication. An increase or decrease in the prices of imported materials or equipment due to tariffs is not a basis of merit.

Examples for Determining Merit: Examples assume a bid date of January 2022 and a release for fabrication of May 20, 2022.

Commodity Name	Commodity Code	Jan-22	May-22	% Increase/Decrease	Merit
Other noncurrent-carrying wiring devices and supplies (boxes, covers, bar hangers, etc.)	1171-0217	185	212	14.5%	Yes
Ready-mix concrete	1333	314	319	1.5%	No

- C. Adjustment of contract - The value of the change order will be determined by the difference of the established basis of estimate from step 1 and the value as of the date of the authorization for fabrication. Both the basis of estimate and the subcontract must be equivalent in scope, quantity, and materially related to each other and the changed index. The amount of escalation shall be adjusted by an additional six percent (6.00%) to account for

increased or decreased indirect costs, overhead, and profit. No material escalation will be allowed for quantities beyond the established basis of estimate.

- 1.03 Bidder may elect to participate in this escalation/de-escalation program. Failure to provide this completed form with your bid proposal indicates your election to decline participation in this program. By declining participation in this program, Subcontractor/Supplier/Vendor waives the ability to seek change orders pursuant to Article 7 of the General Conditions for changes in market prices for materials, equipment, or energy.

Select one of the following and provide the requested signature information:

\_\_\_\_\_ I elect to PARTICIPATE in the escalation/de-escalation program. If awarded the work package, I shall supply within 30 days of notice of award the basis of estimate information as defined above and agree that this basis of estimate information will be used as the basis of change.

\_\_\_\_\_ I elect to NOT PARTICIPATE in the escalation/de-escalation program.

\_\_\_\_\_  
**Signature**

\_\_\_\_\_  
**Printed Name**

\_\_\_\_\_  
**Date**

- 1.04 For participating firms, list the specific material, equipment, or energy items from within your bid and the selected indices below from Table 9 of the Bureau of Labor Statistics Producer Price Indexes (PPI) ([https://www.bls.gov/web/ppi/ppi\\_dr.pdf](https://www.bls.gov/web/ppi/ppi_dr.pdf)).

Item #	Specific Material, Equipment, or Energy Item(s)	Commodity Index Name	Commodity Index Code	Value of Item Subject to this Clause
Example	Stainless Steel Pipe	Steel pipe and tube, stainless steel	1017-0674	\$400,000
1				
2				
3				
4				
5				



**REFERENCES**

**RFQ No. 2505- Ballasted Flocculation Equipment and Services**

**Bidder Name:** \_\_\_\_\_

**Bidder must provide a minimum of 3 references.**

Company Name:	Contact Person:
Address:	Telephone Number:
City, State, Zip:	E-mail Address:
Services Provided / Date(s) of Service:	

Company Name:	Contact Person:
Address:	Telephone Number:
City, State, Zip:	E-mail Address:
Services Provided / Date(s) of Service:	

Company Name:	Contact Person:
Address:	Telephone Number:
City, State, Zip:	E-mail Address:
Services Provided / Date(s) of Service:	

Company Name:	Contact Person:
Address:	Telephone Number:
City, State, Zip:	E-mail Address:
Services Provided / Date(s) of Service:	

Company Name:	Contact Person:
Address:	Telephone Number:
City, State, Zip:	E-mail Address:
Services Provided / Date(s) of Service:	



**EXCEPTIONS, CLARIFICATIONS, AMENDMENTS**  
**RFQ No. 2505- Ballasted Flocculation Equipment and Services**

**Bidder Name:** \_\_\_\_\_

List below requests for clarifications, exceptions, and amendments, if any, to the RFQ and associated RFQ Documents, and submit with bidder's RFQ response. **The District is under no obligation to accept any exceptions and such exceptions may be a basis for RFQ response disqualification.**

Reference to:			Description
Page No.	Section	Item No.	
p. 23	D	1.c.	<i>Bidder takes exception to...</i>

\*Print additional pages as necessary



## **CONTRACT EQUITY PROGRAM & EQUAL EMPLOYMENT OPPORTUNITY**

The District's Board of Directors adopted the Contract Equity Program (CEP) to enhance equal opportunities for business owners of all races, ethnicities, and genders who are interested in doing business with the District. The program has contracting objectives, serving as the minimum level of expected contract participation for the three availability groups: white-men owned businesses, white-women owned businesses, and ethnic minority owned businesses. The contracting objectives apply to all contracts that are determined to have subcontracting opportunities, and to all contractors regardless of their race, gender, or ethnicity.

All Contractors and their subcontractors performing work for the District must be Equal Employment Opportunity (EEO) employers and shall be bound by all laws prohibiting discrimination in employment. There shall be no discrimination against any person, or group of persons, on account of race, color, religion, creed, national origin, ancestry, gender including gender identity or expression, age, marital or domestic partnership status, mental disability, physical disability (including HIV and AIDS), medical condition (including genetic characteristics or cancer), genetic information, or sexual orientation.

**Contractor and its subcontractors shall abide by the requirements of 41 CFR §§ 60-1.4(a), 60-300.5(a) and 60-741.5(a). These regulations prohibit discrimination against qualified individuals based on their status as protected veterans or individuals with disabilities and prohibit discrimination against all individuals based on their race, color, religion, sex, sexual orientation, gender identity, or national origin in the performance of this contract. Moreover, these regulations require that covered prime contractors and subcontractors take affirmative action to employ and advance in employment individuals without regard to race, color, religion, sex, national origin, protected veteran status or disability.**

All Contractors shall include the nondiscrimination provisions above in all subcontracts.

Please include the required completed forms with your bid.

Non-compliance with the Guidelines may deem a bid non-responsive, and therefore, ineligible for contract award. Your firm is responsible for:

- 1) Reading and understanding the CEP guidelines.
- 2) Filling out and submitting with your bid the appropriate forms.

The CEP guidelines and forms can also be downloaded from the District website at the following link:  
<http://ebmud.com/business-center/contract-equity-program/>

If you have questions regarding the Contract Equity Program, please call (510) 287-0114.



## EXHIBIT B INSURANCE REQUIREMENTS

**CONTRACTOR/COMPANY NAME:** \_\_\_\_\_

PROPOSER shall take out and maintain during the life of the Agreement all insurance required and PROPOSER shall not commence work until such insurance has been approved by DISTRICT. The proof of insurance shall be on forms provided by DISTRICT directly following these Insurance Requirements.

PROPOSERS are not required to submit completed insurance verification documents with their bid but will be required to submit them upon notification of award. By signing Exhibit A – RFQ Response Packet, the PROPOSER agrees to meet the minimum insurance requirements stated in the RFQ.

### **Provisions Applicable to All Required Insurance**

- A. Prior to the beginning of and throughout the duration of Services, and for any additional period of time as specified below, CONTRACTOR shall, at its sole cost and expense, maintain insurance in conformance with the requirements set forth below.
- B. CONTRACTOR shall provide Verification of Insurance as required by this Agreement by providing the completed Verification of Insurance as requested below by signing and submitting Exhibit B (“Insurance Requirements”) to the DISTRICT. The Insurance Requirements may be signed by the insurance broker or the insurance broker’s agent (Insurance Broker/Agent) for the CONTRACTOR, or by an officer of the CONTRACTOR (Officer), or by the CONTRACTOR’s risk manager (Risk Manager). The Notice to Proceed shall not be issued, and CONTRACTOR shall not commence Services until a signed Verification of Insurance evidencing the specific coverages and limits required by this Agreement has been received by the DISTRICT.
- C. CONTRACTOR shall carry and maintain the minimum insurance requirements as defined in this Agreement. CONTRACTOR shall require any contractor/subcontractor to carry and maintain the minimum insurance required in this Agreement to the extent the insurance applies to the scope of the services to be performed by contractor/subcontractor.
- D. Receipt of a signed Verification of Insurance by the DISTRICT shall not relieve CONTRACTOR of any of the insurance requirements, nor decrease liability of CONTRACTOR.
- E. Insurance must be maintained, and an updated Verification of Insurance must be provided to the DISTRICT before the expiration of insurance by having the Insurance Broker/Agent, Officer, or Risk Manager update, sign and return the Insurance Requirements to the DISTRICT’s contract manager. The updated Insurance Requirements shall become a part of the Agreement but shall not require a change order to the Agreement. It is the CONTRACTOR’s sole responsibility to provide or to ensure that an updated Verification of Insurance is provided to the DISTRICT. The DISTRICT has no obligation to solicit, remind, prompt, request, seek, or otherwise obtain any updated Verification of Insurance, and any actual or alleged failure on the part of the DISTRICT to obtain any updated Verification of Insurance under this Agreement shall not in any way be construed to be a waiver of any right or remedy of the DISTRICT, in this or any regard.
- F. The insurance required hereunder may be obtained by a combination of primary, excess and/or umbrella insurance, and all coverage shall be at least as broad as the requirements listed in this Agreement.

- G. Any deductibles, self-insurance, or self-insured retentions (SIRs) applicable to the required insurance coverage must be declared to and accepted by the DISTRICT.
- H. At the option and request of the DISTRICT, CONTRACTOR shall provide documentation of its financial ability to pay the deductible, self-insurance, or SIR.
- I. CONTRACTOR is responsible for the payment of any deductibles or SIRs pertaining to the policies required under this Agreement. In the event CONTRACTOR is unable to pay the required SIR, CONTRACTOR agrees that such SIR may be satisfied, in whole or in part, by the DISTRICT as the additional insured at the DISTRICT's sole and absolute discretion, unless to do so would terminate or void the policy(ies).
- J. Unless otherwise accepted by the DISTRICT, all required insurance must be placed with insurers with a current A.M. Best's rating of no less than A- V.
- K. CONTRACTOR shall defend the DISTRICT and pay any damages as a result of failure to provide the waiver of subrogation from the insurance carrier required by this Agreement.
- L. For any coverage that is provided on a claims-made coverage form (which type of form is permitted only where specified), the retroactive date must be shown, must be before the date of this Agreement, and must be before the beginning of any Services related to this Agreement.
- M. For all claims-made policies the updated Verification of Insurance must be provided to the DISTRICT for at least three (3) years after expiration or termination of this Agreement.
- N. If claims-made coverage is canceled or is non-renewed and if the claims-made coverage is not replaced with another claims-made policy form with a retroactive date prior to the effective date of this Agreement and prior to the start of any Services related to this Agreement, CONTRACTOR must purchase an extended reporting period for a minimum of three (3) years after expiration or termination of the Agreement.
- O. In the event of a claim or suit, and upon request by the DISTRICT, CONTRACTOR agrees to provide a copy of the pertinent policy(ies) within 10 days of such request to the DISTRICT for review. Any actual or alleged failure on the part of the DISTRICT to request a copy of the pertinent policy(ies) shall not in any way be construed to be a waiver of any right or remedy of the DISTRICT, in this or any regard. Additionally, the DISTRICT may, at any time during CONTRACTOR's performance under this Agreement, request a copy of the Declarations pages and Schedule of Forms and Endorsements of any policy required to be maintained by CONTRACTOR hereunder, whether or not a suit or claim has been filed. Premium details may be redacted from any such documents requested.
- P. The defense and indemnification obligations of this Agreement are undertaken in addition to, and shall not in any way be limited by, the insurance obligations contained herein.
- Q. Where additional insured coverage is required, the additional insured coverage shall be primary and non-contributory and will not seek contribution from the DISTRICT's insurance or self-insurance.
- R. CONTRACTOR agrees to provide immediate Notice to the DISTRICT of any loss or claim against CONTRACTOR arising out of, pertaining to, or in any way relating to this Agreement or to Services performed under this Agreement. The DISTRICT assumes no obligation or liability by such Notice but has the right (but not the duty) to monitor the handling of any such claim(s) if the claim(s) is likely to involve the DISTRICT.



- S. It is the obligation of the CONTRACTOR to ensure all contractors/subcontractors performing services under this Agreement maintain the necessary coverages and limits. CONTRACTOR shall ensure that all contractors/subcontractors agree to the same indemnity obligation that CONTRACTOR agrees to in this Agreement based on the nature and scope of services being performed by each contractor/subcontractor. CONTRACTOR shall require that each contractor/subcontractor include the DISTRICT, its directors, officers, and employees as additional insureds on its liability policy(ies) (excepting Professional Liability and Workers' Compensation) for all ongoing and completed operations with coverage as broad as required of CONTRACTOR under this Agreement. Failure or inability to secure fully adequate insurance shall in no way relieve the CONTRACTOR or all contractors/subcontractors of the responsibility for its own acts or the acts of any contractors/subcontractors or any employees or agents of either. All contractors/subcontractors are to waive subrogation against the DISTRICT on all policies. CONTRACTOR shall be responsible for maintaining records evidencing contractors'/subcontractors' compliance with the necessary insurance coverages and limits, and such records shall be made available to the DISTRICT within 10 days upon request.
- T. It is CONTRACTOR's responsibility to ensure its compliance with the insurance requirements. Any actual or alleged failure on the part of the DISTRICT to obtain proof of insurance required under this Agreement shall not in any way be construed to be a waiver of any right or remedy of the DISTRICT, in this or any regard.
- U. Notice of Cancellation/Non-Renewal/Material Reduction. The insurance requirements hereunder are mandatory, and the DISTRICT may, at its sole and absolute discretion, terminate the services provided by CONTRACTOR, should CONTRACTOR breach its obligations to maintain the required coverage and limits set forth in this Agreement. No coverage required hereunder shall be cancelled, non-renewed or materially reduced in coverage or limits without the DISTRICT being provided at least thirty (30) days prior written notice, other than cancellation for the non-payment of premiums, in which event the DISTRICT shall be provided ten (10) days prior written notice. Replacement of coverage with another policy or insurer, without any lapse in coverage or any reduction of the stated requirements does not require notice beyond submission to the DISTRICT of an updated Verification of Insurance which shall be met by having the Insurance Broker/ Agent, or Officer, or Risk Manager update, sign and return the Insurance Requirements.

## **I. Workers' Compensation and Employer's Liability Insurance Coverage**

- A. Workers' Compensation insurance including Employer's Liability insurance with minimum limits as follows:
- |             |  |
|-------------|--|
| Coverage A. | Statutory Benefits Limits                            |
| Coverage B. | Employer's Liability of not less than:               |
|             | Bodily Injury by accident: \$1,000,000 each accident |
|             | Bodily Injury by disease: \$1,000,000 each employee  |
|             | Bodily Injury by disease: \$1,000,000 policy limit   |
- B. If there is an onsite exposure of injury to CONTRACTOR, and/or contractor/subcontractor's employees under the U.S. Longshore and Harbor Workers' Compensation Act, the Jones Act, or under laws, regulations or statutes applicable to maritime employees, coverage is required for such injuries or claims.
- C. If CONTRACTOR is exempt from carrying Workers' Compensation Insurance, CONTRACTOR must return the completed Verification of Insurance confirming that CONTRACTOR has no employees and is exempt from the State of California Workers' Compensation requirements.

- D. If CONTRACTOR is self-insured with respect to Workers' Compensation coverage, CONTRACTOR shall provide to the DISTRICT a Certificate of Consent to Self-Insure from the California Department of Industrial Relations. Such self-insurance shall meet the minimum limit requirements and shall waive subrogation rights in favor of the DISTRICT as stated below in section "E."
- E. Waiver of Subrogation. Workers' Compensation policies, including any applicable excess and umbrella insurance, must contain a waiver of subrogation endorsement providing that CONTRACTOR and each insurer waive any and all rights of recovery by subrogation, or otherwise, against the DISTRICT, its directors, board, and committee members, officers, officials, employees, agents, and volunteers. CONTRACTOR shall defend and pay any and all damages, fees, and costs, of any kind arising out of, pertaining to, or in any way relating to CONTRACTOR's failure to provide waiver of subrogation from the insurance carrier.

**Verification of Workers' Compensation and Employer's Liability Insurance Coverage**

By checking the box and signing below, I hereby verify that the CONTRACTOR is exempt from the State of California's requirement to carry Workers' Compensation insurance.

As the CONTRACTOR's Insurance Broker/Agent, Officer, or Risk Manager, I hereby verify that I have reviewed and confirmed that the CONTRACTOR carries Workers' Compensation insurance as required by this Agreement, including the relevant provisions applicable to all required insurance.

Self-Insured Retention: Amount: \$ \_\_\_\_\_

Policy Limit: \$ \_\_\_\_\_

Policy Number: \_\_\_\_\_

Policy Period: from \_\_\_\_\_ to \_\_\_\_\_

Insurance Carrier Name: \_\_\_\_\_

Insurance Broker/Agent or Officer or Risk Manager - Print Name: \_\_\_\_\_

Insurance Broker/Agent or Officer or Risk Manager's Signature: \_\_\_\_\_

**II. Commercial General Liability Insurance ("CGL") Coverage**

- A. CONTRACTOR's insurance shall be primary, and any insurance or self-insurance procured or maintained by the DISTRICT shall not be required to contribute to it.
- B. The insurance requirements under this Agreement shall be the greater of (1) the minimum coverage and limits specified in this Agreement; or (2) the broader coverage and maximum limits of coverage of any insurance policies or proceeds available to the Named Insured. It is agreed that these insurance requirements shall not in any way act to reduce coverage that is broader or that includes higher limits than the minimums required herein. No representation is made that the minimum insurance requirements of this Agreement are sufficient to cover the obligations of the CONTRACTOR.

- C. Minimum Requirements. CGL insurance with minimum per occurrence and aggregate limits as follows:
 

Bodily Injury and Property Damage	\$2,000,000 per occurrence & aggregate
Personal Injury/Advertising Injury	\$2,000,000 per occurrence & aggregate
Products/Completed Operations	\$2,000,000 per occurrence & aggregate
- D. Coverage must be on an occurrence basis and be as broad as Insurance Services Office (ISO) form CG 00 01.
- E. Coverage for Products, and Completed Operations, and Ongoing Operations must be included in the insurance policies and shall not contain any “prior work” coverage limitation or exclusion applicable to any Services performed by CONTRACTOR and/or contractor/subcontractor under this Agreement.
- F. There will be no exclusion for explosions, collapse, or underground liability (XCU).
- G. Insurance policies and Additional Insured Endorsement(s) shall not exclude liability and damages to work arising out of, pertaining to, or in any way relating to services performed by contractor/subcontractor on CONTRACTOR’s behalf.
- H. Contractual liability coverage shall be included and shall not limit, by any modification or endorsement, coverage for liabilities assumed by CONTRACTOR under this Agreement as an “insured contract.”
- I. Waiver of Subrogation. The policy shall be endorsed to include a Waiver of Subrogation ensuring that the CONTRACTOR and its insurer(s) waive any rights of recovery by subrogation, or otherwise, against the DISTRICT, its directors, board, and committee members, officers, officials, agents, volunteers, and employees. CONTRACTOR shall defend and pay any and all damages, fees, and costs, of any kind, arising out of, pertaining to, or in any way resulting from CONTRACTOR’s failure to provide the waiver of subrogation from its insurance carrier(s).
- J. Independent Contractor’s Liability shall not limit coverage for liability and/or damages arising out of, pertaining to, or in any way resulting from Services provided under this Agreement.
- K. To the fullest extent permitted by law, the DISTRICT, its directors, board, and committee members, officers, officials, employees, agents, and volunteers must be covered as Additional Insureds on a primary and noncontributory basis on all underlying, excess and umbrella policies that shall be evidenced in each case by an endorsement. Coverage for the Additional Insureds must be as broad as ISO forms CG 20 10 (ongoing operations) and CG 20 37 (completed operations) for liability arising in whole, or in part, from work performed by or on behalf of CONTRACTOR, or in any way related to Services performed under this Agreement.
- L. A severability of interest provision must apply for all the Additional Insureds, ensuring that CONTRACTOR’s insurance shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the policies’ limit(s).

**Verification of Commercial General Liability (CGL) Insurance Coverage**

**As the CONTRACTOR’S Insurance Broker/Agent, Officer, or Risk Manager, I hereby verify that I have reviewed and confirmed that the CONTRACTOR carries Commercial General Liability insurance, as required by this Agreement, including the relevant provisions applicable to all required insurance:**

**Self-Insured Retention: Amount: \$ \_\_\_\_\_**

**Policy Limit: \_\_\_\_\_**

**Policy Number:** \_\_\_\_\_

**Policy Period: from** \_\_\_\_\_ **to** \_\_\_\_\_

**Insurance Carrier Name:** \_\_\_\_\_

**Insurance Broker/Agent or Officer or Risk Manager - Print Name:** \_\_\_\_\_

**Insurance Broker/Agent or Officer or Risk Manager's Signature:** \_\_\_\_\_

**III. Business Auto Liability Insurance Coverage**

- A. CONTRACTOR's insurance shall be primary, and any insurance or self-insurance procured or maintained by the DISTRICT shall not be required to contribute to it.
- B. The insurance requirements under this Agreement shall be the greater of (1) the minimum coverage and limits specified in this Agreement; or (2) the broader coverage and maximum limits of coverage of any insurance policies or proceeds available to the Named Insured. It is agreed that these insurance requirements shall not in any way act to reduce coverage that is broader or that includes higher limits than the minimums required herein. No representation is made that the minimum insurance requirements of this Agreement are sufficient to cover the obligations of the CONTRACTOR.
- C. Minimum Requirements. Auto insurance with minimum coverage and limits as follows:
  - Each Occurrence Limit (per accident) and in the Aggregate: \$2,000,000
  - Bodily Injury and Property Damage: \$2,000,000
- D. Coverage must include either "owned, non-owned, and hired" autos or "any" automobile. This provision ensures the policy covers losses arising out of use of company-owned vehicles ("owned autos"), employee's personal autos ("non-owned autos" meaning not owned by company/insured) or autos that are rented or leased ("hired autos").
- E. If CONTRACTOR is transporting hazardous materials or contaminants, evidence of the Motor Carrier Act Endorsement-hazardous materials clean-up (MCS-90, or its equivalent) must be provided.
- F. If CONTRACTOR's Scope of Services under this Agreement exposes a potential pollution liability risk related to transport of potential pollutants, seepage, release, escape or discharge of any nature (threatened or actual) of pollutants into the environment arising out of, pertaining to, or in any way related to CONTRACTOR's and/or contractor's/subcontractor's performance under this Agreement, then Auto Liability Insurance policies must be endorsed to include Transportation Pollution Liability insurance. Alternatively, coverage may be provided under the CONTRACTOR's Pollution Liability Policies if such policy has no exclusions that would restrict coverage under this Agreement. Coverage shall also include leakage of fuel or other "pollutants" needed for the normal functioning of covered autos.
- G. To the fullest extent permitted by law, the DISTRICT, its directors, board, and committee members, officers, officials, employees, agents, and volunteers must be covered as Additional Insureds on a primary and noncontributory basis on all underlying and excess and umbrella policies.
- H. A severability of interest provision must apply for all the Additional Insureds, ensuring that CONTRACTOR's insurance shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the insurer's limits of liability.

**Verification of Business Auto Liability Insurance Coverage**

As the CONTRACTOR’S Insurance Broker/Agent, Officer, or Risk Manager, I hereby verify that I have reviewed and confirmed that the CONTRACTOR carries Business Automobile Liability insurance, as required by this Agreement, including the relevant provisions applicable to all required insurance:

Self-Insured Retention: Amount: \$ \_\_\_\_\_

Policy Limit: \$ \_\_\_\_\_

Policy Number: \_\_\_\_\_

Policy Period: from \_\_\_\_\_ to \_\_\_\_\_

Insurance Carrier Name: \_\_\_\_\_

Insurance Broker/Agent or Officer or Risk Manager – Print Name: \_\_\_\_\_

Insurance Broker/Agent or Officer or Risk Manager’s Signature: \_\_\_\_\_

**IV. Professional Liability (also known as Errors and Omissions) Insurance Coverage**

A. The insurance requirements under this Agreement shall be the greater of (1) the minimum coverage and limits specified in this Agreement; or (2) the broader coverage and maximum limits of coverage of any insurance policies or proceeds available to the Named Insured. It is agreed that these insurance requirements shall not in any way act to reduce coverage that is broader or that includes higher limits than the minimums required herein. No representation is made that the minimum insurance requirements of this Agreement are sufficient to cover the obligations of the CONTRACTOR.

B. Minimum Requirements: Professional Liability Insurance with minimum limits as follows:

- Each Claim: \$2,000,000
- Aggregate Limit: \$2,000,000

If Coverage is written on a claims-made form, the following shall apply:

1. The retroactive date must be shown and must be before the date of the Agreement or the beginning of the Services.
2. Insurance must be maintained, and evidence of insurance must be provided for a minimum of three (3) years after completion of the Services.
3. If claims-made coverage is canceled or non-renewed, and not replaced with another claims-made policies form with a retroactive date prior to the effective date of the Agreement, CONTRACTOR must purchase an extended reporting period for a minimum of three (3) years after completion of the Services.

C. Insurance shall include prior acts coverage sufficient to cover the services under this Agreement.

**Verification of Professional Liability (Errors and Omissions) Insurance Coverage**

As the CONTRACTOR’S Insurance Broker/Agent, Officer, or Risk Manager, I hereby verify that I have reviewed and confirmed that the CONTRACTOR carries Professional Liability insurance as required by this Agreement, including the relevant provisions applicable to all required insurance.

Self-Insured Retention: Amount: \$ \_\_\_\_\_

Policy Limit: \$ \_\_\_\_\_

Policy Number: \_\_\_\_\_

Policy Period: from \_\_\_\_\_ to \_\_\_\_\_

Insurance Carrier Name: \_\_\_\_\_

Insurance Broker/Agent or Officer or Risk Manager- Print Name: \_\_\_\_\_

Insurance Broker/Agent or Officer or Risk Manager’s Signature: \_\_\_\_\_

**V. Installation Floater Insurance Coverage**

At all times during the performance of services under this Agreement, CONTRACTOR shall maintain Installation Floater insurance on a special form (“all risks”) basis against direct physical loss, theft, or damage to all materials, property, structures, and equipment that will become part of the project, while in transit or storage, and during construction, erection, installation and testing. Coverage shall be in an amount equal to 100% of the projected completed value of the Project as well as subsequent modifications to that sum, unless an agreed amount is otherwise stated between the CONTRACTOR and the DISTRICT. CONTRACTOR shall cause the policy to be endorsed with a waiver of subrogation in favor of the DISTRICT, its officials, officers, employees, and agents. The DISTRICT shall be included as a Loss Payee on the policy.

**Verification of Installation Floater Insurance Coverage**

As the CONTRACTOR’S Insurance Broker/Agent, Officer, or Risk Manager, I hereby verify that I have reviewed and confirmed that the CONTRACTOR carries Installation Floater insurance, as required by this Agreement, including the relevant provisions applicable to all required insurance:

Self-Insured Retention: Amount: \$ \_\_\_\_\_

Policy Limit: \$ \_\_\_\_\_

Policy Number: \_\_\_\_\_

Policy Period: from \_\_\_\_\_ to \_\_\_\_\_

Insurance Carrier Name: \_\_\_\_\_

Insurance Broker/Agent or Officer or Risk Manager – Print Name: \_\_\_\_\_

Insurance Broker/Agent or Officer or Risk Manager’s Signature: \_\_\_\_\_

## **VI. Excess and/or Umbrella Liability Insurance Coverage (Optional – See Paragraph A below)**

- A. The insurance requirements set forth above may be satisfied by a combination of primary and excess or umbrella policies. Where excess or umbrella policies are used the following shall apply:
- B. CONTRACTOR's insurance shall be primary, and any insurance or self-insurance procured or maintained by the DISTRICT shall not be required to contribute to it.
- C. The insurance requirements under this Agreement shall be the greater of (1) the minimum coverage and limits specified in this Agreement; or (2) the broader coverage and maximum limits of coverage of any insurance policies or proceeds available to the Named Insured. It is agreed that these insurance requirements shall not in any way act to reduce coverage that is broader or that includes higher limits than the minimums required herein. No representation is made that the minimum insurance requirements of this Agreement are sufficient to cover the obligations of the CONTRACTOR.
- D. Minimum Requirements: It is expressly understood by the parties that CONTRACTOR's Excess and/or Umbrella Liability policies shall, at minimum, comply with all insurance requirements set forth within this Agreement, and shall be at least as broad as coverage required of the underlying policies required herein.
1. Coverage for Products, Completed Operations, and Ongoing Operations must be included in the insurance policies and shall not contain any "prior work" coverage limitation or exclusion applicable to any Services performed under this Agreement and, if it is a claims-made policy, it must be maintained for a minimum of three (3) years following final completion of the Services.
  2. There will be no exclusion for explosions, collapse, or underground damage (XCU).
  3. Insurance policies and Additional Insured Endorsements shall not exclude coverage for liability and damages from services performed by contractor/subcontractor on CONTRACTOR's behalf.
  4. Contractual liability coverage shall be included and shall not limit, by any modification or endorsement, coverage for liabilities assumed by CONTRACTOR under this Agreement as an "insured contract."
  5. Independent Contractor's Liability shall not limit coverage for liability and/or damage arising out of, pertaining to, or in any way related to Services provided under this Agreement.
  6. To the fullest extent permitted by law, the DISTRICT, its directors, officers, officials, agents, volunteers, and employees must be covered as Additional Insureds on a primary and noncontributory basis on all excess and umbrella policies. The Additional Insureds must be covered for liability arising in whole or in part from any premises, Products, Ongoing Operations, and Completed Operations by or on behalf of CONTRACTOR, in any way related to Services performed under this Agreement.
  7. A severability of interest provision must apply for all the Additional Insureds, ensuring that the CONTRACTOR's insurance shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the policy's limits.
  8. CONTRACTOR and its excess and/or umbrella Liability insurance coverage must waive any rights of subrogation against the DISTRICT, its directors, officers, officials, employees, agents, and volunteers, and CONTRACTOR shall defend and pay any damages as a result of failure to provide the waiver of subrogation from the insurance carrier(s).

**Verification of Excess and/or Umbrella Liability Insurance Coverage**

**As the CONTRACTOR’S Insurance Broker/Agent, Officer, or Risk Manager, I hereby verify that I have reviewed and confirmed that the CONTRACTOR carries Excess and/or Umbrella Liability insurance, as required by this Agreement, including the relevant provisions applicable to all required insurance.**

**Excess/Umbrella Limits: Amount \$** \_\_\_\_\_

**Policy Limit: \$** \_\_\_\_\_

**Policy Number:** \_\_\_\_\_

**Policy Period from** \_\_\_\_\_ **to** \_\_\_\_\_

**Insurance Carrier Name:** \_\_\_\_\_

**Underlying Policy(ies) listed above to which Excess/Umbrella applies:**

\_\_\_\_\_

**Insurance Broker/Agent or Officer or Risk Manager - Print Name:** \_\_\_\_\_

**Insurance Broker/Agent or Officer or Risk Manager’s Signature:** \_\_\_\_\_



**EXHIBIT C**  
**GENERAL CONDITIONS AND SUPPLEMENTARY GENERAL CONDITIONS**

# GENERAL CONDITIONS

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# GENERAL CONDITIONS

## ARTICLE 1 - GENERAL PROVISIONS

### 1.1 Interpretation

1.1.1 The following interpretative rules apply throughout the Contract Documents.

- .1 The provisions of the Contract Documents are complementary and should be interpreted viewing the Contract Documents as a whole.
- .2 A concept phrased in the singular should be interpreted in the plural as required.
- .3 Masculine includes feminine, and feminine includes masculine.
- .4 The words “shall,” “will” and “must,” in any of their tenses, indicate mandatory requirements.
- .5 The use of examples like “such as” or “including” does not limit or exclude examples not specifically mentioned.
- .6 The words “provide,” “perform,” “construct,” and “install” mean, unless preceded by the word “only,” that the Contractor shall provide, perform, construct, and install and include all services necessary to provide, perform, construct and install.

### 1.2 Definitions

1.2.1 Throughout the Contract Documents, the terms below will have the following defined meanings:

- .1 **Addendum:** A written change, clarification, or correction to the Contract Documents issued by the East Bay Municipal Utility District prior to bid opening.
- .2 **Bidder:** Any individual, partnership, joint venture, or corporation submitting a proposal for the work contemplated, acting directly or through a duly authorized representative.
- .3 **Board or Board of Directors:** The Board of Directors of the East Bay Municipal Utility District.
- .4 **Change Order:** A Change Order is a written instrument used for modifying the contract with regards to the scope of Work, Contract Sum, and/or Contract Time. An approved Change Order is a Change Order signed by the District. An

executed Change Order is a Change Order signed by both the District and the Contractor.

- .5 Compensable Delay:** A period of delay to the Contractor's performance of the Work that meets all of the following criteria:

  - a) the delay directly prevents the Contractor from performing critical path Work;
  - b) the delay is caused directly and solely by the District or by causes within the exclusive control of the District;
  - c) the delay is not concurrent with any other type of delay;
  - d) the delay could not have been avoided by the Contractor through work-arounds, rescheduling or other mitigation measures; and
  - e) the Contractor gave timely notice of the delay to the District in compliance with the terms of this contract.
  
- .6 Concurrent Delay:** Two or more independent causes of delay to the Contractor's performance of the Work that meet all of the following criteria:

  - a) the delays occur at the same time during all or a portion of the delay period being considered;
  - b) the delays directly prevent the Contractor from performing critical path Work;
  - c) each of the delays would have delayed the Contractor's performance of critical path work even in the absence of any of the other delays;
  - d) none of the delays could have been avoided by the Contractor through work-arounds, rescheduling or other mitigation measures required under this contract; and
  - e) the Contractor gave timely notice of the delays to the District in compliance with the terms of this contract.
  
- .7 Contract Completion:** The Work has been fully completed in accordance with the Contract Documents as determined by the Engineer and all governmental authorities with jurisdiction over the project have issued acceptance or a certificate of occupancy.
  
- .8 Contract Documents:** See Article 1.3.
  
- .9 Contract Sum:** The contract price stated in the contract form (Document 00 52 00) plus all Approved Change Orders.
  
- .10 Contract Time:** The number of days set forth in the contract to achieve Contract Completion. The required completion date is computed by adding the number of days to the effective date of the Notice to Proceed. If the required completion date falls on a District holiday or non-Work Day, that day is excluded and the following Work Day is counted. The Contract Time may only be adjusted by approved Change Order.

- .11 Contractor:** The individual, partnership, joint venture, or corporation with whom the contract is made by the District.
- .12 Critical Path:** The sequence of schedule activities that determines the duration of the Work.
- .13 Day:** Unless otherwise specified, days are calendar days, measured from midnight to the next midnight.
- .14 Deficiency Notice:** A written notice issued by the Engineer informing the Contractor of non-conforming Work.
- .15 District:** The East Bay Municipal Utility District.
- .16 Engineer:** The Director of Engineering and Construction or the Director of Wastewater of the District acting directly or through authorized agents acting within the duties entrusted to them.
- .17 Excusable Delay:** A period of delay to the Contractor's performance of the Work that meets all of the following criteria:
- a) the delay prevents the Contractor from performing critical path work;
  - b) the delay is directly caused by events beyond the control of both the District and the Contractor (including, but not limited to, adverse weather);
  - c) the delay is not concurrent with an Inexcusable Delay as defined in this contract;
  - d) the delay could not have been avoided by the Contractor through work-arounds, rescheduling or other mitigation measures required under the contract; and
  - e) the Contractor gave timely notice of the delay to the District in compliance with the terms of this contract.
- .18 Fixed Costs** (also known as **Fixed Price**): Any necessary labor, material, and equipment costs directly expended which remain constant regardless of the quantity of work done.
- .19 Force Account:** Method of compensation for Work performed that is billed at actual cost for labor, materials, equipment, taxes and other costs plus a specified percentage of markup for overhead and profit. Compensation rate for certain cost elements may be specified in the contract.
- .20 Free Float** (also known as **Activity Float**): The amount of time that a scheduled activity can be delayed without delaying the early start of any immediately following schedule activity.
- .21 Inexcusable Delay:** A period of delay to the Contractor's performance of the Work caused by circumstances within the Contractor's control or within the scope of the Contractor's contract responsibilities. Delays attributable to or

within the control of a Subcontractor of any tier, or a Supplier, shall be deemed to be delays within the control of the Contractor. Inexcusable Delays include, but are not limited to, any of the following:

- a) delays caused by the Contractor's failure to perform its cooperation and coordination responsibilities required by this contract;
- b) delays caused by the District's enforcement of any government act or regulation, or the provisions of the contract;
- c) delays caused by the District's right to sequence the Work in a manner that would avoid disruption to the District's tenants, customers, contiguous property owners, and their contractors or other prime contractors and their respective Subcontractors;
- d) any delay that is neither a Compensable Delay nor Excusable Delay as defined in this contract; and
- e) delays of any kind that the Contractor fails to give timely notice to the District in compliance with the terms of this contract.

**.22 Lump Sum Price:** Pricing arrangement where the Contractor agrees to perform the scope of work for a fixed price that cannot be adjusted unless there is a Change Order. For the purpose of this contract, the terms Lump Sum Price and Fixed Price adjustment are used interchangeably.

**.23 Notice to Proceed:** A written directive, issued by the District, authorizing the Contractor to start performance of the work and establishing date of commencement of the work. The effective date is the date the Contractor acknowledges receipt of the Notice to Proceed or five days from mailing, whichever is earlier.

**.24 Shop Drawings:** Includes all drawings, specifications, diagrams, calculations, illustrations, product samples, brochures, catalog cuts, schedules, and other data which are prepared by the Contractor, a Subcontractor, tier-subcontractor, manufacturer, Supplier, or distributor, illustrating how specific portions of the Work shall be fabricated or installed.

**.25 Shoring:** A temporary structural system designed to support any and all loads for the purposes of excavation. Sloping of the soil shall not be considered as shoring.

**.26 Subcontractor:** The person or persons, co-partnership, firm or entity in direct contract with the Contractor or with any other Subcontractor for the purpose of furnishing materials, equipment, and/or performing a part of the contract Work.

**.27 Superintendent:** The Contractor's authorized on-site representative in charge of supervising the Work. Instructions and information given by the Engineer to the Superintendent shall be considered to have been given to the Contractor.

**.28 Supplier:** A manufacturer, fabricator, distributor, or any person or organization who supplies materials or equipment for the contract Work, including that

fabricated to a special design, but who does not ordinarily perform labor at the jobsite.

**.29 Total Float:** The amount of time that a schedule activity may be delayed from its early start without delaying the Contract Completion date, or violating a schedule constraint.

**.30 Underground Utilities:** All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities that are installed underground to furnish any of the following services or materials: water, sewage and drainage removal, electricity, gases, steam, liquid petroleum products, telephone or other communication systems, cable television, traffic, or other control or information systems.

**.31 Unit Price:** Pricing arrangement in which the total amount of compensation for performance of the work is computed by multiplying the actual quantity of Work performed by the line item unit price except as noted in Article 7.5. Measurement of the quantity of work performed shall be determined by the Engineer.

**.32 Work:** All labor, material, equipment, submittal, and appurtenances required to be furnished to properly complete construction of the work under the Contract Documents.

**.33 Work Day:** Unless specified elsewhere, work day includes all days of the year except Saturdays, Sundays, and District Holidays.

### **1.3 Contract Documents**

**1.3.1** The Contract Documents comprise the entire agreement between the District and the Contractor concerning the Work. The Contractor shall properly perform all requirements of the Contract Documents.

**1.3.2** The Contract Documents include the District's contract form and any exhibits attached thereto, including the Notice to Contractors, Instructions to Bidders, Bidding Form, Proposal, General Conditions, Supplementary General Conditions, Designation of Subcontractors, Contract Equity Program Forms, specifications, addenda, appendices, and approved Change Orders, if any.

**1.3.3** The Contract Documents are intended to be complementary and include all items necessary for the Contractor's proper execution and completion of the Work. Anything mentioned in the specifications and not shown on the drawings or shown on the drawings and not mentioned in the specifications shall be as if shown or mentioned in both. Any part of the Work not shown or mentioned on the drawings or in the specifications that is reasonably implied by either, or is necessary or usual



for proper performance of the Work, shall be provided by the Contractor at its expense.

**.1** In the case of conflicts, errors, or discrepancies in any of the Contract Documents, the order of precedence is as follows. Within the same order of precedence, specific requirements shall take precedence over general requirements.

1. Change Orders
2. Contract Forms
3. Addenda
4. Contractor's Bid (Bid Form)
5. Supplementary General Conditions
6. General Conditions
7. Specifications (Divisions 01 - 49)
8. Drawings/Plans
9. Referenced Standard Specifications
10. Remainder of Specifications (Division 00)

**.2** With reference to the Drawings:

1. Numerical dimensions govern over scaled dimensions
2. Detailed drawings govern over general drawings
3. Addenda/Change Order drawings govern over contract drawings
4. Contract drawings govern over standard drawings
5. Notes apply only to the drawing where the notes appear, unless classified as "typical" or intended to apply elsewhere in which case they apply to all drawings where the conditions or circumstance noted occurs
6. Typical details apply to all drawings unless a specific different detail is shown

**1.3.4** "Related Sections" are referenced solely for the convenience of the Contractor and its Subcontractors and Suppliers, but does not, whether by omission or otherwise, lessen the requirements of the specification section where the related section is referenced.

**1.3.5** Command type sentences used in the specifications refer to and are directed to the Contractor.

**1.3.6** No interest in the contract shall be transferred to any other party without permission of the Board of Directors.

## **ARTICLE 2 - RIGHTS-OF-WAY AND PROPERTY**

### **2.1 Provided by the District**

- 2.1.1** The District will provide reasonable access to the site for performance of the Work. Upon approval by the Engineer, the Contractor may use a suitable portion of the District's rights-of-way or property for working space and for storage of equipment and materials. The Contractor is responsible for any damage resulting from its use of the District's rights-of-way or property and shall return and restore it to its pre-existing condition. The District will not be responsible for any loss or damage to equipment or materials stored on the work site or on the District's rights-of-way or property.
- 2.1.2** The Contractor does not have exclusive use of the site or the rights-of-way and must coordinate its use with the District and others.

### **2.2 Additional Property**

- 2.2.1** If the Contractor's operations cause the contractor to require additional property that is not within the District's rights-of-way or property for its operations, the Contractor shall, at its own expense, arrange with the property owners to use the additional property.
- 2.2.2** Agreements with property owners for storing materials and equipment, or other purpose related to the Work shall be made in writing with a copy submitted to the Engineer.

## **ARTICLE 3 - ADMINISTRATION OF THE CONTRACT**

### **3.1 Authority of the Engineer**

- 3.1.1** The decision of the Engineer will be final and binding on both parties with respect to all questions concerning the intent of the Contract Documents, the acceptability of material or equipment, the classification of material, the execution of the Work, and/or conflicting interests of separate contractors performing related work.

### **3.2 Inspection and Non-Conforming Work**

- 3.2.1** All materials furnished and Work completed under the contract is subject to inspection by the Engineer. The Engineer's inspections are solely for the District's benefit and do not constitute acceptance of any of the Contractor's work or waiver of the requirement that the Contractor's work conform to the requirements of the Contract Documents. The Contractor shall furnish, without extra charge, all necessary test pieces and samples, including facilities and labor for obtaining those pieces, as requested by the Engineer. The Engineer will have safe access to the work site or shop where the work, material or equipment subject to inspection is

being performed or manufactured or where any off-site work is being performed, including shops, sites, and assembly facilities of Subcontractors and Suppliers.

- 3.2.2** All material, equipment or Work that does not conform to the Contract Documents is non-conforming work and will be rejected regardless of whether it may have been inspected by the Engineer or its representative. Installation of unapproved materials and equipment is non-conforming work until the materials or equipment are approved by the Engineer. Deficiency Notices may be issued by the Engineer to advise the Contractor of non-conforming work. However, lack of a Deficiency Notice shall not waive the Contractor's obligation to correct any and all non-conforming work, patent or latent, through the expiration of the warranty period, or other such longer period as specified in the Contract Documents.
- 3.2.3** Within 10 Work Days after receipt of a Deficiency Notice, the Contractor shall submit its proposal and schedule for correcting all non-conforming work. The District may withhold 150% of the installed value identified or such reasonable costs as determined by the Engineer until the non-conforming work is completed in accordance with the requirements of the Contract Documents. Additional costs for engineering, observation, administrative, clerical or other work associated with or resulting from the Contractor's failure to perform its work in conformance with the Contract Documents shall be borne solely by the Contractor, and the Engineer may elect to deduct the District's additional costs from any future payments to the Contractor. If the Contractor refuses or neglects to replace the non-conforming work, the District may correct or replace the non-conforming work at the Contractor's expense. The District's expenses in correcting any non-conforming work will be calculated as fully burdened costs for labor, plus actual costs for materials and equipment, plus a 15% markup on materials and equipment.
- 3.2.4** Work completed without the Engineer's inspection and approval may be required to be reconstructed or replaced upon the Engineer's inspection. Work covered without prior approval of the Engineer may be required to be uncovered to the extent necessary for the Engineer to determine if the covered Work is satisfactory. The entire cost of replacing or uncovering and re-covering the Work, including the cost of materials furnished by the District, shall be borne by the Contractor, whether or not the Work uncovered or replaced is found to be defective.

### **3.3 Lines, Grades, and Measurements**

- 3.3.1** Lines and grades will be established by the Engineer, unless otherwise noted, and the Contractor shall provide such assistance and materials as may be required. The Contractor shall be responsible for transferring grades from the survey stakes provided by the Engineer. The Contractor shall carefully preserve all stakes and reference points. Should any stakes, points or monuments be removed or destroyed without the approval of the Engineer, the stakes, points or monuments shall be reset, as necessary, at the Contractor's expense.

- 3.3.2** The Contractor shall inform the Engineer at least four full Work Days in advance of the times and places that the Contractor requires establishment of lines, grades, or quantity surveys.
- 3.3.3** If the Contractor fails to provide timely notice to the Engineer regarding its survey requirements, no compensation will be made for the impact to the Contractor for resulting delays.

## **3.4 Disputes and Claims**

### **3.4.1 Disputes**

- .1** If the Engineer issues an order or decision that requires the Contractor to perform Work that the Contractor believes is not required by the Contract Documents, the Contractor shall, within 48 hours of the order or decision, notify the Engineer in writing that it disputes the order or decision. The Contractor's notice shall include the date and circumstances of the Engineer's order or decision and the detailed basis for disputing the order or decision. Regardless of the basis of the dispute, the Contractor shall immediately perform the disputed Work or conform to the Engineer's order or decision.
- .2 Notice of Intent To File a Claim:** The Engineer will consider and investigate the dispute and issue a written and final decision regarding the dispute. If the Contractor disagrees with the Engineer's final decision, the Contractor shall, within 10 days of receipt of the decision, send the Engineer a written Notice of Intent To File a Claim.
- .3 Waiver:** Failure of the Contractor to comply with the notifications of Articles 3.4.1.1 and 3.4.1.2 within the specified time constitutes a waiver of the Contractor's right to assert a Claim concerning such matter.

### **3.4.2 Claims**

- .1 Time to Submit Claim:** The Contractor shall submit a written Claim within 30 days after submitting a Notice of Intent to File a Claim. The Claim shall relate directly to the circumstances addressed in the Notice of Intent to File a Claim, must identify the date of the Notice of Intent to File a Claim to which the Claim relates, and may not raise new issues or circumstances that were not identified in the Notice of Intent to File a Claim. The Claim shall clearly state that it is a Claim being submitted under this Article. Failure to submit a written Claim within the 30-day period waives any right to recover compensation or obtain an extension of Contract Time due to the issues referenced in the Notice of Intent to File a Claim.
- .2 Contents of Written Claim:** The written Claim shall provide detailed information sufficient to allow the Engineer to evaluate entitlement and value of the Claim, including:

- a) Description of the event or events giving rise to the Claim;
- b) Identification of the date or dates of the event, or events giving rise to the Claim;
- c) Identification of all statutory or contractual support for the Claim; and
- d) Detailed analysis of the asserted effect on the Contract Sum and the Contract Time.

- .3 Extensions in Contract Time:** The Claim shall provide an analysis of schedule impact that describes how the Contractor will incorporate the alleged changed Work in the schedule and how that Work impacts the current accepted schedule. The analysis of schedule impacts shall contain a written narrative and a schedule diagram per Construction Progress Documentation set forth in Section 01 32 00 of the specifications depicting how the alleged changed Work affects other schedule activities and an analysis of the potential mitigation efforts. The written narrative shall describe the sequence of events surrounding the alleged change, the affect the events had or will have on the progress of the Work, an explanation regarding the cause of delay, the Contractor's mitigation efforts taken to minimize time impacts to the project, and the Contractor's determination whether additional compensation and/or an extension of the Contract Time is sought for delay. If the Contractor is requesting an extension in the Contract Time, the magnitude and cause of the delay shall be demonstrated in the analysis of schedule impacts.
- .4 Delay Analysis Diagrams:** The same scheduling software used for the project schedule and schedule update shall be used to create the analysis diagram. The analysis diagram shall be provided in an editable, electronic, file format as well as a printed copy. The results of the analysis diagram shall be tied to the affected sequence of schedule activities to enable the Engineer to evaluate the impact to the critical path as a result of the alleged changed work. The schedule diagram shall also show logic relationships and durations of new activities associated with the alleged change and logic and duration revisions to existing schedule activities due to the alleged change and mitigations taken to minimize impacts to the project. The Contractor is responsible for requesting extensions to its Contract Time based on the analysis of schedule impact.
- .5 Adjustments to Contract Sum:** The Claim shall also provide adequate financial data supporting any request for a change in Contract Sum. The Claim shall include a detailed cost breakdown of all items claimed, including all costs associated with delays, acceleration, overhead and profit, and the computations used in determining such costs. The Contractor's proposal shall include detailed estimates with cost breakdowns for each Subcontractor whose break down will include the following categories: labor, material, equipment, overhead, and profit. Labor shall be broken down into hours and rate per hour. If applicable, the proposal shall include a breakdown for off-site labor (including factory labor, engineering, etc.). If the exact amount of a Claim is not ascertainable at the time the claim is made, the available supporting data

shall be submitted and any supplemental data supporting the exact amount of the Claim shall be submitted as soon as available.

**.6 Claim Format:**

a) The Contractor shall submit the claim in the following format:

- 1) Cover letter and certification.
- 2) Summary of claim including:
  - (a) Underlying Facts.
  - (b) Entitlement.
  - (c) Mitigation Efforts.
  - (d) Calculations.
  - (e) Contract Provisions Supporting Relief.
- 3) List of documents relating to claim:
  - (a) Specifications.
  - (b) Drawings.
  - (c) Clarifications/Requests For Information.
  - (d) Schedules.
  - (e) Other.
- 4) Chronology of Events and Correspondence.
- 5) Analysis of Claim Merit.
- 6) Analysis of Claim Cost.
- 7) Analysis of Schedule Impact.
- 8) Attachments:
  - (a) Specifications.
  - (b) Drawings.

- (c) Clarifications/Requests For Information.
  - (d) Correspondence.
  - (e) Schedules.
  - (f) Other.
- b) The Contractor, through a corporate officer or general partner, shall certify under penalty of perjury pursuant to the laws of the State of California for any Claim filed on behalf of itself or its Subcontractors or Suppliers, that:
  - 1) The Claim is made in good faith;
  - 2) Supporting data are accurate and complete to the best of the Contractor's knowledge and belief; and
  - 3) The amount requested accurately reflects the contract adjustment for which the Contractor believes the District is liable.
- .7 If Contractor does not certify the Claim as required above, the Claim will be denied without any further recourse by, or remedy to, the Contractor.
- .8 Condition Precedent (Government Code, Sections 930, et seq.):**
  - a) The Disputes and Claims procedures set forth in Article 3.4 are the exclusive procedures for presenting any Claims exceeding \$375,000 and are a condition precedent to filing a Government Code Claim, which, in turn, is a condition precedent to the right to initiating any action against the District related to the Claim. Claims may not be divided into amounts less than \$375,000 to avoid the requirements of this Article 3.4 and any claims arising from the same facts or circumstances, or related facts or circumstances, will be deemed a single claim valued as the sum of all related claims. Failure to comply with the Disputes and Claims procedures offset forth in Article 3.4 is a waiver of any Claim arising from or related to the facts and circumstances described in the Claim or the Notice of Intent to File a Claim.
- .9 For claims less than or equal to \$375,000, the Contractor shall comply with Public Contract Code, Section 20104, et seq., which is set forth below in relevant part (as used therein, the term "local agency" means East Bay Municipal Utility District). This Public Contract Code section on Claim resolution does not supersede the Claim documentation requirements in this Article 3.4 and only becomes operative upon the timely notice and submittal of a Claim under the contract.

“20104. (a) (1) This article applies to all public works claims of three hundred seventy-five thousand dollars (\$375,000) or less which arise between a contractor and a local agency.

(2) This article shall not apply to any claims resulting from a contract between a contractor and a public agency when the public agency has elected to resolve any disputes pursuant to Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2.

(b) (1) "Public work" means “public works contract” as defined in Section 1101 but does not include any work or improvement contracted for by the state or the Regents of the University of California.

(2) "Claim" means a separate demand by the contractor for (A) a time extension, (B) payment of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public work and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or (C) an amount the payment of which is disputed by the local agency.

20104.2. For any claim subject to this article, the following requirements apply:

(a) The claim shall be in writing and include the documents necessary to substantiate the claim. Claims must be filed on or before the date of final payment. Nothing in this subdivision is intended to extend the time limit or supersede notice requirements otherwise provided by contract for the filing of claims.

(b) (1) For claims of less than fifty thousand dollars (\$50,000), the local agency shall respond in writing to any written claim within 45 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 the local agency may have against the claimant.

(2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

(3) The local agency’s written response to the claim, as further documented, shall be submitted to the claimant within 15 days after receipt of the further documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.

(c) (1) For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the local



agency shall respond in writing to all written claims 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 the local agency may have against the claimant.

(2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

(3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 30 days after receipt of the further documentation, or within a period of time no greater than that taken by the claimant in producing the additional information or requested documentation, whichever is greater.

(d) If the claimant disputes the local agency's written response, or the local agency fails to respond within the time prescribed, the claimant may so notify the local agency, in writing, either within 15 days of receipt of the local agency's response or within 15 days of the local agency'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 a demand, the local agency shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(e) Following the meet and confer conference, if the claim or any portion remains in dispute, the claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) or Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits his or her written claim pursuant to subdivision (a) until the time that claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.

(f) This article does not apply to tort claims and nothing in this article is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code.”

All civil actions filed to resolve claims under this Act are subject to the provisions of Public Contract Code Section 20104.4 and 20104.6(b).

**.10** The parties specifically and expressly agree that Government Code, Section 12650, et seq., applies. If a false claim is knowingly submitted (as the terms "claim" and "knowingly" are defined in the California False Claims Act, Government Code, Section 12650, et seq.), the District will be entitled to civil

remedies set forth in the California False Claim Act. It may also be considered fraud and the Contractor may be subject to criminal prosecution.

- .11 Under no circumstances will the Contractor be entitled to indirect, consequential, special and incidental damages.

## ARTICLE 4 - CONTRACTOR'S RESPONSIBILITIES

### 4.1 Responsibility of the Contractor

- 4.1.1 Means and Methods.** The Contractor shall complete the entire Work to the satisfaction of the Engineer in accordance with the Contract Documents. The Contractor is solely responsible for the means, methods, techniques, sequence, scheduling, workforce, and procedures of construction unless otherwise specified. The Contractor is solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with performance of Work under the contract and shall comply and enforce all Cal/OSHA requirements on this project. The Contractor is the “controlling employer” for this project as defined by Cal/OSHA.
- 4.1.2 Work.** The Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, transportation, utilities, and other facilities and services required for the proper execution and completion of the Work included in this contract.
- 4.1.3 Permit, Fee and Licenses.** Unless otherwise specified, the Contractor shall secure and pay for all licenses, royalties, government fees, and permits necessary for proper execution and completion of the Work. The Contractor shall give notices as required by permits prior to commencement of the Work, and provide copies of all permits to the Engineer before starting on the Work.
- 4.1.4 Contractor’s Licensing Requirements.** The Contractor shall have all required California State and local licenses and certificates for performance of the Work, and shall furnish satisfactory proof of licensing and certifications to the Engineer upon request. All required licenses and certificates shall be valid throughout construction of the project.
- 4.1.5 Taxes.** The Contractor shall pay all State, Federal, and local taxes applicable to the project, including all sales, use, gross receipts and similar taxes properly assessed against its equipment, materials, or property used or required in connection with the Work.
- 4.1.6 Compensation for Employees.** In accordance with the provisions of Section 3700 of the Labor Code, the Contractor shall secure the payment of compensation to its employees, Subcontractors and Suppliers.

## 4.2 Supervision of the Work

- 4.2.1 Superintendent.** The Contractor shall provide a qualified, competent superintendent at the project site to supervise and direct all Work being performed by the Contractor, Subcontractors, and their respective agents and employees to ensure that the Work is being carried out in accordance with the Contract Documents. The Contractor shall designate, in writing, the scope and authority of the superintendent before the Work begins. Instructions and information given by the Engineer to the Contractor's superintendent about the Work are binding on the Contractor.
- 4.2.2 Coordination of the Work.** Before starting each portion of the Work, the Contractor shall: (i) review and compare the various Contract Documents relative to that portion of the Work, as well as any additional information furnished by the Engineer and approved Subcontractor submittals that may affect proper installation of the Work; (ii) field measure existing conditions related to that portion of the Work; and (iii) observe any conditions at the site that may directly impact that portion of the Work, promptly reporting any improper or defective Work to the Engineer. Any errors or inconsistencies in the Contract Documents shall be promptly reported to the Engineer in writing as a request for information or clarification.
- 4.2.3 Duty of Care.** All Work shall be performed in a workmanlike manner meeting construction industry standards for a similar project located in California, regardless of any omission from the Contract Documents.

## 4.3 Contractor's Employees

- 4.3.1** The Contractor shall employ competent qualified personnel to construct the Work and shall maintain discipline and order at the project site.
- 4.3.2 Substitution of Key Personnel.** The Contractor cannot substitute key personnel, lessen their level of effort, or reduce the amount of time key personnel are assigned to the project without written consent from the Engineer. If the Contractor proposed specific key personnel during prequalification, or in response to an invitation to bid, the Contractor shall provide the same personnel at the same level of effort and for the same duration and amounts of time per week.
- 4.3.3 Removal of Personnel.** The Contractor shall not remove or replace any key personnel without the prior written consent of the Engineer, which will not be unreasonably withheld. When required by the Engineer, the Contractor shall remove from the project any person who, in the Engineer's opinion, is unfit, disorderly, dangerous, insubordinate, incompetent, or otherwise objectionable. Removed personnel may not be reemployed on the project without the Engineer's prior written consent. Such removal shall not be the basis of any claim for compensation or damages against the District or any of its officers, directors or employees. Within one week of removal, the Contractor shall propose a replacement to the Engineer. The replacement person shall hold the same position

or title and have approximately the same number of years of experience or more as the person that was removed from the project.

#### **4.4 Materials and Workmanship**

**4.4.1 Materials and Workmanship.** All materials and equipment incorporated into the Work shall be new, unexpired, of good quality, and of current manufacture unless otherwise specified. All materials shall be of the specified quality and equal to approved samples, if samples were required.

**4.4.2 Substitution of Materials or Equipment.** Materials, products, services or equipment specified or designated in the Contract Documents are intended to indicate the measure of quality and utility. Unless the Contract Documents specifically state that there are no substitutions, the Contractor may submit other brands of the specified product provided that the submitted product is of equal or better quality, possesses the required characteristics for the purpose intended and shall not involve additional cost to the District. By proposing a substitute, the Contractor warrants that it is equal to that specified and takes complete responsibility for any errors, omissions, conflicts, all modifications to existing piping, ductwork or electrical connections, or inconsistencies caused by using the substitute, including any additional costs of engineering or inspection, or necessary coordination with connections to make the substitute perform as specified. All submittals shall receive written approval from the Engineer prior to installation.

**4.4.3 Procurement and Storage.** All materials and equipment shall be furnished in ample quantities and procured in a timely manner to ensure uninterrupted progress of the Work. All materials and equipment shall be properly stored and protected and any loss or damage due to improper storage or protection shall be borne by the Contractor.

**4.4.4 Site Logistics.** The Contractor shall maintain its storage area and shall keep its storage areas clean, safe and secure. Any materials or equipment stored offsite shall be insured. The risk of loss shall remain on the Contractor for all materials and equipment stored off-site.

#### **4.5 District's Right to Perform Separate Work**

**4.5.1 Separate Work.** The District reserves the right to perform separate work at or near the project site at any time by the use of its own forces or other contractors. The Contractor shall coordinate its Work with the District and/or the District's other contractors and shall cooperate with the District to avoid any delay or hindrance to the project schedule and the other's work.

**4.5.2 Delays and Defective Construction.** The District shall be reimbursed by the Contractor for costs incurred by the District that are payable to its separate contractors as a result of the Contractor caused delays, improperly timed activities, damaged work, or defective construction.

## **4.6 Patents and Copyrights**

**4.6.1** The Contractor shall pay all license fees and royalties and all other costs incidental to use in the Work of any patented or copyrighted design, process, or product. The Contractor shall indemnify and hold harmless the District, its officers, agents, and employees against all costs and claims arising from any infringement of patents or copyrights incidental to use in the Work of any design, process, or product not specified in the Contract Documents.

## **4.7 Contractor's Responsibility for Losses and Liabilities**

**4.7.1 Risk of Loss.** Until acceptance of the Work by the District, the Contractor bears all risk of loss or damage to the Work or to any part of the Work and to any materials or equipment ordered or purchased for the Work whether located at the project, suitably stored off-site or in transit regardless of the cause of loss or damage. However, the Contractor is not responsible for the cost of repair or restoration of damage to the Work caused by an Act of God as that term is defined in Section 7105 of the Public Contract Code.

### **4.7.2 Protection of Materials and Facilities**

- .1** The Contractor is responsible for the preservation, protection and care of equipment, materials and facilities whether located on the project site or elsewhere and if it does not do so, the District may, at its option, do so at the Contractor's expense.
- .2** The Contractor is responsible for any District-furnished material upon receipt and for protection of the Work until it is completed and accepted. The Contractor shall at its own expense replace damaged or lost material and repair damaged parts of the Work.
- .3** The Contractor shall protect District facilities from damage resulting from its Work. District facilities damaged by or as a result of the Contractor's Work shall be repaired or replaced, at the Contractor's expense.
- .4** The Contractor shall maintain the project site in a clean, safe and orderly condition. Upon completion of the Work, the Contractor shall remove all temporary buildings and structures, rubbish, debris, abrasive blast media, unused material, concrete forms, and other materials used during construction that are not part of the completed work.
- .5** The Contractor shall provide fire watch and be responsible for all fire prevention in connection with the Work. Open fires will not be permitted on the project site. The Contractor shall notify the Engineer before undertaking any torch cutting and welding operations. The Contractor shall take all necessary safety precautions during torch cutting and welding operations including, but not limited to, fire watch, providing fire extinguishers and fire blankets at the location where the operations are occurring. The Contractor shall be

responsible for any damages caused by the Contractor or Subcontractor during such operations.

#### **4.7.3 Laws and Regulations**

- .1 The Contractor, its agents and employees shall observe and comply with all Federal, State, Municipal and local laws, ordinances, rules, regulations, building codes and standards, orders, notices and requirements applicable to its Work on this project. Nothing in these Contract Documents may be construed to permit Work not conforming to such laws, ordinances, and regulations. If the Contractor should discover any aspect or portion of the Contract Documents that conflicts with any law, ordinance, regulation, order, or decree, the Contractor shall immediately report the conflict in writing to the Engineer. Where the applicable legal requirements of public authorities differ from those of the Contract Documents, the more stringent requirements shall apply.
- .2 If an applicable law requirement was not in effect on the date of submission of bids, the Contract Sum and the Contract Time will be adjusted, if necessary, as provided in Article 7. Under no other circumstance will the Contract Sum or Contract Time be adjusted because of the effect of any applicable law, ordinance, regulation, order, decree or other legal requirement of public authorities in effect on the date of bid submission.

**4.7.4 Duty to Defend.** Notwithstanding assertions that the District, the Board, any member of the Board, or the District's officers, agents, or employees may have been actively or solely negligent, the Contractor shall assume the defense of the District, the Board, each member of the Board, and the District's officers, agents, and employees from all claims of any kind arising directly or indirectly out of the performance of, or on account of, the Work.

#### **4.7.5 Indemnity**

- .1 To the fullest extent allowed by law (including, but not limited to, Civil Code Section 2782), the Contractor shall indemnify and save harmless the District, the Board, each member of the Board, and the District's officers, agents, and employees (collectively "Indemnitees") from all liability, claims, damage and loss, of any kind, including attorneys' fees, subject to the limitations set forth by law, that arise out of, on account of, or in connection with the performance of the Work, including, but not limited to, liability or claims arising out of or resulting from:
  - a) Any act or omission of the Contractor, its Subcontractors and Suppliers, or anyone directly employed by any of them for whom the Contractor may be liable, during the performance of the Work; in guarding or maintaining the Work; or from any improper materials, implement, or appliances used in construction of the Work;

- b) Violation of any law, ordinance, regulation, order, or decree, whether by the Contractor, its Subcontractors, Suppliers or anyone directly employed by any of them for whom the Contractor may be liable;
  - c) The use or manufacture by the Contractor, its agents, or the District of any copyrighted composition, secret process, patented invention, article, or appliance, unless specifically specified in the Contract Documents;
  - d) Any breach of warranties, whether express or implied, made to the District by the Contractor, its Subcontractors, Suppliers or anyone directly employed by any of them for whom the Contractor may be liable;
  - e) The willful misconduct of the Contractor, its Subcontractors, Suppliers or anyone directly employed by any of them for whom the Contractor may be liable;
  - f) Any breach or default of the obligations assumed by the Contractor under this contract;
  - g) Injuries, sickness, disease or death of employees of the Contractor or its Subcontractors, Suppliers or anyone directly employed by any of them for whom the Contractor may be liable in connection with performance of the Work; and
  - h) Destruction of tangible property (other than the Work itself).
- .2 The Contractor's duty to indemnify is not affected or in any way diminished because the District, the Board, any member of the Board, or the District's officers, agents, or employees jointly caused or contributed to the liability or claim by their acts, omissions, conduct, or negligence, except that the Contractor is not obligated to indemnify an Indemnitee against its sole or active negligence, willful misconduct, or for defects in designs furnished by the Indemnitee. The Contractor's indemnification obligation is not limited by the Contractor's insurance, if any, or by the amount or type of damages, compensation, or benefits payable by or for the Contractor or any Subcontractor or other person or organization under the Workers' Compensation Act, Disability Benefit Act, or other employee benefit act. Said duty to indemnify shall not apply to the District's active negligence, consistent with Civil Code Section 2782.

## **4.8 Protection of Property**

- 4.8.1** The Contractor shall take all necessary precautions to provide for the safety and protection of all persons who may come in contact with the Work and for all property within and adjacent to the project site including, but not limited to, adequate precautions to protect existing sidewalks, curbs, pavements, utilities, shrubs, trees, and other adjoining property and structures. Should any facility,

structure, or property be damaged by the operations of the Contractor, the Contractor shall immediately notify the proper owners or authorities and the Engineer. The precautionary measures shall apply continuously and not be limited to normal work hours.

**4.8.2** If damage to persons or property occur as a result of the Work, the Contractor shall be responsible for proper investigation, documentation, including video or photography, to adequately memorialize and make a record of what transpired. The Contractor, at its own expense, shall rebuild, repair and restore, to the Engineer's satisfaction, all damage resulting from its operations as a condition of contract acceptance.

**4.8.3** Pursuant to Public Contract Code, Section 9201, the District will provide timely notification to the Contractor of the receipt of any third-party claims relating to damaged property.

#### **4.9 Contractor Use of Premises**

**4.9.1** The Contractor shall confine operations at the project site to areas permitted by the Contract Documents and shall not encumber the site with excessive material or equipment. The Contractor shall not impose load on any structure that will damage or endanger the structure. The Contractor shall take all actions necessary to prevent annoyance to occupants adjacent to or in the vicinity of the Work and shall not hinder access or operations of District personnel or equipment.

#### **4.10 Documents On-site**

**4.10.1 Contract Documents.** The Contractor shall maintain a copy of all Contract Documents at the project site, including but not limited to, subcontracts; Change Orders; requests for information; site, health and safety plan; material safety data sheets; the current construction progress schedule; updated as-built drawings; all approved submittals and samples pertaining to the Work; and any governing authority required documents. The Engineer shall have access to the Contract Documents during the Contractor's normal business hours.

#### **4.11 Review of Contract Documents and Field Conditions**

**4.11.1** The Contractor shall carefully study and compare the Contract Documents for any errors, omissions, or discrepancies; and shall take field measurements and carefully compare such field measurements with the Contract Documents. The Contractor shall immediately inform the Engineer in writing of any apparent errors, omissions, or discrepancies and shall await instructions before proceeding with the Work. Instructions given by the Engineer, which are manifestly necessary to carry out the intent of the Contract Documents or which are customarily performed, shall be performed by the Contractor as if fully and correctly set forth in the Contract Documents at no additional cost to the District.



- 4.11.2** If the Contractor performs any construction activity that it either knows or should have known involves an error, omission, or discrepancy referred to in Article 4.11.1 without notifying and receiving written instructions from the Engineer, the Contractor shall be responsible for resultant losses, including without limitation, the costs and time of correcting the defective Work.
- 4.11.3** Drawings indicate general and typical details of construction. Where conditions are not specifically indicated but are of similar character to details shown, similar details for construction shall be used, subject to review by the Engineer.

## **ARTICLE 5 – SUBCONTRACTORS AND SUPPLIERS**

- 5.1.1** The Contractor is fully responsible to the District for the acts and omissions of Subcontractors, Suppliers, and of persons and/or persons or entities employed by the Contractor to the same extent the Contractor is responsible for its own acts and omissions.
- 5.1.2** All Subcontractors shall possess the appropriate California State contractor's license and certifications at time of bid and during the performance of the Work. The Contractor shall comply with all requirements of the Subletting and Subcontracting Fair Practices Act commencing with Public Contract Code, Section 4100, et seq. Violation of the Subletting and Subcontracting Fair Practice Act are grounds for cancellation of the Contract under Public Contract Code, Section 4110, and disciplinary actions under Section 4111.
- 5.1.3** The Contractor shall coordinate all Subcontractors and Suppliers engaged in the Work. The Contractor shall ensure that all of its Subcontractors commence their respective work at the proper time and proceed with due diligence to avoid delays and/or damage to the Work. Any property damage caused by Subcontractors or Suppliers during the Work shall be repaired or paid for by the Contractor.
- 5.1.4** Nothing contained in the Contract Documents shall be construed as creating any contractual relationship between any Subcontractor, or Supplier, and the District. The District will not undertake to settle differences between the Contractor and its Subcontractors or Suppliers.

## **ARTICLE 6 - SAFETY OF PERSONS AND PROPERTY**

### **6.1 Contractor's Responsibility**

- 6.1.1** Notwithstanding any other provision of the specifications, the Contractor is solely and completely responsible for conditions of the jobsite, including safety of all persons and property, during performance of the Work. This requirement applies continuously and is not limited to normal work hours. Health and safety provisions shall conform to applicable Federal, State, County, and local laws, regulations, ordinances, standards, and codes, including the Federal Occupational Safety and

Health Act of 1970 (29 U.S.C., Section 651, et seq.) and California Code of Regulations, Title 8, Industrial Relations Division 1, Department of Industrial Relations, Chapter 4. Where any of these are in conflict, the more stringent requirement shall be followed.

## **6.2 Public Safety**

**6.2.1** During the performance of the Work, the Contractor shall erect and maintain necessary temporary fences, bridges, railings, lights, signals, barriers, or other safeguards as appropriate under the circumstance for the prevention of accidents. In addition, the Contractor shall take other precautions as necessary for public safety including, but not limited to, traffic control.

## **6.3 Engineer's Responsibility**

**6.3.1** The Engineer's review of the Contractor's construction performance and submittal documents is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the construction site.

**6.3.2** The Engineer may suspend operations if it determines that an imminent safety hazard exists.

## **6.4 Emergency Work**

**6.4.1 During Work Hours.** The Contractor shall act, without previous direction from the Engineer in case of an emergency arising from the performance of the Work that threatens loss or injury to property and/or safety of life. The Contractor shall notify the Engineer of the emergency as soon as possible. Any compensation claimed by the Contractor, together with substantiated documents in regard to expense, shall be submitted to the Engineer within 15 calendar days after the emergency. Additional compensation, if allowed, will be paid for through Article 7.

**6.4.2 Outside of Work Hours.** The Engineer will notify the Contractor of all emergencies for which it is aware that arise outside of regular work hours as a result of the Work. The Contractor shall respond to the emergency immediately without delay and shall, with the least practicable inconvenience, make the necessary repairs, replacements, or perform other necessary work. If the Contractor does not act promptly in accordance with this requirement, or should the circumstances of the case require repairs, replacements, or performance of other necessary work before the Contractor can be notified or can respond, the District may, at its option, make the necessary repairs, replacements, or perform the necessary work and deduct its cost of labor, materials and equipment from the Contractor's next progress payment. Performance of emergency work by District forces will not relieve the Contractor of any of its responsibilities, obligations, or liabilities under the contract.

## **ARTICLE 7 - CHANGES**

### **7.1 General**

The District reserves the right to make such alterations, deviations, additions to or deletions from the drawings and specifications, including increases or decreases to the quantity of any item or portion of work or omitting any item or portion of the work or any other changes in the Work that the Engineer determines to be necessary or advisable for proper completion or construction of the whole work. No change in the scope of work shall be authorized, and the Contractor shall not be eligible for compensation for any extra work performed, unless the change is ordered by the Engineer in writing.

### **7.2 Change Orders**

**7.2.1** Changes in the Work can only be made through a written contract Change Order issued by the Engineer. If the change causes an increase or decrease in the Contractor's Contract Sum, or a change in the Contract Time, an adjustment may be made as determined by the Engineer. The approved Change Order will specify increase or decrease to the Contract Sum and adjustment to the Contract Time, if any.

**7.2.2** Prior to issuing an approved Change Order, the Engineer may request that the Contractor submit a proposal covering the changes. The Change Order request will include a description of the work or revised drawings or specifications reflecting the proposed changes. Within 10 Work Days after receiving the request, the Contractor shall submit its proposal to the Engineer of all costs associated with the proposed change and any request for an extension of Contract Time. Contractor's proposal shall include detailed estimates with cost breakdowns for each Subcontractor, including labor, material, equipment, overhead, and profit. Labor shall be broken down into hours and rate per hour. If applicable, the proposal shall include a breakdown for off-site labor (including factory labor, engineering, etc.). The Contractor's proposal shall include an Analysis of Schedule Impact (See Article 3.4.2) when the Contractor is requesting an adjustment in Contract Time. Costs associated with preparation of the proposal, including the Analysis of Schedule Impact, are considered to be covered in the markup allowances in Article 7.3.4. The Contractor shall be responsible for any delay associated with its failure to submit its change proposal within the time specified. If the Engineer decides not to issue an approved Change Order after requesting a proposal from the Contractor, the Contractor will be notified in writing. The Contractor is not entitled to reimbursement for Change Order preparation costs for cancelled Change Order requests.

**7.2.3** If the Contractor agrees with the terms and conditions of the approved Change Order, the Contractor shall indicate its acceptance by signing the original copy and returning it to the Engineer within 10 Work Days after receipt or with reasonable promptness and in such sequence as to not delay the Work or activities of the District or of separate contractors, whichever is sooner. If notice of any change is

required to be given to a surety by the provisions of any bond, the Contractor shall provide notice and the amount of each applicable bond shall be adjusted separately. Payment in accordance with the terms and conditions set forth in the executed Change Order shall constitute full compensation for all Work included in the Change Order and the District will be released from any and all claims for direct, indirect, and impact expenses and additional time impact resulting from the Work. If the Contractor disagrees with the terms and conditions of the approved Change Order, the Contractor shall indicate specific areas of disagreement and return the approved Change Order to the Engineer. The Contractor shall submit a written dispute in accordance with Article 3.4. No payment will be made on the disputed work until the approved Change Order is returned to the Engineer. However, whether or not the Contractor agrees with the terms and conditions of an approved Change Order, the Contractor shall immediately revise its sequence of operations as required to facilitate timely completion of the changed work and shall proceed with the revised work sequence.

**7.2.4** The Engineer may, after having received a written cost quotation from the Contractor, order the Contractor, in writing, to proceed with the work prior to issuance of an approved Change Order through a change directive. The change directive will authorize the Contractor to proceed with the work subject to the cost quotation submitted by the Contractor. Within five days following receipt of the change directive, the Contractor shall submit a detailed change proposal as described in Article 7.2.2 documenting the amount of compensation. The Engineer will review the change proposal and, at its option, will either issue an approved Change Order for the work or direct the Contractor to perform the work through Force Account. Until the method of compensation is determined and the approved Change Order is received, the Contractor shall keep full and complete time and material records of the cost of the ordered work and shall permit the Engineer to have access to such records. An approved Change Order shall supersede any previously issued written change directive covering the same Work.

**7.2.5** Accord and Satisfaction and Reservations of Rights: Every executed Change Order shall constitute a full accord and satisfaction, and release of all Contractor (and, if applicable, Subcontractor) claims for additional time, money or other relief arising from or relating to the subject matter of the change including, without limitation, impacts of all types, cumulative impacts, inefficiency, overtime, delay, and any other type of claim.

### **7.3 Determination of Costs for Force Account Change Order Work**

**7.3.1 Labor.** The cost of labor used in performing the Change Order work, whether the employer is the Contractor and/or its Subcontractor, shall be the sum of the following:

- .1 Actual Wages:** Actual wages paid to workers, including foremen devoting their exclusive attention to the work in question. The actual wages shall include payments to, or on behalf of, workers for health and welfare, pension, vacation,

travel, subsistence, and similar purposes, and shall be paid at the wage rate demonstrated by submitted certified payrolls or, if the certified payrolls were not available, at the rate set forth in the pertinent prevailing wage determinations issued by the Director of Industrial Relations for the wage class common to the work performed. Superintendent's wages are included under the allowance for overhead and profit and shall not be included as part of these computations.

- .2 **Labor Surcharge:** To the actual wages, as defined in Article 7.3.1.1 above less those for travel and subsistence, will be added 27 percent, which shall constitute full compensation for all payments imposed by State and Federal laws, such as taxes, and for insurance and all other payments made to, or on behalf of, the workers, other than actual wages as defined in Article 7.3.1.1 above.

**7.3.2 Materials.** Only materials incorporated in the Change Order work will be paid for, the cost of which shall be the cost to the purchaser, including sales tax, if applicable, whether the Contractor and/or its Subcontractor, from the Supplier thereof, except as the following are applicable:

- .1 If a cash or trade discount by the actual Supplier is offered or available to the purchaser, it shall be credited to the District notwithstanding the fact that such discount may not have been taken.
- .2 If materials are procured by the purchaser by any method which is not a direct purchase from a direct billing by the actual Supplier to such purchaser, the cost of such materials shall be deemed to be the price paid to the actual Supplier as determined by the Engineer. No markup except for actual costs incurred in the handling of such materials will be permitted, and only application of one common markup to cover multiple handling.
- .3 If the materials are obtained from a supply or source owned wholly or in part by the purchaser, payment therefor will not exceed the price paid by the purchaser for similar materials furnished from said source on contract items or the current wholesale price for such materials delivered on the job site, whichever price is lower.
- .4 If the cost of such materials is excessive in the opinion of the Engineer, then the cost of such materials shall be deemed to be the lowest current wholesale price at which such materials are available in the quantities concerned and timely delivered to the job site, less any discounts as provided in Article 7.3.2.1 above.

**7.3.3 Equipment.** The Contractor and/or its Subcontractor will be paid for the use of equipment at the rental rates established as provided in Articles 7.3.3.1 and 7.3.3.2 below, which rates shall include the cost of fuel oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals. Operators of rented equipment will be paid for as provided in Article 7.3.1 above.

Unless otherwise specified, manufacturers' ratings shall be used to classify equipment for the determination of applicable rental rates.

**.1 Equipment on the Work:** For the use of any equipment normally required for the contract regardless of whether the equipment is already on the work or is to be delivered to the project, the Contractor and/or its Subcontractor will be paid for the use of such equipment as follows:

- a) If equipment is owned by the Contractor and/or its Subcontractor, payment will be at the rental rates listed for such equipment in the State of California's Department of Transportation publication titled "Labor Surcharge and Equipment Rental Rates" that is in effect on the date that the Work is performed. The rental rates for equipment not listed under the schedules of rental rates set forth by the State of California shall be those agreed upon by the Contractor and/or its Subcontractor, and the Engineer, except that in no case shall the rental rates exceed those of established distributors or equipment rental agencies within the locality of the project. The Contractor and/or its Subcontractor shall provide full documentation to the satisfaction of the Engineer to support any proposed equipment rental rates. Documentation shall include a breakdown of costs per Article 7.3.3, including amortized depreciation versus wear and tear, and maintenance expenses versus operating expenses. Compensation for idle time of equipment through delays caused by the District will be made by applying the delay factor listed in the Caltrans User's Guide for Labor Surcharge and Equipment Rental Rates (current version), or if unlisted at 50 percent of the rental rates listed in the State of California Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rates." Compensation for idle time shall not exceed eight (8) hours per day and forty (40) hours per week.
- b) If equipment is rented, payment will be the actual rental cost as indicated on the rental invoice.

Individual pieces of equipment or tools not listed and having a replacement value of \$1,000 or less, whether or not consumed by use, shall be considered to be small tools and no payment will be made for their use on the Work.

In computing the rental of equipment, the minimum rental time to be paid per day shall be one hour. Rental time shall not be allowed while equipment is inoperative due to breakdowns or non-Work Days. Loading and transporting costs shall be allowed when the equipment is moved by means other than its own power.

**.2 Equipment for Change Order Work:** For the use of equipment not required under the Contract Documents, moved on the Work and used exclusively for Change Order work, the Contractor will be paid at the rates agreed upon by the

Contractor and/or Subcontractor, and the Engineer through the Change Order process, except that in no case shall the rental rates paid exceed those of established distributors or equipment rental agencies.

The rental period shall begin at the time the equipment is required and unloaded at the site and shall terminate on the day that the Change Order work is completed, except that the minimum total rental time to be paid for shall be not less than four hours.

The Contractor and/or its Subcontractor will be reimbursed for the cost of transporting the equipment to and from the Work. Should the equipment be transported by low bed trailers, hourly rates charged by established haulers will be paid. Also, the District will pay for loading and unloading costs. Should the Contractor and/or its Subcontractor desire the return of the equipment to a location other than its original location, the District will pay the cost of transportation in accordance with the above provisions, provided such cost does not exceed the cost of moving the equipment to the project.

**7.3.4 Markup Allowances.** The Contractor and/or its Subcontractors or Suppliers that perform on-site work are entitled to compensation for overhead and profit for the performance of Change Order work. This compensation shall be in the form of markup percentages applied to the costs computed as provided for in Articles 7.3.1 through 7.3.3 and is full and complete payment for overhead and profit. Overhead includes, but is not limited to, superintendent costs, bond and insurance premiums, financing costs, project engineer, project manager, scheduler, estimator, drafting, small tools, home office expenses, field office expenses, and utilities (gas, electricity, sewer, water, telephone, fax, copier, etc.). The Contractor shall not receive payment for itemized costs which are considered to be included under the profit and overhead percentage markup.

**.1** For work by the Contractor's own organization or by its Subcontractor's own workforce, the Contractor may apply, as a maximum, the following markup percentages as overhead and profit:

1. Labor	20 percent
2. Materials	15 percent
3. Equipment (owned or rented)	15 percent

**.2** Under a fixed price adjustment basis, if work is performed by a Subcontractor with its own workforce, the Contractor may apply an additional 5 percent markup to the total which has been computed in accordance with Article 7.3.4.1. The Contractor shall reach agreement with the Subcontractor and any intermediate Subcontractor as to the division of the markup percentages between them.

- .3 Under a force account basis, if work is performed by a Subcontractor with its own workforce, the Contractor may not apply an additional 5 percent markup, as provided for under Article 7.3.4.2, to the total which has been computed in accordance with Article 7.3.4.1. The Contractor shall reach agreement with the Subcontractor and any intermediate Subcontractor as to the division of the markup percentages between them.

#### **7.4 Lump Sum or Force Account Adjustments**

- 7.4.1** Change Order work will be paid for by either a Lump Sum adjustment of the Contract Sum or on a Force Account basis, or a combination of both, as determined by the Engineer. Change Order work will not be paid for unless ordered in writing by the Engineer.
- 7.4.2** In the event the Contractor fails to submit its proposal within 15 days after receipt of a written request for proposal, or the Engineer and the Contractor fail to agree upon a negotiated Lump Sum adjustment, within a reasonable time, or if in the judgement of the Engineer, it is impracticable because of the nature of the Work or for any other reason to fix the price for completion before the work order is issued, the Engineer has the option of authorizing payment on the basis of a Force Account.
- 7.4.3** The Contractor shall notify the Engineer in writing of the day and time on which Force Account work will commence prior to beginning work. All Force Account work shall be reported daily on daily extra work reports furnished by the Engineer to the Contractor and signed by both parties, which daily reports shall thereafter be considered the true record of Force Account work completed. Completely detailed invoices covering the Force Account work shall be submitted for payment consideration not later than 15 days after the completion of the work. The charges for Work performed by the Contractor or a Subcontractor shall be reported separately. Substantiating invoices from Suppliers and Subcontractors shall be included with the Contractor's invoices. The Contractor shall permit examination of accounts, bills, and vouchers relating to the Force Account work when requested by the Engineer. Payment for the Work done under Force Account will be made after receipt of an executed Change Order issued to cover the increase in the Contract Sum.
- 7.4.4** Payment for the Work completed under Lump Sum adjustment will be made after receipt of an executed Change Order issued to cover the change in the Contract Sum and/or Contract Time.

#### **7.5 Variation in Quantity in Unit Price Work**

- 7.5.1 General.** The estimated quantities for Unit Price work listed in the Bid Form are established for the sole purpose of bid comparison and do not constitute a guarantee to the Contractor of the quantities of work to be performed under this contract. The Contractor shall be compensated only for the actual quantities of work performed which were directed by the Engineer. The amount of compensation for each item of



Work shall be computed by multiplying the actual quantity by the appropriate bid Unit Price except as follows:

**.1 Increases of more than 20 percent:** If the actual quantity of work performed on an item of Work exceeds the estimated quantity by more than 20 percent, the quantity in excess of 120 percent of the estimated quantity shall be paid for based upon (a) actual unit cost or (b) as mutually agreed to by the Contractor and the Engineer. The Engineer will determine which method is to be utilized. If the actual unit cost method is utilized, the actual unit cost is determined by calculating the total cost incurred for completing 120 percent of the estimated quantity using the markups allowed under Article 7.3.4, which is then divided by the quantity of work performed, i.e., 120 percent of the estimated quantity. If costs applicable to the Work performed include fixed costs, such fixed costs shall be deemed to have been recovered by the Contractor by the payments made to the Contractor for 120 percent of the estimated quantity at the bid Unit Price. In computing the actual unit cost, such fixed costs shall be excluded.

At the discretion of the Engineer, the Engineer can make payment on the quantity in excess of 120 percent of the estimated quantity using exactly the provisions and procedures in the "Force Account" Articles 7.3 and 7.4.3.

**.2 Decreases of more than 20 percent:** If the actual quantity of work performed on an item of Work is less than 80 percent of the estimated quantity, the quantity shall be paid for (a) based upon actual cost using the markups allowed under Article 7.3.4, or (b) as mutually agreed to by the Contractor and the Engineer.

Payment for the actual quantity of work performed shall, in no case, exceed the payment which would have been made for performance of 80 percent of the estimated quantity at the bid Unit Price.

## **7.6 Deleted Work**

**7.6.1 Deleted Work.** If work is deleted, payment will be made to the Contractor for costs incurred in connection with the deleted work if incurred prior to notification of deletion by the Engineer.

If approved material is ordered by the Contractor for the deleted work prior to the notification by the Engineer, and if orders for such materials cannot be canceled, payment for such material will be the actual cost to the Contractor. In such case, the material shall become the property of the District. If the material can be returned to the vendor, and if the Engineer so directs, the material shall be returned and the Contractor will be paid for the actual costs or charges made by the vendor for returning the material including any stocking charges.

The costs incurred or charges paid to the Contractor for Work completed prior to deletion shall be computed using the markups allowed in Article 7.3.4. Payment for

deleted work will be based on the approved schedule of costs or other mutually agreed value. A minimum of a 10 percent credit shall be provided to the District for overhead, profit and markup associated with the deleted work.

## **7.7 Differing or Unusual Site Conditions**

- 7.7.1** Pursuant to Public Contract Code, Section 7104, the Contractor shall promptly, and before such conditions are disturbed, notify the Engineer in writing of: (1) material that the Contractor believes may be hazardous waste, as defined in Section 25117 of the Health and Safety Code (other than material indicated in the Contract Documents) and that is required by law to be removed to a Class I, Class II, or Class III disposal site; (2) subsurface or latent physical conditions at the site differing materially from those indicated in this contract; or (3) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this contract.
- 7.7.2** The Engineer will promptly investigate the conditions. If the Engineer finds that the conditions do materially differ, or do involve hazardous waste, and do cause an increase or decrease in the Contractor's Contract Sum and/or the Contract Time a contract adjustment will be made through the Change Order process, as determined by the Engineer.
- 7.7.3** If the Contractor and the Engineer disagree whether the conditions do materially differ or whether a hazardous waste is involved or whether the conditions cause an increase or decrease in the Contractor's Contract Sum and/or Contract Time, the Contractor shall nevertheless proceed with all Work to be performed under the contract and shall comply with the completion dates required by the contract. The Contractor waives any rights to an increase in Contract Time, or an increase in Contract Sum, unless it timely follows the Disputes and Claims procedures in Article 3.4.

## **ARTICLE 8 - TIME**

### **8.1 Commencement, Prosecution, and Completion of Work**

- 8.1.1 Notice to Proceed.** The Notice to Proceed will not be issued until the contract is properly executed, bonds are furnished, proof of insurance submitted by the Contractor, and both the bonds and the insurance are approved by the District. The Contract Time will not be extended, and the Contractor will not receive any additional compensation, because of delays caused by receipt, review and approval by the District of the Contractor's bonds and insurance. Except as required elsewhere, the Contractor is not authorized to perform any Work under this contract until it has received an official Notice to Proceed.

- 8.1.2 Prosecution of the Work.** Work shall proceed at all times with such force and equipment as will be sufficient to complete the Work within the Contract Time.
- 8.1.3 Required Contract Completion.** The Contractor expressly agrees that it will complete the Work within the Contract Time, subject to approved Change Orders that impact time.
- 8.1.5 Early Completion.** The Contractor shall not be entitled to claim damages for expenses due to the District not authorizing early completion.

## **8.2 Liquidated Damages**

- 8.2.1** Should the Contractor fail to complete all or any portion of the Work within the specified time therefor or within such extra time as may be allowed for delays by formal extensions granted by the District, deductions will be made from the Contractor's earnings for the time that the Work remains incomplete beyond the specified completion time. Liquidated damages will be apportioned such that the Contractor will be responsible for all delays not otherwise properly subject to time extensions.
- 8.2.2** Liquidated damages cover only certain damages and are limited to the cost of administration, overhead, and general loss of use of the facility by the District as a result of a delay, and does not cover any other type of damages set forth in Section 8.2.3. It being impracticable or extremely difficult to fix the actual amount of damage for the above-referenced categories of damages, the parties agree that the amounts set forth in this Contract as liquidated damages will be deducted from any money due the Contractor under the contract. Should the amount of the damages exceed the amount due the Contractor, the Contractor and its sureties shall be liable for the excess.
- 8.2.3** Liquidated damages shall not be deemed to include within their scope additional damages or administrative costs arising from defective work, lost revenues, interest expenses, cost of completion of the Work, cost of substitute facilities, claims and fines of regulatory agencies, damages suffered by others or other forms of liability claimed against the District as a result of delay (e.g., delay or delay-related claims of other contractors, Subcontractors or tenants), and defense cost thereof. The Contractor shall be fully responsible for the actual amount of any such damages it causes, in addition to the liquidated damages otherwise due the District.

## **8.3 Use of Facilities Prior to Completion of Contract**

- 8.3.1** If the Contractor has received and provided to the District a temporary certificate of occupancy from governmental authorities having jurisdiction over the project and/or in the Engineer's opinion, the Work under the contract, or any portion of the Work, is in a condition suitable for the District's use, the District may, after written notice from the Engineer to the Contractor, use (which includes, but is not limited

to, taking over or placing into service) any portion or portions of the project designated by the Engineer.

- 8.3.2** Even if the District elects to use the Work or a portion of the Work prior to Contract Completion, the Contractor will nonetheless make all necessary repairs, renewals, changes, or modifications in the Work or any portion of the Work that does not meet the requirements of the Contract Documents or is deficient due to defective materials or workmanship, unless the deficiency is solely caused by ordinary wear and tear.
- 8.3.3** The use of any portion of the Work by the District does not relieve the Contractor of any of its responsibilities or liabilities under the Contract Documents or constitute a waiver by the District of any claims. Said use shall not cancel liquidated damages as of the first date of use, or any continuance thereof, nor impair, reduce, or change the amount of liquidated damages.

#### **8.4 Delays and Extensions of Time**

- 8.4.1** The Contractor shall take reasonable precautions to foresee and prevent delays to the Work including, but not limited to, maintaining construction schedules that are properly updated to reflect current conditions and the actual critical path, and continuous monitoring of critical and dependent activities of the Contractor, Subcontractors, Suppliers, the District, agencies and other third parties. When the Contractor foresees a delay event, and in any event upon the occurrence of a delay event, the Contractor shall immediately notify the Engineer in writing of the probability or the actual occurrence of a delay in the Contract Time, and its cause. With respect to all delays (compensable, excusable and/or inexcusable), the Contractor shall reschedule its Work and/or revise its operations, to the extent possible under the terms of the contract, to mitigate the effects of the delay through work-arounds, overtime and acceleration of the project schedule, re-sequencing the Work, or other methods commonly utilized in the construction industry.
- 8.4.2** For Inexcusable Delay (as defined in Article 1.2.1.21), the Contractor shall not be entitled to an extension of time or compensation for any loss, cost, damage, expense or liability resulting directly or indirectly from the Inexcusable Delay including, but not limited to, extended field or home office overhead, field supervision, cost of capital, interest, escalation charges, labor costs, materials expense, or acceleration costs.
- 8.4.3** For Excusable Delay (as defined in Article 1.2.1.17), the Engineer will grant the Contractor an extension of time in an amount equal to the period of Excusable Delay based on the analysis of schedule impact and delay analysis diagram, which shall be the Contractor's sole and exclusive remedy for such delay. Excusable Delays shall include labor strikes, adverse weather as defined in Article 8.5, and Acts of God.

- 8.4.4** For Compensable Delay (as defined in Article 1.2.1.5), the Engineer will grant the Contractor an extension of Contract Time with compensation in an amount that represents the Contractor's actual direct costs incurred as a direct result of the Compensable Delay. The Contractor may recover its direct costs only and may not recover (and waives) all other types of indirect, consequential, special and incidental damages.
- 8.4.5** For Concurrent Delay (as defined in Article 1.2.1.6), the following rules apply: if one or more of the Concurrent Delays are excusable or compensable, then the District will treat the period of Concurrent Delay as an Excusable Delay; and if all of the Concurrent Delays are inexcusable, then the District will treat the Concurrent Delay as inexcusable. These rules for Concurrent Delay shall be the Contractor's sole and exclusive remedy for periods of Concurrent Delay, and the Contractor's entitlement shall be limited to the measures of recovery defined herein for Inexcusable, Excusable and Compensable Delay, as applicable.
- 8.4.6** No time extension will be granted to the Contractor for encountering delays while performing Work after the specified or formally extended Contract Completion date, except for causes of delay specified in Article 8.4.4.
- 8.4.7** The Contractor shall provide notice and documentation of delays in accordance with the following rules:
- .1** Within five days of knowing about an event that may cause a delay in the project schedule, the Contractor shall notify the Engineer in writing about the delay in the Work, the impact it may have on the project schedule, and the causes of the delay. The Contractor's notice shall set forth the anticipated impact of the delay on the critical path, specify any additional time requested, and provide a detailed description of the cause or causes of the delays.
  - .2** If the Contractor intends to request an extension of time or compensation for damages resulting from delay, then the Contractor shall make the request in writing to the Engineer not more than 15 days after the end of such delay. If any delay exceeds 30 days, however, then the request shall be made monthly and then updated every month after that (as applicable). The Contractor shall provide an Analysis of Schedule Impact of the delay (see Article 3.4.2.3 and 3.4.2.4) and update it monthly (as applicable). The Contractor shall also provide documentation showing that the delay was either excusable or compensable and that the Contractor has revised its construction schedule, to the extent possible, to mitigate the delay. No compensation for damages resulting from delay will be granted unless supported by cost records justifying the costs claimed in connection with the delay.

- 8.4.8** The Contractor's failure to give written notice of a delay or to submit or document a request for an extension of time or for damages resulting from delay in the manner and within the times stated above shall constitute a waiver of all rights thereto.
- 8.4.9** An extension in Contract Time must be approved by the Engineer to be effective. An extension of Contract Time with or without consent of the sureties, shall not release the sureties from their obligations, which shall remain in full force until the discharge of the contract.
- 8.4.10** The Engineer will investigate the facts and ascertain the extent of the delay, and issue a written statement regarding its findings. If the Contractor disagrees with any decision of the Engineer regarding delays and extensions in Contract Time, the Contractor may dispute the Engineer's decision in accordance with Article 3.4.

## **8.5 Weather Conditions Unfavorable for Prosecution of Work**

- 8.5.1** The Engineer may suspend the Work whenever weather conditions or conditions resulting from inclement weather are unfavorable for the prosecution of the Work. The delay caused by such suspension may entitle the Contractor to an extension in Contract Time, but not to any other compensation.
- 8.5.2** If the Contractor believes that the Work should be suspended under this Article, the Contractor may request such suspension. The delay caused by the suspension may entitle the Contractor to an extension of Contract Time, but not to any other compensation. The Contractor's request for suspension must be agreed to by the Engineer in order to be granted an extension of Contract Time.
- 8.5.3** No extension of time will be granted for suspension of Work unless the suspension impacts the Contract Completion date or the timely completion of a milestone completion date for a portion of the Work. Determination that suspension of the Work for inclement weather conditions or conditions resulting from inclement weather impacts timely completion and entitles the Contractor to an extension of Contract Time shall be made and agreed to in writing by the Engineer and the Contractor for each day that work is suspended. In the event of failure to agree, the Contractor may protest under the provisions of Article 3.4.
- 8.5.4** If the Work is suspended and an extension of Contract Time is granted under this Article, the Contractor will be entitled to a one Work Day extension of time for each Work Day that the Contractor is unable to perform the Work for at least one-half of its current normal Work Day; and if the Work is suspended at the regular starting time on any Work Day and the Contractor's workforce is dismissed as a result of the suspension, then the Contractor will be entitled to a one Work Day extension of Contract Time whether or not conditions change thereafter and the major portion of the day is suitable for work.

- 8.5.5** The Contractor shall use best available technologies to secure the site to mitigate/minimize the effects of inclement weather in conformance with applicable Federal, State, and regional regulatory requirements.

## **ARTICLE 9 - INSURANCE AND BONDS**

### **9.1 Faithful Performance and Payment Bonds**

- 9.1.1** The Contractor shall furnish to the District a Faithful Performance Bond, and maintain it in an amount not less than 100 percent of the current Contract Sum, conditioned upon the faithful performance by the Contractor of all covenants and stipulations in the contract.
- 9.1.2** The Contractor shall furnish to the District a Payment Bond and maintain it, in an amount not less than 100 percent of the current Contract Sum.
- 9.1.3** The Payment Bond and the Faithful Performance Bond shall be on the forms of the District as provided for in Documents 00 61 13.16 and 00 61 13.13 and shall be properly executed as described therein.
- 9.1.4** If, at any time, during the performance of the Work any of the sureties, in the opinion of the District, are or become financially irresponsible, the District may require the Contractor to furnish other or additional sureties to the satisfaction of the District within 10 days after receipt of notice. If the Contractor fails to provide satisfactory sureties within the 10-day period, the contract may be terminated for cause under Article 11, and the materials purchased or the Work completed as provided in Article 11.
- 9.1.5** The Contractor and its sureties understand and agree that no modifications or alterations made in the Contract Documents shall operate to release any surety from liability on any bond or bonds required to be provided in this contract.

### **9.2 Insurance Requirements**

- 9.2.1** The Contractor shall procure and maintain during the period of the contract all required insurance and shall submit certificates of insurance and additional insured endorsements to the policies to the Engineer for review and approval. The certificates of insurance shall be on the forms provided by the District. The insurance requirements must be met within the same period allowed for contract execution, as provided for in the Instructions to Bidders.
- 9.2.2** The Contract will not be executed until the certificates of insurance and endorsements to the policies have been received and accepted by the District. Acceptance of the certificates of insurance and endorsements by the District shall not relieve the Contractor from compliance with any of the insurance requirements or liability arising from said failure.

- 9.2.3** The District may require the Contractor to provide insurance policies to the Engineer for review. If requested, the Contractor agrees to provide the District with complete copies of the policies within 10 days following the request.
- 9.2.4** If the Contractor does not maintain all of the required insurance, or fails to timely deliver requested insurance policies to the District, the District reserves the right to stop the Work, and/or terminate the Contractor's right to proceed under the contract, in whole or in part. Any delay caused by the Work stoppage is an Inexcusable Delay.

## **ARTICLE 10 - WARRANTY**

- 10.1** The Contractor warrants that any Work performed under the contract shall be performed in a competent manner in accordance with the duty of care set forth in Section 4.2.3; that any material furnished will be the best of its class; and that the Work shall fully meet the requirements of the Contract Documents.
- 10.2** The Contractor warrants workmanship, including subcontracted work, against defects for a period of one year from the date of Contract Completion unless a longer period of time is required by the Contract Documents.
- 10.3** The Contractor shall provide a similar one-year warranty for all materials and equipment provided under this contract unless a longer period of time is required by the Contract Documents.
- 10.4** If the District elects to use any portion or portions of the Work before Contract Completion, the warranty for those portions shall begin upon commencement of such use. The warranty for the remainder of the Work shall begin on the Contract Completion date.
- 10.5** If the District notifies the Contractor, within one year from the Contract Completion, or within any longer period of time required by the Contract Documents or another warranty period for partial occupancy as established under Section 10.4, that any portion of the Work fails to fulfill any of the requirements of the Contract Documents, the Contractor shall repair or replace the defective, non-conforming or otherwise unsatisfactory Work, without delay or further cost to the District in a manner that least inconveniences the District's operations. With regard to any defective work or material repaired or replaced by the Contractor, the one-year warranty will be measured from the date of the latest repair or replacement.
- 10.6** Should the Contractor fail to act promptly in accordance with this requirement, or should the exigencies of the case require repairs or replacements to be made before the Contractor can be notified or can respond to the notification, the District may, at its option, make the necessary repairs or replacements, or perform the necessary Work, and the Contractor shall pay to the District the actual cost of such repairs plus the markup percentages shown in Article 3.2.3.



**10.7** If equipment has repeatedly malfunctioned, is unreliable, requires excessive maintenance, or if repair of the equipment will not result in equipment that is equivalent to that required by the Contract Documents (both in functionality and useful life), the Contractor shall replace, rather than repair, the equipment under the warranty.

**10.8** The Contractor is responsible for all costs incidental to making good any and all of its warranties and agreements. These warranties and agreements are covenants that are binding on the Contractor and its sureties.

## **ARTICLE 11 - TERMINATION OR SUSPENSION OF THE CONTRACT**

### **11.1 Termination by the District for Cause or Default**

**11.1.1** The District may terminate the Contractor's right to proceed under the contract, in whole or in part, for cause at any time after the occurrence of any of the following events:

- .1** The Contractor becomes insolvent or files for relief under the bankruptcy laws of the United States.
- .2** The Contractor makes a general assignment for the benefit of its creditors or fails to pay its debts as the same become due.
- .3** A receiver is appointed to take charge of the Contractor's property.
- .4** The Contractor abandons the Work. Abandonment is conclusively presumed when the District requests a written plan to cure a default and the Contractor does not submit the plan within five Work Days of the District's request.

**11.1.2** If any of the following events occur, the District may require that the Contractor submit a written plan to cure its default:

- .1** The Contractor 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.
- .2** The Contractor fails to make progress so as to endanger performance of the Work within the Contract Time.
- .3** The Contractor disregards legal requirements of agencies having jurisdiction over the Work, the Contractor, or the District.
- .4** The Contractor materially fails to execute the Work in accordance with the Contract Documents.

**.5** The Contractor is in default of any other material obligation under the Contract Documents.

**11.1.3** The District may terminate the Contractor's right to proceed under the contract in whole or in part for default if the written plan is not received by the District within five days after the District's request or if the District does not accept the Contractor's plan for curing its default.

**11.1.4** Upon any of the occurrences referred to in Articles 11.1.1, 11.1.2 and 11.1.3, the District may, at its election and by notice to the Contractor, terminate the contract in whole or in part; accept the assignment of any or all of the subcontracts; and then complete the Work by any method the District may deem expedient. If requested by the District, the Contractor shall remove any part or all of the Contractor's materials, supplies, equipment, tools, and construction equipment and machinery from the Work within seven days of such request; and, if the Contractor fails to do so, the District may remove or store, and after 90 days sell, any of the same at the Contractor's expense.

**11.1.5** If the contract is terminated by the District as provided in Article 11.1, the Contractor shall not be entitled to receive any further payment until the expiration of 35 days after acceptance of all Work by the District.

**11.1.6** No termination or action taken by the District after termination shall prejudice any other rights or remedies of the District provided by law or by the Contract Documents.

**11.1.7** If, after termination for default, it is determined that the Contractor was not in default, or that default was excusable, the rights and obligations of the parties shall be the same as if the termination had been issued for convenience pursuant to Article 11.2.

## **11.2 Termination by the District for Convenience**

**11.2.1** The District may, at its option, and for its convenience, terminate this contract at any time by giving written notice to the Contractor specifying the effective date of termination. Upon such termination, the Contractor agrees to comply with the notice and further agrees to waive any claims for damages, including loss of anticipated profits, on account of the termination in accordance with Article 11.2.5; and, as the sole right and remedy of the Contractor, the District shall pay the Contractor in accordance with Article 11.2.4.

**11.2.2** Upon receipt of notice of termination under Article 11.2, the Contractor shall, unless the notice directs otherwise, do the following:

**.1** Immediately discontinue the Work to the extent specified in the notice.

- .2 Place no further orders or subcontracts for materials, equipment, services, or facilities, except as may be necessary for completion of a portion of the Work that is not discontinued or is necessary to secure the project site.
- .3 Promptly cancel, on the most favorable terms reasonably possible, all subcontracts to the extent they relate to the performance of the discontinued portion of the Work.
- .4 Thereafter, do only such Work as may be necessary to preserve and protect Work already in progress and to protect materials, plants, and equipment in transit to or on the project site.

**11.2.3** Upon termination, the obligations of the contract shall continue as to portions of the Work already performed and, subject to the Contractor's obligations under Article 11.2.2, as to bona fide obligations assumed by the Contractor prior to the date of termination.

**11.2.4** Upon such termination, the District will pay to the Contractor the sum of the following:

- .1 The amount of the Contract Sum allocable to the portion of the Work properly performed by the Contractor as of the effective date of termination, less sums previously paid to the Contractor.
- .2 Previously unpaid costs of any items delivered to the project site that were already fabricated for subsequent incorporation into the Work.
- .3 Any proven losses with respect to materials and equipment directly resulting from the termination.
- .4 Reasonable demobilization costs.

**11.2.5** The above reimbursement is the sole and exclusive remedy to which the Contractor is entitled in the event the contract is terminated for convenience; and the Contractor expressly waives any other claims, damages, demands, compensation or recovery related to this contract or project. The Contractor agrees to sign a general release incorporating this waiver.

### **11.3 Termination of the Contract - Act of God or Force Majeure**

**11.3.1** "Act of God" has the meaning set forth in Section 7105 of the Public Contract Code. "Force Majeure" shall solely have the meaning set forth in Section 1511, Subparagraph 2 of the Civil Code. If an Act of God or Force Majeure occurs, the Engineer may, by written notice, suspend or terminate this contract. If the contract is not suspended or terminated, or if the contract is resumed after suspension, the Contractor shall fully restore the work except as limited by Public Contract Code, Section 7105(a), in the case of an "Act of God."

**11.3.2** If the contract is terminated because of an Act of God or Force Majeure, the Contractor will be paid for Work performed prior to the Act of God or Force Majeure at either (i) the Unit Prices named in the contract; or (ii) in the event no unit prices are named, a sum equal to the percentage that the Contract Sum for the Work completed, at the time of occurrence of the Act of God or Force Majeure bears to the Contract Sum for all Work to be performed under the contract as determined by the Engineer. In no event will the District be liable to the Contractor for breach of contract, extra work, or damages because the contract is terminated due to an Act of God or Force Majeure.

#### **11.4 Suspension by the District**

**11.4.1** The Engineer may, in his or her sole discretion, order the Contractor, in writing, to suspend, delay, or interrupt the Work in whole or in part for as long as 90 days from the date of delivery of a written order of suspension. The order shall be specifically identified as a "suspension order" under this Article. The work may be suspended for a longer period or periods if the parties agree. Upon receipt of a suspension order, the Contractor shall comply with its terms and take all reasonable steps to minimize costs related to the suspension of the Work or the portion of the Work. Within 90 days after the issuance of the suspension order, or such extension to that period as is agreed upon by the Contractor and the District, the District will either cancel the suspension order or delete the suspended Work.

**11.4.2** If a suspension order is canceled or expires, the Contractor shall resume the suspended Work. A Change Order may be issued to cover any adjustments of the Contract Sum or an extension of Contract Time necessarily caused by the suspension. If the Contractor disputes the adjustment of the Contract Sum or the Contract Time, the Contractor shall submit a claim per Article 3.4.

**11.4.3** Costs directly associated with the suspension will be at the District's expense if the suspension is not due to any fault of the Contractor.

**11.4.3** A suspension order shall not be required to stop the Work as permitted or required under any other provision of the Contract Documents.

### **ARTICLE 12 - LABOR PROVISIONS**

#### **12.1 Prevailing Wages**

**12.1.1** Pursuant to Section 1773 of the Labor Code, the District has obtained from the Director of Industrial Relations of the State of California, the general prevailing rates of per diem wages and the general prevailing rates for holiday and overtime work in the locality in which the Work is to be performed, for each craft, classification, or type of worker needed to execute the contract. A copy of the prevailing wage rates is on file and available for inspection by any interested party on request at the District's Specifications and Engineering Support Section.

- 12.1.2** The holidays upon which such rates shall be paid shall be all holidays recognized in the collective bargaining agreement applicable to the particular craft, classification, or type of worker employed on the Work.
- 12.1.3** The Contractor shall post a copy of the general prevailing rate of per diem wages at the jobsite pursuant to Section 1773.2 of the Labor Code.
- 12.1.4** Pursuant to Section 1774 of the Labor Code, the Contractor and any of its Subcontractors shall not pay less than the specified prevailing rate of wages to all workers employed in the execution of the contract.
- 12.1.5** As set forth with more specificity in Section 1773.1 of the Labor Code, "per diem" wages include employer payments for health and welfare, pension, vacation, travel, subsistence and, in certain instances, apprenticeship or other training programs, and shall be paid at the rate and in the amount spelled out in the pertinent prevailing wage determinations issued by the Director of Industrial Relations.
- 12.1.6** The Contractor shall, as a penalty to the State or the District, forfeit not more than the maximum set forth in Section 1775 of the Labor Code for each calendar day, or portion thereof, for each worker paid less than the prevailing rates for the work or craft in which the worker is employed under the contract by the Contractor or by any Subcontractor under him. The difference between the prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which such worker was paid less than the stipulated prevailing wage rate shall be paid to such worker by the Contractor.
- 12.1.7** The specified wage rates are minimum rates only and the District will not consider and shall not be liable for any claims for additional compensation made by the Contractor because of its payment of any wage rate in excess of the general prevailing rates. All disputes in regard to the payment of wages in excess of those specified herein shall be adjusted by the Contractor at its own expense.
- 12.1.8** General prevailing wage determinations have expiration dates with either a single asterisk or a double asterisk. Pursuant to California Code of Regulations, Title 8, Section 16204(b), the single asterisk means that the general prevailing wage determination shall be in effect for the specified contract duration. The double asterisk means that the predetermined wage modification shall be paid after the expiration date. Notwithstanding what is stated in Article 3.4 and Article 4.7 of the General Conditions, no adjustment in the Contract Sum will be made for the Contractor's payment of these predetermined wage modifications.

## **12.2 Payroll Records**

- 12.2.1** The Contractor and each Subcontractor shall keep an accurate payroll record, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages

paid to each journeyman, apprentice, worker or other employee employed in connection with the Work. The payroll records shall be certified and shall be available for inspection in accordance with the provisions of Section 1776 of the Labor Code.

**12.2.2** The Contractor shall submit for each week in which any contract Work is performed a copy of all payroll records to the Engineer. The Contractor shall be responsible for submission of copies of payroll records of all Subcontractors. Payroll records shall be completed and submitted by the 25th of the month for the previous 30-day period which started on the 15<sup>th</sup> of the previous month to the 15<sup>th</sup> of the current month.

**12.2.3** Certified payroll records shall be on the forms provided by the Department of Industrial Relations (reduced size sample in Appendix A) or contain the same information required on the Department's form. Copies of the form may be obtained from:

Division of Labor Standards Enforcement  
Bureau of Field Enforcement  
2031 Howe Avenue, Suite 100  
Sacramento, CA 95825-5378  
(916) 263-1811  
(916) 263-5378

The Contractor or Subcontractor shall certify the payroll records as shown on the reverse of the State form. In addition, the records shall be accompanied by a statement signed by the Contractor or Subcontractor certifying that the classifications truly reflect the Work performed and that the wage rates are not less than those required to be paid.

**12.2.4** In the event of noncompliance with the requirements of Section 1776 of the Labor Code, the Contractor shall have 10 days in which to comply subsequent to receipt of written notice specifying in what respects such Contractor must comply with said Section. Should noncompliance still be evident after such 10-day period, the Contractor shall, as a penalty to the State or the District, forfeit the amount set forth in Section 1776(h) of the Labor Code 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, such penalties shall be withheld from progress payments then due.

### **12.3 Hours of Labor**

**12.3.1** Pursuant to the provisions of Sections 1810, et seq. of the Labor Code and any amendments thereof:

**.1** Eight hours of labor constitutes a legal day's Work under the contract.

- .2 The time of service of any worker employed upon the work shall be limited and restricted to eight hours during any one calendar day, and forty hours during any one calendar week except as provided in Article 12.3.1.4 below.
- .3 The Contractor shall, as a penalty to the State or the District, forfeit the amount set forth in Section 1813 of the Labor Code for each worker employed in the execution of the contract by the Contractor or by any Subcontractor for each calendar day during which such worker is required or permitted to work more than eight hours in any calendar day and forty hours in any one calendar week in violation of this Article and the provisions of Labor Code, Sections 1810, et seq.
- .4 Work performed by employees of the Contractor in excess of eight hours per day, and forty hours during any one calendar week, shall be permitted upon compensation for all hours worked in excess of eight hours per day at not less than one and one-half times the basic rate of pay.
- .5 The Contractor and every Subcontractor shall keep an accurate record showing the name of and the actual hours worked each calendar day and each calendar week by each worker employed by him in connection with the Work; the record shall be kept open at all reasonable hours to the inspection of the District and to the Division of Labor Standards Enforcement of the State of California.

#### **12.4 Employment of Apprentices**

**12.4.1** In the performance of the contract, the Contractor and any Subcontractor shall comply with the provisions concerning the employment of apprentices in Section 1777.5 of the Labor Code and any amendments thereof.

**12.4.2** In the event the Contractor or any Subcontractor willfully fails to comply with the aforesaid section, such Contractor or Subcontractor shall be subject to the penalties for noncompliance in Labor Code, Section 1777.7.

### **ARTICLE 13 - MISCELLANEOUS PROVISIONS**

#### **13.1 Governing Law**

The contract is governed by the laws of the State of California.

#### **13.2 Antitrust Claims**

By entering into the contract, the Contractor 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. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the contract. The Contractor shall

include in each subcontract a provision corresponding to the foregoing binding the Subcontractor to offer and agree to assign to the District such rights, title, and interest held by the Subcontractor. Such assignment shall be made and become effective at the time the District tenders final payment to the Contractor without further acknowledgment by the parties.

### **13.3 Non-Discrimination Clauses**

13.3.1 There shall be no discrimination against any person, or groups of persons, per Government Code Section 12940, Labor Code Section 1735, or any other applicable law or regulation in the performance of this contract.

13.3.2 There shall be no discrimination in the performance of this contract, against any person, or group of persons, on account of race, color, religion, religious creed, national origin, ancestry, gender including gender identity or expression, age, marital or domestic partnership status, mental disability, physical disability (including HIV and AIDS), medical condition (including genetic characteristics or cancer), genetic information, sexual orientation, or military and veteran status. The Contractor shall not establish or permit any such practice(s) of discrimination with reference to the contract. Contractors determined to be in violation of this section will be deemed to be in material breach of the contract.

**13.3.3 Contractor and its subcontractors shall abide by the requirements of 41 CFR §§ 60-1.4(a), 60-300.5(a) and 60-741.5(a). These regulations prohibit discrimination against qualified individuals based on their status as protected veterans or individuals with disabilities, and prohibit discrimination against all individuals based on their race, color, religion, sex, or national origin in the performance of this contract. Moreover, these regulations require that covered prime contractors and subcontractors take affirmative action to employ and advance in employment individuals without regard to race, color, religion, sex, national origin, protected veteran status or disability.**

13.3.4 The Contractor shall include the nondiscrimination and compliance provisions of these clauses in all subcontracts.

### **13.4 Trenching and Shoring**

The Contractor shall comply with Labor Code, Sections 6500, 6705, and 6707, and Public Contract Code, Section 7104, regarding trenching and shoring, and notwithstanding any other provisions of the Contract Documents.

### **13.5 Third Party Claims**

Pursuant to Public Contract Code, Section 9201, the District will provide Contractor with timely notification of the receipt of any third-party claims relating to this contract.

END OF DOCUMENT





SUPPLEMENTARY GENERAL CONDITIONS

The following supplements shall modify, delete, and/or add to the General Conditions. Where any article, paragraph, or subparagraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such article, paragraph, or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any article, paragraph, or subparagraph in the General Conditions is amended, voided, or superseded by any of the following paragraphs, the provisions of such article, paragraph, or subparagraph not so amended, voided, or superseded shall remain in effect.

1. In Article 1.2.1

A. Renumber .20 through .33 to .22 through .35, respectively.

B. Renumber .1 through .19 to .2 through .20, respectively.

C. Before Paragraph 1.2.1.2, insert:

“**.1 Act of God:** An occurrence or condition and effect as defined in Public Contract Code § 7105.”

D. After Paragraph 1.2.1.20, insert:

“**.21 Force Majeure:** An event of force majeure is an event or circumstance which is beyond the control and without the fault or negligence of the Contractor or the District, and which by the exercise of reasonable diligence the Contractor or the District is unable to anticipate or prevent, provided that the event or circumstance is limited to: adverse weather conditions, including, but not limited to, National Weather Service Red Flag Warnings, public safety power shutoffs, drought, fires, or floods; wars; civil or military disturbances; acts of terrorism; epidemics; acts of civil or military authority; or governmental actions, that affect the Contractor’s or District’s ability to perform its contractual scope of work.”

2. In Article 1.3.3.1, delete Items **9** and **10**, and replace with:

“**9.** Remainder of Division 00  
**10.** Appendices  
**11.** Referenced Standard Specifications”

3. In Article 3.4, replace Paragraphs 3.4.2.7 through 3.4.2.9 with:

“**.7** If Contractor does not certify the Claim as required above, the Claim will be considered incomplete and subject to denial without any further recourse by, or remedy to, the Contractor.

- .8** A claim complying with the requirements of Article 3.4 by the Contractor sent to the District through the District's Construction Management Information System ("CMIS", see Section 01 31 23.10) and by registered or certified mail with return receipt requested, either on its own behalf, or on behalf of one of its subcontractors of any tier that is a separate demand for a time extension, including without limitation, for relief from damages or penalties for delay, for money or damages arising from work done by, or on behalf of the Contractor for which payment is not otherwise provided, or to which the Contractor is not otherwise entitled, or payment of an amount disputed by the District shall be subjected to the following procedures:
- a)** Upon receipt of a Claim, the District will conduct a reasonable review of the Claim and will provide to the Contractor a written statement identifying what portion of the Claim is disputed and what portion is undisputed within 45 days from the date of receipt. The time for providing the written statement may be extended by mutual agreement between the District and the Contractor. If the District requires approval from its governing Board, and its Board does not meet within the 45-day period from receipt of a Claim, then the 45-day period shall be extended to three days following the next duly publicly noticed meeting of the District's Board.
  - b)** Upon request by the District, the Contractor shall furnish reasonable documentation to support the Claim, as outlined in Article 3.4.2.
  - c)** Any payment due on an undisputed portion of the Claim will be paid within 60 days after the District issues the written statement referenced in Subparagraph 3.4.2.8.a, above.
  - d)** If the Contractor disputes the District's written statement, or if the District fails to timely respond to a Claim, the Contractor may demand in writing, sent through the CMIS and by registered or certified mail with "return receipt requested", an informal conference to meet and confer for settlement of the issues in dispute with the District. Within 30 days from the date of receipt of such demand to meet and confer, the District will schedule and hold a meet and confer conference, unless the timing is extended by mutual agreement of the Contractor and the District.
  - e)** Within 10 business days following the conclusion of the meet and confer conference, if the Claim or any portion of the Claim remains in dispute, the District will provide the Contractor a written statement identifying the portion of the Claim that remains in dispute and the portion that is undisputed. If additional unpaid undisputed portions of the Claim are identified, payment on such undisputed portions will be made within 60 days after the District issues the written statement referenced in this Subparagraph 3.4.2.8.e.
  - f)** Following receipt of the District's written statement in Subparagraph 3.4.2.8.e, the Contractor may identify in writing any disputed portion of the Claim and request mediation. The disputed portion of the Claim, as identified in writing by the Contractor, shall be submitted to nonbinding mediation. The costs of mediation shall be shared equally by the District and the Contractor. The District and the Contractor shall mutually agree to a mediator within 10 business days after the

disputed portion of the Claim has been identified in writing as provided herein. If the District and the Contractor cannot agree upon a mediator, they shall each select a mediator, and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the Claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. Alternatively, the parties may agree to any nonbinding process, included but not limited to neutral evaluation or a dispute review board, and such nonbinding process shall be considered to comply with the mediation requirements set forth herein. Unless otherwise agreed by the District and the Contractor in writing, the mediation shall excuse any further obligation under Public Contract Code § 20104.4 to mediate after litigation has been commenced. The District and the Contractor may mutually agree to waive mediation in writing, at which time the procedures set forth in Article 3.4 shall be deemed complete and complied with, other than the mediation provided herein.

- g) If mediation of the disputed portion of the Claim is unsuccessful, the Contractor shall be required to follow all of the other claim procedures set forth in Article 3.4.
- h) Failure by the District to respond to a Claim within the time periods set forth herein will result in the Claim being deemed rejected in its entirety. A Claim that is denied by reason of the District's failure to have responded to a Claim, or its failure to otherwise meet the time requirements of Subparagraph 3.4.2.8, shall not constitute an adverse finding with regard to the merits of the Claim or the responsibility or qualifications of the Contractor.
- i) Amounts not paid in a timely manner as required in Subparagraph 3.4.2.8 will bear interest at 7 percent per annum.
- j) It is intended that the provisions stated in this Subparagraph 3.4.2.8 be a summary of the requirements of Public Contract Code § 9204, and it is not intended that the provisions herein shall waive or alter the requirements of Public Contract Code § 9204, except to the extent permitted by law upon mutual written agreement by the Contractor and the District.

**.9 Condition Precedent (Government Code, Sections 930, et seq.):**

- a) The Disputes and Claims procedures set forth in Article 3.4 are the exclusive procedures for presenting any Claims and are a condition precedent to filing a Government Code Claim, which, in turn, is a condition precedent to the right to initiating any action against the District related to the Claim. Failure to comply with the Disputes and Claims procedures set forth in Article 3.4 is a waiver of any Claim arising from or related to the facts and circumstances described in the Claim or the Notice of Intent to File a Claim.”

4. In Article 4.2.1, replace Article 4.2.1 in its entirety with:

**“4.2.1 Superintendent.** The Contractor shall employ a qualified, competent superintendent who shall be present at the project site at all times whenever work is being

performed and who shall supervise and direct all Work being performed by the Contractor, Subcontractors, and their respective agents and employees to ensure that the Work is being carried out in accordance with the Contract Documents. The superintendent shall be a regular employee of the Contractor and shall have been so for at least 30 days prior to work on this project. The Contractor shall designate, in writing, the name, scope, and authority of the superintendent before the Work begins. Instructions and information given by the Engineer to the Contractor's superintendent about the Work are binding on the Contractor. Failure of the Contractor to have a designated superintendent at the project site as required by this paragraph shall constitute a material breach of this Contract, and shall further constitute grounds for suspension of all work until the Contractor has fully complied with the requirements of this paragraph. Any such suspension shall be considered an inexcusable delay by the Contractor, and may serve as grounds for termination for default at the election of the District."

5. After Article 4.3.3, add:

**“4.3.4** All personnel including sole proprietors performing electrical work covered by Division 26 of the contract documents shall be journeymen or registered apprentices or shall be certified as electricians pursuant to certification standards established by the Division of Labor Standards Enforcement. Personnel shall submit satisfactory proof of certification or registration to the Engineer prior to performing electrical work.”

6. In Article 4.7.1, delete:

“ However, the Contractor is not responsible for the cost of repair or restoration of damage to the Work caused by an Act of God as that term is defined in Section 7105 of the Public Contract Code.”

7. In Article 11

A. Delete Article 11.3 in its entirety.

B. Renumber Article 11.4 to 11.3.

C. After Article 11.3, insert:

**11.4 Termination or Suspension of the Contract - Act of God or Force Majeure**

**11.4.1** If an Act of God or Force Majeure occurs, the Engineer may, by written notice, either suspend this contract pursuant to Article 11.3, or terminate this contract pursuant to Article 11.2. In the case of suspension pursuant to Article 11.4, the 90-day suspension period limitation in Article 11.3.1 shall not apply. If the contract is not suspended or terminated, or if the contract is resumed after suspension, the Contractor shall fully restore the work except as limited by Public Contract Code, Section 7105(a), in the case of an “Act of God.”

**11.4.2** If the contract is terminated because of an Act of God or Force Majeure,

the Contractor will be paid for Work performed prior to the Act of God or Force Majeure at either (i) the Unit Prices named in the contract; or (ii) in the event no unit prices are named, a sum equal to the percentage that the Contract Sum for the Work completed, at the time of occurrence of the Act of God or Force Majeure bears to the Contract Sum for all Work to be performed under the contract as determined by the Engineer. In no event will the District be liable to the Contractor for breach of contract, extra work, or damages because the contract is terminated due to an Act of God or Force Majeure.”

8. After Article 12.1.8, add:

“12.1.9 The Contractor and all Subcontractors of any tier shall be properly registered with the State Department of Industrial Relations at the time of bid opening and for the duration of the project pursuant to Section 1725.5 of the Labor Code.

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

9. After Article 12.2.4, add:

“12.2.5 The Contractor and all subcontractors are required to submit certified payroll records online, on a monthly basis to the Labor Commissioner. In addition, the Contractor and all subcontractors shall maintain and provide payroll records on forms as provided by the Division of Labor Standards Enforcement or shall contain the same information as the forms provided by the division.”

10. In Article 13.3, replace Articles 13.3.2 and 13.3.3 in their entirety with:

“13.3.2 There shall be no discrimination in the performance of this contract, against any person, or group of persons, on account of race, color, religion, religious creed, national origin, ancestry, gender including gender identity or expression, age (over 40), marital or domestic partnership status, mental disability, physical disability (including HIV and AIDS), medical condition (including genetic characteristics or cancer), veteran or military status, family or medical leave status, genetic information, or sexual orientation. The Contractor shall not establish or permit any such practice(s) of discrimination with reference to the contract. Contractors determined to be in violation of this section will be deemed to be in material breach of the contract.

**13.3.3 Contractor and its subcontractors shall abide by the requirements of 41 CFR §§ 60-1.4(a), 60-300.5(a) and 60-741.5(a). These regulations prohibit discrimination against qualified individuals based on their status as protected veterans or individuals with disabilities, and prohibit discrimination against all individuals based on their race, color, religion, sex, sexual orientation, gender identity, or national origin in the performance of this contract. Moreover, these regulations require that covered prime contractors and subcontractors take affirmative**

**action to employ and advance in employment individuals without regard to race, color, religion, sex, national origin, protected veteran status or disability.”**

END OF DOCUMENT



# EXHIBIT D IRAN CONTRACTING ACT CERTIFICATION

Pursuant to Public Contract Code (PCC) § 2204, an Iran Contracting Act Certification is required for solicitations of goods or services of \$1,000,000 or more.

To submit a bid or proposal to East Bay Municipal Utility District (District), you must complete **ONLY ONE** of the following two paragraphs. To complete paragraph 1, check the corresponding box **and** complete the certification for paragraph 1. To complete paragraph 2, check the corresponding box and attach a copy of the written permission from the District.

- 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.

### CERTIFICATION FOR PARAGRAPH 1:

I, the official named below, CERTIFY UNDER PENALTY OF PERJURY, that I am duly authorized to legally bind the BIDDER/bidder to the clause in paragraph 1. This certification is made under the laws of the State of California.

Firm: \_\_\_\_\_

By: \_\_\_\_\_ Date: \_\_\_\_\_  
(Signature of Bidder)

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

Signed at: \_\_\_\_\_ County, State of: \_\_\_\_\_

**OR**

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



**EXHIBIT E**  
**TECHNICAL SPECIFICATIONS AND DRAWINGS**

SET NO. \_\_\_\_\_

---

**BALLASTED FLOCCULATION  
EQUIPMENT AND SERVICES**

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EXHIBIT E -  
TECHNICAL SPECIFICATIONS AND DRAWINGS

VOLUME I OF III

SPECIFICATIONS  
(DIVISIONS 01)

RFQ 2505



EAST BAY MUNICIPAL UTILITY DISTRICT

Bids will be opened at 1:30 pm, Wednesday, March 12, 2025 in the Board Room,  
Second Floor of the District's Administration Building, 375 11<sup>th</sup> Street, Oakland, California

RFQ 2505

BALLASTED FLOCCULATION EQUIPMENT AND SERVICES

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SECTION 01 31 19

PROJECT MEETINGS

PART 1 - GENERAL

1.1 PRECONSTRUCTION CONFERENCE

- A. Upon receipt of the Notice to Proceed, or at an earlier time if mutually agreeable, the Engineer will arrange a kickoff conference to be attended by the Ballasted Flocculation System Supplier's (BFSS') project representative authorized to commit on behalf of the BFSS, the Engineer, District representatives, and others involved in the execution of the Work.
- B. The purpose of this conference will be to establish a working relationship and understanding between the parties and to discuss project organization, job communications, the Construction Schedule, shop drawing submittals and processing, cost breakdown payment applications and their processing, extra work procedures, safety requirements, inspections, and such other subjects as may be pertinent for the execution of the Work.

1.2 WEEKLY PROGRESS MEETINGS

- A. The Engineer and/or General Contractor (Assignee) will arrange and conduct weekly progress meetings, as needed. The Engineer or Assignee will prepare and circulate an agenda for each meeting.
- B. Progress meetings will be conducted at a time that is mutually agreed upon by the Engineer and the BFSS. Progress meetings shall be attended by the Engineer, Assignee representatives, District Operations and Maintenance personnel as required, BFSS's project representative, and representatives of all subcontractors required by the BFSS or requested by the Engineer.
- C. Progress meetings will be held at any of the following locations, as determined by the Engineer:
  - 1. The Construction Division Office at 1100 21<sup>st</sup> Street Oakland, CA 94607
  - 2. The Design Division Office at 375 11<sup>th</sup> Street, Oakland, CA 94607
  - 3. Construction trailer at project job site
  - 4. Other locations as determined by the Engineer
- D. The purpose of the meetings will be to facilitate the work of the BFSS and any subcontractor or other organization that is not up to schedule, resolve conflicts,

identify and resolve any potential delays and, in general, coordinate and facilitate the execution of the Work.

- E. The agenda of progress meetings shall include review of work progress and the latest schedule, potential project delays, submittal reviews, information requests, safety concerns, and extra work items.
- F. The Engineer will prepare and distribute minutes of the meetings.
- G. Progress meetings may be conducted using remote meeting software applications such as Microsoft (MS) Teams, Zoom etc. at the option of the District. BFSS shall have equipment available for this remote communication.

### 1.3 FIELD TESTING COORDINATION MEETINGS

- A. Field testing coordination mandatory meetings (see Section 01 75 17, Article 3.3) will be required to coordinate detailed commissioning procedures for complicated work or work with high potential impact to operations and schedule with the Pretreatment Project contractor (Assignee), BFSS, subcontractors, and vendors. These meetings will be scheduled as needed by the Commissioning Engineer.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

## SECTION 01 31 23.10

### CONSTRUCTION MANAGEMENT INFORMATION SYSTEM

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. The BFSS, and its subcontractors and suppliers shall utilize the District's Construction Management Information System (CMIS) for submission of all data and documents (unless specified otherwise herein and in this Section) throughout the duration of the Contract. "Copy" or Copies" shall refer to electronic copies unless a hard copy is specified. Where a hard copy is specified, both electronic and paper versions shall be submitted.

1. The District's current CMIS is Kahua, a web-based construction management software hosted by Kahua, Inc.
2. The CMIS is paid for by the District.
3. The CMIS will be made available to all BFSS' personnel, subcontractor personnel and suppliers working under the Contract.
4. The joint use of this system is to facilitate electronic exchange of information, automation of key processes, and overall management of Contract Documentation.
5. The CMIS shall be the primary means of project information submission and management.

B. Related Sections:

1. Section 01 33 00 – Submittal Procedures

##### 1.2 USER ACCESS LIMITATIONS

A. The Engineer will establish the BFSS' access to the CMIS by allowing access and assigning user profiles to accepted BFSS personnel. User profiles will define levels of access into the system and determine assigned function-based authorizations and user privileges to enter and access information in the CMIS. Subcontractors and suppliers will be given access to the CMIS by and through the BFSS. Entry of information exchanged and transferred between the BFSS and its subcontractors and suppliers on the CMIS shall be the responsibility of the BFSS.

### 1.3 OWNERSHIP OF DATA

- A. Data entered in a collaborative mode (entered with the intent to share as determined by permissions and workflows within the CMIS) by the Engineer and the BFSS will be jointly owned.

### 1.4 AUTOMATED SYSTEM NOTIFICATION AND AUDIT LOG TRACKING

- A. Review comments made (or lack thereof) by the Engineer on BFSS-submitted documentation shall not relieve the BFSS from compliance with requirements of the Contract Documents. The BFSS is responsible for managing, tracking, and documenting the Work to comply with the requirements of the Contract Documents. District's acceptance via automated system notifications or audit logs extends only to the face value of the submitted documentation and does not constitute validation of the BFSS' submitted information.

### 1.5 PRECONSTRUCTION SUBMITTALS

- A. See Section 01 33 00 – Submittal Procedures.
- B. Within five work days after receiving the Notice to Proceed, BFSS shall submit:
  - 1. List of BFSS' personnel responsible for CMIS administration, as well as that for the BFSS' subcontractors and suppliers
  - 2. Include descriptions of key personnel's roles and responsibilities for this project. BFSS shall also identify its organization's administrator on the list.

### 1.6 COMPUTER REQUIREMENTS

- A. The BFSS shall use PC-based computer hardware and software that meets the requirements of the CMIS as recommended by the host of the CMIS, and as described herein to access and utilize the CMIS. As recommendations are modified by the host of the CMIS, the BFSS shall upgrade its system(s) to meet or exceed the recommendations. Upgrading of the BFSS's computer systems shall not be justification for a cost or time modification to the Contract.
- B. The BFSS shall ensure that connectivity to the CMIS is accomplished through an internet connection with a minimum bandwidth requirement of 128 kb/s for using the system. It is recommended that a faster connection be used when uploading pictures and files into the system.
- C. The CMIS currently supports the current and prior two versions of Chrome, Firefox, Edge, and Safari.
- D. The BFSS shall use applications compatible with Adobe Acrobat Professional Version XI or later to create Portable Document Format (PDF) files.

## 1.7 CONTRACTOR RESPONSIBILITY

- A. Contractor shall be responsible for scanning or otherwise converting to electronic format all project submittals and BFSS correspondence, drawings, sketches, etc., and uploading them to the CMIS.
- B. The BFSS shall be responsible for the validity of its information placed in the CMIS.
- C. Accepted users shall be knowledgeable in the use of computers, including Internet Browsers, email programs, CAD drawing applications, and Portable Document Format (PDF) document distribution program.
- D. The BFSS shall utilize the existing forms in the CMIS to the maximum extent possible. If a required form does not exist in the CMIS, the BFSS shall include a form of its own or one provided by the Engineer (if available) as an attachment to a submittal. The District discourages the use of e-mails and other methods of submitting requests and documents. Unless approved in advance by the Engineer, requests and documents not submitted through the CMIS will not be recognized as official correspondence.
- E. PDF documents shall be created through electronic conversion rather than optically scanned whenever possible. If optically scanned, the document shall be converted through OCR (Optical Character Recognition) software so that all documents are searchable. If the documents have multiple sections then the BFSS shall provide a “bookmark” for each section. The BFSS is responsible for the training of its personnel in the use of the CMIS (outside what is provided by the District) and the other programs indicated above as needed. The BFSS shall disable all security so that copying and pasting of information from the PDF document is enabled.
- F. User Access Administration
  - 1. Provide a list of BFSS’s key CMIS administration personnel for the Engineer’s acceptance. BFSS is responsible for informing the Engineer of additional personnel, subcontractors and suppliers to be added to the system, or of personnel, subcontractors and suppliers to be removed from the system. The Engineer reserves the right to perform a background check on all potential users.

## 1.8 CONNECTIVITY LIMITATIONS

- A. The CMIS is a web-based environment and therefore, subject to the inherent speed and connectivity limitations of the Internet. The BFSS is responsible for its own connectivity to the Internet. CMIS response time is dependent on the BFSS’ equipment, including processor speed, Internet access speed, etc. and current traffic on the Internet. The District will not be liable for any delays associated from the usage of the CMIS including, but not limited to: slow response time, down time periods, connectivity problems, or loss of information. The BFSS shall ensure connectivity to the CMIS (whether at the home office or job site). Under no circumstances will usage of CMIS be grounds for a time extension or cost adjustment to the Contract.



## 1.9 TRAINING

- A. The host of the CMIS will provide training consisting of a 2-hour web-based seminar in conjunction with a conference call. The seminar will accommodate multiple participants. BFSS shall determine how many seminars it requires.
- B. BFSS shall arrange and pay for the facilities and hardware/software required to facilitate the BFSS' own training.
- C. BFSS shall be responsible for coordinating the provision of training from the host of the CMIS for its personnel and its subcontractors' personnel.

## PART 2 - PRODUCTS

### 2.1 DESCRIPTION

- A. Kahua project management application (no substitutions) provided by Kahua, Inc.

## PART 3 - EXECUTION

### 3.1 CMIS UTILIZATION

- A. The CMIS shall be utilized in connection with all document and information management required by these Contract Documents. Documents and information to be submitted electronically include, but are not limited to, the documents described below.

#### 1. Submittals:

##### a. Shop Drawings

- 1) Shop drawings and design data documents shall be submitted as AutoCAD format files and PDF attachments to the CMIS submittal workflow process and form. Examples include, but are not limited to:
  - a) Standard manufacturer installation drawings
  - b) Drawings prepared to illustrate portions of the work designed or developed by the BFSS
  - c) Steel fabrication, piece, and erection drawings
  - d) Electrical interconnection drawings

##### b. Product Data

- 1) Product data and manufacturers' instructions shall be submitted as PDF attachments to the CMIS submittal workflow process and form. Examples include, but are not limited to:
  - a) Manufacturer's printed literature

- b) Preprinted product specification data and installation instructions
- c. Samples
  - 1) Sample submittals shall be physically submitted as specified in Section 01 33 00 – Submittal Procedures; additionally, BFSS shall enter submittal data information into the CMIS with a copy of the submittal form(s) attached to the actual sample. Examples include, but are not limited to:
    - a) Product finishes and color selection samples
    - b) Product finishes and color verification samples
    - c) Finish/color boards
    - d) Physical samples of materials
- d. Administrative Submittals
  - 1) All correspondence and pre-construction submittals shall be submitted using the CMIS. Examples include, but are not limited to:
    - a) Permits
    - b) List of project personnel
    - c) Requests for Information (RFI)
    - d) System Outage Requests
    - e) NOT USED
    - f) NOT USED
    - g) Plant Inspection Requests
    - h) Survey Requests
    - i) Requests for Meetings
  - 2) All schedules and associated reports and updates shall be submitted as specified in these Contract Documents and as a native backed-up file of the scheduling program being used. The schedule shall be posted as a PDF file in the format specified in these Contract Documents and as backed-up file.
  - 3) Plans for safety, demolition, environmental protection, and similar activities

- 4) Meeting minutes for weekly construction meetings, progress meetings, pre-installation meetings, etc.
  - 5) Any general correspondence submitted
- e. Compliance Submittals
- 1) Test reports, certificates, and manufacture field report submittals shall be submitted on the CMIS as PDF attachments. Examples include, but are not limited to:
    - a) Field test reports
    - b) Quality Control certifications
    - c) Manufacturers' documentation and certifications for quality of products and materials provided
- f. Record and Closeout Submittals
- 1) Operation and maintenance data closeout submittals shall be submitted via the CMIS as PDF documents during the approval and review stage as specified, with actual hardcopy set of documents submitted for final (in addition to the final being submitted via the CMIS). Examples include, but are not limited to:
    - a) Operation and Maintenance Manuals: Final documents shall be submitted as specified.
    - b) Extra Materials, Spare Stock, etc.: Submittal forms shall indicate when and where actual materials are submitted.
- g. Financial Submittals
- 1) Schedule of Costs, Pay Estimates, and Change Order Requests shall be submitted via the CMIS. Supporting material for Pay Estimates and Change Order Requests shall be submitted via the CMIS as PDF attachments. Examples include, but are not limited to:
    - a) BFSS' Schedule of Costs utilizing both the native CMIS Schedule of Costs format and as required by the Contract Documents in both PDF and Microsoft Excel
    - b) BFSS' Monthly Progress Payment Requests utilizing the CMIS
    - c) Contract Change proposals requested by the District

END OF SECTION

## SECTION 01 33 00

### SUBMITTAL PROCEDURES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section includes:

1. The requirements of this section apply to all submittals in the Contract Documents.
2. Submit samples, drawings, and data for the Engineer's review which demonstrate fully that the construction, and the materials and equipment to be furnished will comply with the provisions and intent of this Specification. All submittals shall be written in Standard American English and all numerical data, whether in drawings, test reports, engineering calculations, manufacturer's literature, or maintenance manuals, shall be in United States Customary System (USCS) measuring units (foot, pound, gallons, etc). If original design work was completed in metric units, their equivalent USCS dimension and unit shall be indicated. All submittals, in printed or electronic format, shall be original quality and completely legible. Any obfuscation or loss of clarity of original which may result in ambiguous interpretation is not acceptable.
3. Specific items to be covered by the submittals shall include, as a minimum, the following:
  - a. For structures, submit all shop, setting, equipment, miscellaneous iron and reinforcement drawings and schedules necessary.
  - b. For pipelines, submit a detailed layout of the pipeline with details of bends and fabricated specials and furnish any other details necessary. Show location of shop and field welds.
  - c. For equipment which requires electrical service, submit detailed information to show power supply requirements, wiring diagrams, control and protection schematics, shop test data, operation and maintenance procedures, outline drawings, and manufacturer's recommendation of the interface/interlock among the equipment.
  - d. For mechanical equipment submit all data pertinent to the installation and maintenance of the equipment including shop drawings, manufacturer's recommended installation procedure, detailed installation drawings, test data and curves, maintenance manuals, and other details necessary.
  - e. Substitutions

4. Additional submittals required: See pertinent sections of this specification.
5. Submit a Schedule of Submittals including monthly updates.
6. For mechanical or electrical equipment that require submittals: provide separate submittals for each piece of equipment to be installed at each site. Title the submittals to denote which site the equipment pertains to.

B. Related sections:

1. Section 01 31 23.10 – Construction Management Information System
2. Section 01 61 00 – Common Product Requirements

## 1.2 PRODUCT HANDLING

- A. Submittals shall be accompanied by a cover page and shall be in strict accordance with the provisions of this section.
- B. Submit priority of processing when appropriate.
- C. Submit materials to the EBMUD Materials Testing Laboratory when so specified. Submit other submittals to Construction Division, EBMUD, in accordance with Article 3.1 unless specified otherwise.
- D. Proposals for “or equal” substitutions made prior to bid opening, pursuant to PCC Section 3400, shall be delivered after coordinating the delivery with the District. BFSS shall coordinate with the District’s Purchasing Division at the following telephone numbers: (510) 287-1253, or (510) 287-2017.

## 1.3 SUBMITTALS

- A. Submittals shall include the following information:
  1. A copy of the applicable section(s), with addendum updates included as appropriate, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.
  2. A check mark shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the BFSS, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Engineer is the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the BFSS with the specifications.

- B. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.
- C. Any deviation from the contract documents not specifically requested and clearly identified, although accepted through oversight, may be rejected at any stage of the Work. The BFSS shall, at its own expense, reconstruct all work affected by the later rejection of a contract deviation that was not specifically called out and explained for review and acceptance by the District as detailed above.

PART 2 - PRODUCTS

2.1 NOT USED

2.2 SHOP DRAWINGS

A. Scale required:

- 1. Make all shop drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the work.

B. Type of prints required:

- 1. Make all shop drawing prints in blue or black line on white background. Reproductions of District drawings are not acceptable.

C. Size of drawings required:

- 1. The overall dimensions of each drawing submitted to the Engineer shall be equal to one of the District's standard sheet sizes as listed below. The title block shall be located in the lower right hand corner of each drawing and shall be clear of all linework, dimensions, details, and notes.

Sheet Sizes  
Height x Width

11" x 8-1/2"  
11" x 17"  
22" x 34"

- D. Stamp or permanently print on each drawing "Reference EBMUD Drawing \_\_\_\_\_" and enter the pertinent drawing number.

2.3 COLORS

A. General:

1. Unless the precise color and pattern are specified elsewhere, submit accurate color charts and pattern charts to the Engineer for his review and selection whenever a choice of color or pattern is available in a specified product. Label each chart naming the source, the proposed location of use on the project, and the project name itself.

## 2.4 MANUFACTURERS' LITERATURE

- A. Where contents of submitted literature from manufacturers include data not pertinent to the submittal, clearly show which portions of the contents are being submitted for review.
- B. Clearly mark the literature with the materials and options being provided to illustrate conformance with the specification details.
- C. Provide the complete part number and include the legend containing the descriptive details that define the meaning of each digit of the number.

## 2.5 SUBSTITUTIONS

- A. Engineer's approval required:
  1. The contract is based on the materials, equipment, and methods described in the Contract Documents. Any BFSS-proposed substitutions are subject to the Engineer's approval.
  2. The Engineer will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data, and all other information required by the Engineer to evaluate the proposed substitution.
  3. Where substitutions are proposed for consideration, BFSS shall submit a written request for the substitution and shall show that it is equal to the specified item. The proposed substitution shall be identified separately and included with the required submittal for the item. When submitting a variation or substitution the BFSS warrants that:
    - a. The contract has been reviewed to establish that the substitution, when incorporated, will be compatible with other elements of work.
    - b. The BFSS shall perform all necessary work for making substitutions workable and shall bear any additional cost necessary because of the proposed substitution.
  4. Substitutions not specifically requested, although accepted through oversight, may be rejected at any stage of the work. The BFSS shall, at its own expense, reconstruct all work affected by the later rejection of a substitution that was not specifically requested.

B. Trade names and "or equal as approved by the Engineer" provision:

1. See Article 4.4 of the General Conditions.
2. See Instructions To Bidders, Article 3, for proposals for "or equal" substitutions made prior to bid opening as permitted pursuant to PCC Section 3400.

## 2.6 OPERATIONS AND MAINTENANCE MANUALS

A. See "Table 1: O&M Manual Summary" at the end of this section.

B. The provisions of this article are considered minimal requirements and do not supersede any requirements in individual sections of this specification.

C. When O&M manuals are required to be submitted covering items included in this work, prepare all such manuals in approximately 8-1/2" x 11" format in durable, three ring plastic binders. Each manual shall be identical and include at a minimum information identified on the O&M Manual Review Checklist attached in Appendix A. In addition, furnish the following:

1. Binder Cover: Identification on, or readable through, the front cover stating the District's specification (project) number and project title, District facility or facilities where the equipment will be installed, specification section number, and the system or equipment described in the manual.
2. Binder Spine Label: Include the system or equipment name as shown on the binder cover along with the specification section number.
3. Title page including applicable equipment tag numbers and equipment manufacturer's name, address, telephone number, and the submittal date. In addition, provide name, address and telephone number of the local manufacturer's representative.
4. Table of contents organized and referenced to manual section dividers
5. Complete instructions regarding storage, handling, installation, operation, servicing, and maintenance of all equipment involved
6. Comprehensive replacement parts list, with complete nomenclature of all replaceable parts, their part numbers, current cost, and name and address of nearest vendor of parts
7. Detailed description of handling, replacement, and disposal of all fluids and replacement parts
8. Copies of Safety Data Sheets (SDS) as required
9. Copies of all guarantees and warranties issued including the start and end dates for the warranty period or conditions for the initial start date and the duration



10. Copies of drawings with all data concerning changes made during construction
  11. Copies of calculations or reports appropriately prepared including sketches, given or known information with the source of the data, equations with each variable defined and applicable units, cross-references, code/standard references, annotations and footnotes
  12. All field and factory test data
  13. Engineering calculations or reports pertinent to the content of the O&M manual. See Article 2.8 Engineering Calculations or Reports.
  14. Provide a separate section with tab divider for documents developed in the field after the O&M manual has been accepted. These documents include, but not limited to the following: manufacturer's certificate of proper installation, field test results, etc.
- D. Materials shall be word-processed.
- E. For mechanical or electrical equipment that require O&M manuals: provide separate O&M manuals for each piece of equipment installed at each site. Title the O&M manuals to denote which site the equipment pertains to.
- F. Manufacturer's literature shall be originals, or original quality copies. Specifically identify all equipment models and features being provided. Delete or cross out any extra information provided in standard manufacturer's literature that does not apply to the equipment furnished.
- G. Operating and Testing Procedures, and Diagrams: All manufacturers' standard procedures shall be customized or rewritten as necessary to accurately describe the system as it is installed and operated for the project. Procedures shall include District device tag numbers (as shown on the P&IDs) whenever available. All diagrams illustrating the system shall be customized to show installed conditions, and shall include District device tag numbers whenever available.
- H. Three-hole punch shall not obliterate any information. Reduce original material as necessary to provide a suitable margin for three-hole punching or provide three-hole punched clear plastic pockets for inserting single sheet material.
- I. O&M Manual Review Checklist:
1. The manufacturer's representative shall fill out a minimum of one O&M Manual Review Checklist form per submittal (See Appendix A) and include a copy in each submitted manual. Provide more than one checklist when specified in the technical specification sections. Clearly identify the location in the O&M Manual for each element in the Technical Content section (O&M tab number and page number). If the content is in multiple locations or on multiple pages, identify each location in the space provided or in the Comments column on the form.

2. All portions of the form shall be completed prior to submittal, or the submittal may be returned unreviewed. Submittals may also be returned unreviewed if the O&M Manual Checklist form contains multiple error and/or omissions.

J. O&M Manual Review Process

1. Preliminary O&M Manuals: Submit preliminary O&M manuals as searchable Portable Document Format (PDF) per Section 01 31 23.10 for review. The District will return the submittals to the BFSS along with comments identifying necessary corrections or additions to the manuals. The District reserves the right to keep possession of all O&M manuals, and have the BFSS arrange to correct the manuals to comply with the reviewer comments.
  - a. Preliminary O&M manuals shall be submitted and accepted prior to the delivery of the respective equipment or system.
2. Final O&M Manuals:
  - a. The manuals shall not be considered final until the submittal has received a review status of "No Exceptions Taken".
    - 1) Submit the Final O&M Manuals per the requirements of Paragraph 2.6.C.
    - 2) Submit requested number of Final O&M Manual hard copies as shown in Table 1 at the end of this section.
    - 3) Final O&M manuals shall be submitted and accepted prior to RFS milestone.

K. Electronic Files:

1. After the District has accepted each O&M Manual, an electronic version shall be supplied in addition to the required number of hard copies.
2. Electronic files shall be created in both searchable Portable Document Format (PDF) compatible with Adobe Acrobat version XI and Word format compatible with Microsoft Word 2010 or later. The security features (e.g. password protection) of all submitted files shall be disabled so that the District can perform future editing without restriction. Custom-developed drawings included in the O&M manuals (i.e. loop diagrams, system interconnection diagrams, etc.) shall also be submitted electronically in both PDF and the native CAD file format for future editing of the drawings by the Engineer. For CAD files, the associated PDF files shall be saved such that all CAD layering is preserved in the PDF file.
3. Electronic versions shall match the hard copy page for page with blank pages deleted. Electronic files shall be converted to PDF directly rather than using optical scanning. For any document not already in electronic format, the

documents shall be scanned using optical character recognition to provide searching capability in the document.

4. All electronic files shall be submitted to the Engineer via the CMIS.

#### L. Maintenance Summary Forms

1. Furnish a completed Maintenance Summary Form (see Appendix A for typical format) as part of the O&M Manual. Include all typical, routine, or preventive maintenance required to ensure satisfactory performance during warranty period and longevity of the equipment. Manufacturer's representative shall sign and date the form certifying accuracy of the information.
2. Briefly summarize each maintenance activity on the form. Specific references to more detailed maintenance information located elsewhere in the O&M manual may be placed in the "Comments" column. However, simply referencing other sections in the O&M manual without a brief description of the maintenance activity is not acceptable.
3. Information on the form shall be word-processed, or typewritten.
4. Maintenance Summary Forms shall be on 8-1/2 inch by 11-inch paper and may be as many pages as required to completely summarize the required maintenance. However, the order and format shall be in accordance with the supplied form. The Maintenance Summary Forms will be provided in electronic format (MS Word) upon request.

#### 2.7 NOT USED

#### 2.8 ENGINEERING CALCULATIONS OR REPORTS

- A. Engineering calculations/reports required by this specification shall be based on well-established engineering theories and principles. Each calculation/report shall be a complete and independent package.
- B. The BFSS (or Manufacturer) shall provide the signing Engineer all necessary reference drawings and data required for completion of the calculations.
- C. The calculations/reports shall be comprehensive for each structure or item, in that all calculations/reports are contained within the individual structure or item's calculation/report document (i.e., no calculation/report references to other calculation documents).
- D. Presentation format shall be similar to that described in Article 2.6 – Operations and Maintenance Manuals. As a minimum, all calculations/reports shall be bound in an appropriately labeled binder, and contain the following elements:
  1. Facility title, including substructure number, equipment description, applicable equipment tag number(s), and applicable specification section.

2. Table of Contents
  3. Introduction, including description of structure or item, purpose of calculation/report, design assumptions with justification, software utilized for the analysis including the version, and codes/standards used
  4. A list of references used to provide the bases for assumptions, equations, or data used in the calculation/report
  5. Calculations or reports appropriately prepared, including sketches and reference drawings, given or known information with the source of the data, equations with each variable defined and applicable units, cross-references, code/standard references, annotations and footnotes
  6. When spreadsheets are used, provide referenced equations and the formulas used in the calculations.
  7. Results shall be clearly identified. Summary tables shall be used for large amounts of data (especially if a software application is used)
  8. Final design details, ready for transmittal to design drawings or shop drawings
  9. Seal or signature of Professional Engineer registered in the State of California, as appropriate, of the individual(s) who prepared the calculations/reports
  10. Appendices, including input and output files from computer design, and photocopies of catalog sheets for any special material or equipment (e.g., manufacturer sheet for equipment, ICBO reports for anchors, etc.), and checker markups
- E. When any part of the calculation/report has been prepared by computer software, a copy of the input and output files shall be included as part of the final design calculation.
- F. Shop drawings shall not be submitted until all design calculations/reports have been appropriately reviewed, checked and signed. The checker markups and comments shall also be included in an appendix to each calculation.

## 2.9 NOT USED

## 2.10 SUBMITTAL QUANTITIES

- A. Submit four (4) copies of all hard-copy (printed) items as identified herein unless specified otherwise.
- B. Submit one (1) electronic copy of the scanned data and drawings in searchable PDF (compatible with Adobe Acrobat version XI). Submit scanned copy via the CMIS.
- C. Submit three (3) of each sample, unless specified otherwise.

- D. Submit five (5) copies of each manual unless specified otherwise.

## 2.11 ELECTRONIC SUBMITTALS

- A. Provide electronic submittals in searchable PDF (compatible with Adobe Acrobat version XI). All portions of the electronic submittals shall be legible and shall be in full color identical to the original material. Provide manufacturer's literature in original electronic file, if available.
- B. Provide one electronic submittal file for each submittal except as noted hereinafter. The electronic submittal file name shall use the following format: submittal number – specification section number - description (e.g.: “001.1-01 33 00-Coating of Widgets”). Providing multiple electronic files for a single submittal (except as noted hereinafter) is not acceptable. The BFSS shall merge multiple files into a single electronic file.
- C. For larger submittals containing multiple volumes, submit one electronic file for each hardcopy volume and each electronic submittal file name shall include the corresponding hard copy volume number (e.g. “001.1-01 33 00-Coating of Widgets – Volume 3”).
- D. Upon acceptance of the electronic submittal (marked as “No Exceptions Taken”, “Make Corrections Noted”, or “Acknowledged Receipt”), submit three (3) hardcopy sets of the submittal. The hardcopies shall be edited with highlighting, addressing/incorporating District review comments. A revised electronic file shall accompany the hardcopy submission and shall match the hard copy submittal page for page including cover transmittal forms, title pages, and blank pages.
- E. Exceptions requiring hardcopy material initially, are:
  - 1. O&M processing, per Article 2.6
  - 2. When hardcopy material is originally in a form larger than 11" x 17"; the material shall not only be included in the electronic submittal but shall also be submitted in hardcopy form along with the original electronic submittal required in Paragraphs A and B above. Seven (7) submittal copies of the large materials shall be provided.
- F. The BFSS is solely responsible for verifying that the hardcopy submittal and accompanying electronic submittal are identical and address/incorporate prior Engineer review comments.
- G. All portions of the electronic submittals shall be provided with text searching capabilities whenever possible. For any document not already in electronic format, the documents shall be scanned using optical character recognition to provide text searching capability in the document.
- H. Electronic files shall be submitted to the Engineer via the CMIS – See Section 01 31 23.10.

1. Submittals and RFIs shall be linked to at least one drawing within the File Manager application of the CMIS that provides the most relevant details regarding the subject equipment, material, item, or work. Linking shall be accomplished using the CMIS's "pin" feature. Submittals and RFIs received without at least one linked drawing or with a linked drawing that is not relevant will be Returned Without Review.

## 2.12 REVIEW CHECKLISTS

- A. Review Checklists are required for some specification sections (when specified in the section) and for all O&M manual submittals.
- B. Each submittal requiring review checklists shall comply with the following:
  1. Each page of the submittal shall include a unique and sequential page number. The page numbers shall be located in the same general location on each page.
  2. Page numbering may include "point numbers" (10.1, 10.2, etc.) to facilitate inserting pages without renumbering an entire submittal. However, all pages in the submittal shall be in numerical order.
  3. The review checklists shall be completed in its entirety with accurate page number references for each checklist item. Submittals with inaccurate review checklists may be returned without review for correction.
  4. The review checklist shall be inserted at the beginning of the submittal.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Prepare and use a transmittal form for submittals that includes the following information:
  1. \*Project name and specification number
  2. \*Date of submittal
  3. \*"To: Construction Division, MS #62  
East Bay Municipal Utility District  
P.O. Box 24055  
Oakland, CA 94623-1055  
ATTN: Office Engineer"
  4. \*"From:" Name and address of BFSS
  5. Name and address of subcontractor
  6. Name and address of supplier

7. Name of manufacturer
8. \*Spec. Section, Article Number, Paragraph and Subparagraph Number and/or drawing number and detail references
9. Location of use
10. \*Submittal number
11. \*Signature and title of transmitter
12. \*Original submittal or resubmittal

Note: All transmittals shall include asterisked items as a minimum to be acceptable for review.

- B. Use the "Item Number" on the Schedule of the Submittal for the corresponding submittal number. On a resubmittal, add a numerical suffix to the original submittal number. For example, 6.1 indicates the first resubmittal of submittal Number 6.
- C. Use a separate transmittal form for each specific item or class of material or equipment within a division for which a submittal is required. Transmittal of a submittal of multiple items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or when items are so functionally related that review of the group as a whole is appropriate.
- D. If a submittal contains multiple items, then each item shall be clearly labeled throughout the submittal or indexed in a manner eliminating confusion in identifying how each item relates to the whole. When submittal items have been assigned a "District equipment tag number" in the contract documents, each tag number shall be included throughout the submittal to clearly associate the specific submittal information to specific tag numbers.
- E. Stamp or permanently print on each submittal the following certification statement.

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated into RFQ Number 2505, is in compliance with the Contract drawings and specifications, can be installed in the allocated spaces, and is submitted for District (record/review).

Certified by \_\_\_\_\_ Date \_\_\_\_\_ "

### 3.2 NOT USED

- A. .

### 3.3 COORDINATION OF SUBMITTALS

- A. General:

1. Prior to submittal for Engineer's review, use all means necessary to fully coordinate all material, including the following procedures:
  - a. Determine and verify all field dimensions and conditions, materials, catalog numbers, and similar data.
  - b. Clearly indicate all deviations from the Contract Documents.

B. Grouping of submittals:

1. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items; the Engineer may reject partial submittals as not complying with the provisions of the Contract Documents.

C. Resubmittals:

1. The BFSS shall include a Comment and Response sheet with each resubmittal. The Comment and Response sheet shall be the first item after the submittal transmittal form. The Comment and Response sheet shall include each review comment (word for word) from the previous submittal cycle, followed by the BFSS's response clarifying how the comment has been addressed in the resubmittal. All responses shall at a minimum have a general description of what new information in the resubmittal addresses the review comment; and where in the resubmittal this new information can be located (tab number, page number, etc).
2. Resubmittals that do not comply with the requirements set forth in subparagraph C.1 above will be returned to the BFSS without review. The BFSS shall resubmit with an appropriate Comment and Response sheet as specified herein.

### 3.4 TIMING OF SUBMITTALS

A. Article 3.4 – Timing of Submittals, is not applicable for proposals for “or equal” substitutions made prior to bid opening pursuant to PCC Section 3400

B. General:

1. Make all submittals far enough in advance of scheduled dates of installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.
2. In scheduling, unless otherwise noted, allow at least twenty (20) work days for the Engineer's review. No time extension will be allowed for the Contract due to time loss in the review process.



### 3.5 REVIEW BY ENGINEER

- A. Acceptance of each submittal by the Engineer will be general only and shall not be construed as:
  - 1. Permitting any departures from the contract requirements.
  - 2. Relieving the BFSS of the responsibility for any errors and omissions in details, dimensions, or of other nature that may exist.
  - 3. Approving departures from additional details or instructions previously furnished by the Engineer.
  
- B. Submittals (excluding manuals and as-built drawings) will be returned to the BFSS marked "No Exceptions Taken", "Make Corrections Noted", "Revise and Resubmit", "Acknowledged Receipt", or "Rejected", except that in some cases, all copies of a submittal may be returned to the BFSS marked "Returned Without Review".
  - 1. "No Exceptions Taken" indicates that item covered by the submittal may proceed provided it complies with requirements of the specifications. Final acceptance will depend upon that compliance.
  - 2. "Make Corrections Noted" indicates that item covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the specifications. Final acceptance will depend on that compliance.
  - 3. "Revise and Resubmit" indicates that the BFSS shall not proceed with any phase of the item covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations and requirements of the specifications.
  - 4. "Acknowledged Receipt" indicates that the item is required to be submitted to the Engineer primarily for information or record purposes, and is not subject to Engineer's review.
  - 5. "Returned Without Review" indicates that the submittal was not reviewed by the Engineer due to the submittal being incomplete, illegible, inadequate, or otherwise failing to conform to the requirements of the specification. BFSS shall prepare a new submittal for this item.
  - 6. "Rejected" indicates that the submittal proposes an action of which the Engineer does not approve, makes an assertion with which the Engineer disagrees, appears to show intent to violate the terms of the Contract, or is otherwise objectionable to the Engineer and is returned to the BFSS with prejudice.
  
- C. Resubmit revised drawings or data as indicated unless otherwise specified.

- D. Work requiring the Engineer’s review and acceptance shall not begin until the submittals for that work have been returned as "No Exceptions Taken" or "Make Corrections Noted".
- E. Proposals for “or equal” substitutions made prior to bid opening pursuant to PCC Section 3400 will be evaluated by the Engineer, and if accepted, bidders will be notified by addenda.

3.6 CHANGES TO ACCEPTED SUBMITTALS

- A. A resubmittal is required for any proposed change to a submittal that has been marked "No Exceptions Taken" or "Make Corrections Noted". Changes which require resubmittal include, but are not limited to, drawing revisions, changes in materials and equipment, changes to installation procedures and test data. All resubmittals shall include an explanation of the necessity for the change.
- B. Minor corrections to an accepted submittal may be accomplished by submitting a "Corrected Copy".

3.7 O&M MANUAL SUMMARY LIST

- A. Table 1 is a summary of equipment/systems that require O&M manuals. Additional O&M manuals might be required when specified elsewhere.

Table 1: O&M Manual Summary (Additional O&M manuals might be required in other Sections)		Number of Hard Copy(ies) to Print
Section	System / Equipment, or Facility	
26 05 83	Low Voltage Motors	5
33 12 16.05	Miscellaneous Valves	5
46 41 34.01	Vertical Shaft Flocculator Units	5
46 44 10	Ballasted Flocculation	5

END OF SECTION

## SECTION 01 35 24

### PROJECT SAFETY REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

1. Unsafe tools, equipment, or machinery shall not be brought onto the project. Unsafe tools, etc. shall be considered as those tools in need of repair, replacement, lacking proper maintenance, or are unsuitable for the task. This also includes tools and equipment not used in accordance with manufacturer guidance.
2. Comply with:
  - a. Department of Transportation (DOT) testing regulations (49 CFR Part 32)
  - b. CA State Vehicle Code (Section 34520)
  - c. All applicable legally valid rules and regulations regarding drug and alcohol misuse, including consumption, sale or possession
3. Firearms, explosive devices, and other dangerous weapons are prohibited on District property or while engaged in contract Work.

##### B. Related Sections

1. Section 01 31 23.10 – Construction Management Information System
2. Section 01 33 00 – Submittal Procedures
3. Section 01 35 44 – Environmental Requirements

##### 1.2 DEFINITIONS

- A. Where used in the Contract Documents, the following words and terms shall have the meanings indicated. The meanings shall be applicable to the singular and plural of the words and terms.
1. Cal/OSHA: California Occupational Safety & Health Administration
  2. Competent Person: As defined in Title 8 CCR §1504 of the Construction Safety Orders.
  3. Confined Spaces: Any space not designed for human occupancy and having the characteristics identified in Title 8, CCR §5156-5159, and §1950-1962

4. Excavation: Any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal
5. Exposure Assessment: An assessment of potential biological, chemical, physical, and radiological hazards encountered on the project site.
6. Hazard: Any source of potential damage, harm or adverse physical and/or health effects to someone.
7. Hazardous Atmosphere: An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue, injury, or acute illness from one or more of the following causes:
  - a. Flammable gas, vapor, or mist in excess of 10 percent of its Lower Explosive Limit (LEL)
  - b. Airborne combustible dust at a concentration that meets or exceeds its LEL
  - c. Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent
  - d. Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Article 4 of the Construction Safety Orders and Group 16 of the General Industry Safety Orders
  - e. Any other atmospheric condition that is immediately dangerous to life or health
8. Hazardous Energy Control Procedure (HECP): A procedure to implement hazard energy control and isolation in accordance with Lock-Out Tag-Out as defined by Title 8, CCR §3314.
9. Hazardous Substance: Any substance included in the list of hazardous substances prepared by the Director, California Department of Industrial Relations, pursuant to Labor Code Section 6382. Includes hazardous waste.
10. Hot Work Permit: Electric or gas welding, cutting or brazing, wire or grinding wheel, or any extreme heat, flame or spark producing equipment, procedures or operations.
11. Isolate or Isolation: The process or mechanism by which employees are completely protected against the release of energy, material, and contact with an identified hazard(s), by such means as:
  - a. Blanking or blinding
  - b. Misaligning or removing sections of lines, pipes, or ducts
  - c. A double block and bleed system

- d. Lockout or tagout of all sources of energy
  - e. Blocking or disconnecting all mechanical linkages; placement of barriers to eliminate the potential for employee contact with a physical hazard
12. Lock-Out Tag-Out (LOTO): The use of devices, positive methods and procedures, which will result in the effective isolation or securing of prime movers, machinery and equipment from mechanical, hydraulic, pneumatic, chemical, electrical, thermal or other hazardous energy sources.
  13. Order Prohibiting Use (OPU): A tag affixed to a dangerous workplace condition or practice which constitutes an imminent hazard to workers. An OPU tag may be posted prohibiting:
    - a. Entry to the worksite, or part of the worksite
    - b. Use of machinery, devices, or apparatus
  14. Permit-Required Confined Space: A confined space that has one or more of the following characteristics:
    - a. Contains or has a potential to contain a hazardous atmosphere
    - b. Contains a material that has the potential for engulfing an entrant
    - c. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section
    - d. Contains any other recognized serious safety or health hazard
  15. Safe Work Permit: A permit required to be completed by the Contractor and District staff used at a water treatment plant. The permit communicates work to be performed, the areas of work, and potential hazards of the work.
  16. Shutdown: An interruption in operation of the main wastewater treatment plant or remote facilities (including pumping plants) that results in planned interruption and de-energization of parts or the entire facility
  17. System Outage/System Outage Request (SOR): A documented procedure and request to remove one or more facility system(s) from service, and a documented request for contract work that impacts wastewater plant systems and operations. An SOR is typically associated with a Safe Work Notice or a Safe Work Permit.
  18. Trench: A narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet. If forms or other structures are installed or constructed in an excavation so as to reduce the

dimension measured from the forms or structure to the side of the excavation to 15 feet or less, (measured at the bottom of the excavation), the excavation is also considered to be a trench.

### 1.3 NOT USED

### 1.4 TRAINING AND QUALIFICATIONS REQUIREMENTS

- A. Ensure that all BFSS personnel who, as the result of work on this contract, will likely be exposed to hazardous conditions or hazardous substances at the site have received the appropriate training for the hazards they may encounter.
- B. Submit certification of current training & qualification for each worker engaged in work with hazardous conditions or hazardous substances.

### 1.5 TREATMENT PLANT SAFETY VIDEO

- A. All BFSS personnel shall view the treatment plant safety video provided by the District prior to working at treatment plants. The video will be provided to the BFSS at the pre-construction meeting. BFSS shall maintain an updated listing of BFSS personnel who have viewed the video.

## PART 2 - PRODUCTS

### 2.1 SAFETY EQUIPMENT

- A. Provide the equipment to comply with the requirements of this section and all associated safety requirements of the Contract Documents.

## PART 3 - NOT USED

END OF SECTION

## SECTION 01 35 44

### ENVIRONMENTAL REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Work includes:

1. Comply with applicable Federal, State and Local environmental regulations in the execution of the Work.
2. In the event of a conflict or inconsistency between this Section and any provisions of the Contract Documents, the more stringent provision shall prevail.

###### B. NOT USED

###### C. Related Sections

1. Section 01 35 24 – Project Safety Requirements

##### 1.2 ACRONYMS

AMS	Alternative Management Strategies
ARARs	Applicable or Relevant and Appropriate Requirements
BAAQMD	Bay Area Air Quality Management District
BMP	Best Management Practices
CCR	California Code of Regulations
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
CIH	Certified Industrial Hygienist
CUC	Clean Utility Corridor
DTSC	Department of Toxic Substances Control
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
FSP	Field Sampling Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
MMRP	Mitigation Monitoring and Reporting Program
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
OSHA	Occupational Safety and Health Administration
PID	Photoionization Detector
PPMRP	Practices and Procedures Monitoring and Reporting Plan
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RWQCB	Regional Water Quality Control Board

SAP	Sampling and Analysis Plan
SMARTS	Storm Water Multi-Application and Report Tracking System
SOP	Standard Operating Procedure
SOW	Scope of Work
STLC	Soluble Threshold Limit Concentration
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TCLP	Toxicity Characteristic Leaching Procedure
TTLC	Total Threshold Limit Concentration
TWW	Treated Wood Waste
USEPA	United States Environmental Protection Agency
WDR	Water Discharge Requirements

### 1.3 DEFINITIONS

- A. **Characterization:** Identification of chemical, microbiological, or radiological constituents of solid and liquid wastes. Characterization typically involves sampling and analysis performed by a laboratory that complies with and is certified under the Environmental Laboratory Accreditation Program (ELAP) of the State Water Resources Control Board for the purposes of classifying a waste as hazardous, non-hazardous, or other classification.
- B. **Clean Utility Corridor:** A utility corridor in an area with known or suspected contamination, which is designed in such a way as to allow unrestricted access to infrastructure to District employees without HAZWOPER training. It is often over-excavated and lined with geotextile fabric.
- C. **Construction and Demolition Waste (or Debris):** Materials resulting from construction, remodeling, repair, or demolition operations on any structure.
- D. **Contamination:** Any confirmed or anticipated release, spill, or emission, of any substance in the air, soil, surface water, or groundwater which may constitute a risk to the environment or human health. Note: Naturally occurring substances, such as asbestos, arsenic and chromium, may also be considered contaminants if they constitute a risk to human health.
- E. **Divert/Diversion:** The use of waste (or debris) for any purpose other than disposal in a landfill, incineration facility, or alternative daily cover. Methods to divert materials from landfills include reuse, salvage, and recycling.
- F. **Excavation Soils:** Material resulting from any excavation (cut, cavity, trench, or depression in the earth's surface formed by earth removal)
- G. **Hazardous Waste:** A waste or combination of wastes as defined in 40 CFR 261.3, or regulated as hazardous waste in California pursuant to Division 4.5, Title 22, California Code of Regulations, and Chapter 6.5, Division 20, California Health and Safety Code.



- H. Qualified Environmental Professional(s): A person with working knowledge of Federal, State, and local laws and regulations governing environmental compliance including hazardous materials management and disposal requirements. A person also with experience conducting environmental investigations including applicable methods and techniques of environmental sampling, analysis, and modeling.
- I. Sanitary Sewer Discharge: Any discharges to a sanitary sewer system, including the EBMUD collection system
- J. Staging Area: That area shown on the plans for the use of the contractors where construction related activities will occur, including long-term and short-term equipment storage and maintenance, materials storage (both temporary and long term), parking, office space, etc.

#### 1.4 SUBMITTALS

##### A. Spill Prevention and Response Plan

1. Submit plan detailing the means and methods for preventing and controlling the spilling of known hazardous substances used on the jobsite or staging areas.
  - a. Include a list of the hazardous substances proposed for use or generated by the Contractor on site, including petroleum products.
  - b. Define measures that will be taken to prevent spills, monitor hazardous substances, and provide immediate response to spills.
  - c. Include provisions for notification of the Engineer or alternate contact and appropriate agencies including phone numbers; spill-related worker, public health, and safety issues; spill control, and spill cleanup.
  - d. Map showing hazardous materials project-related storage locations, names of the hazardous materials, and volumes/quantities.
  - e. Submit a Safety Data Sheet (SDS) for each hazardous substance proposed to be used prior to delivery of the material to the jobsite.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

## SECTION 01 35 73

### DELEGATED DESIGN PROCEDURES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes:
  - 1. Delegated Design procedures.

##### 1.2 GENERAL

- A. Delegated Design - Professional design services assigned to the BFSS by express delegation in the Contract Documents. Work is “Delegated Design” where the Technical Sections require the BFSS to provide professional design services and to submit signed and sealed documents from a registered Professional Engineer.
- B. BFSS’ Professional Engineer - The design professional retained by the BFSS to perform Delegated Design.
- C. The Engineer may require BFSS to provide professional design services for a portion of the Work by express delegation in the RFQ Documents.
  - 1. Requirements of Delegated Design component as specified in the Technical Section and as indicated on the Drawings.
  - 2. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that the BFSS must furnish to the Engineer with respect to the Delegated Design.
- D. BFSS shall cause such Delegated Design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal shall appear on Drawings, calculations, Specifications, certifications, and Submittals prepared by such design professional.
  - 1. Where not specifically indicated, BFSS shall not be responsible for the adequacy of performance or design criteria specified by the Engineer.
  - 2. BFSS is not required to provide professional services in violation of applicable Laws and Regulations.
  - 3. Such design professional shall issue certifications of design required by Laws and Regulations.
  - 4. If a Shop Drawing or other Submittal related to the District-delegated design is prepared by the BFSS, a subcontractor, or others for submittal to the Engineer,

then such Shop Drawing or other Submittal shall bear the written approval of BFSS' design professional when submitted by the BFSS to the Engineer.

- E. The Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by BFSS under Delegated Design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- F. Engineer's review, approval, and other determinations regarding design drawings, calculations, Specifications, certifications, and other Submittals furnished by BFSS pursuant to a Delegated Design will be only for the following limited purposes:
  - 1. Confirming that Submittal is in conformance with the performance and design criteria specified in the RFQ Documents.

### 1.3 BFSS' PROFESSIONAL ENGINEER

- A. BFSS or subcontractor shall retain a licensed Professional Engineer to perform Delegated Design.
- B. Qualifications:
  - 1. Holding a current license to perform the specified design in the same jurisdiction as the Project Site.
  - 2. Experienced in designing similar systems of similar complexity.
- C. Insurance:
  - 1. Provide BFSS' Professional Engineer's Professional Liability Insurance as specified in RFQ Exhibit B – General Conditions.
- D. Responsibilities:
  - 1. Review and design in accordance with system performance and design criteria stated in the Contract Documents.
    - a. Prepare written requests for clarifications or interpretations of performance or design criteria for submittal to the Engineer by the BFSS.
  - 2. Sign and seal design reports, calculations, design drawings and specifications, and other design Submittals for the Delegated Design Work.
  - 3. Review and submit written approval of Submittals related to the Delegated Design Work.
  - 4. Design modifications to the Delegated Design Work as required.

5. Visit the Site, as required, to verify that installation of the Delegated Design Work is in conformance with the Delegated Design Drawings and Specifications.
6. Submit through BFSS to the Engineer written, signed, and sealed certification that the installed Delegated Design Work complies with BFSS' Professional Engineer's design.

#### 1.4 SUBMITTALS

- A. Prior to the start of Delegated Design, submit to the Engineer:
  1. BFSS' Professional Engineer's qualifications:
    - a. Experience for the Delegated Design.
    - b. Evidence of Professional Engineering license.
  2. BFSS' Professional Engineer Professional Liability Insurance certificate.
- B. Delegated Design:
  1. Product data:
    - a. Details related to the Delegated Design as specified in Technical Sections to completely describe the system.
  2. Design documents with signature and seal from the BFSS' Professional Engineer.
    - a. Design documents include, but are not limited to, Drawings, calculations, Specifications, inspection reports, and certifications.
  3. Lists and schedules:
    - a. Prepare and submit lists or schedules of items where Delegated Design is required by the Contract Documents.
    - b. Group items by location in the Work.
      - 1) When "Area Numbers" are indicated on the Contract Drawings, group lists in accordance with those "areas."
      - 2) For work without area numbers, group using logical divisions acceptable to the Engineer.
      - 3) Group items within each "area" as follows:
        - a) Systems.
        - b) Components.

- c) Supports.
- d) Anchorage.
- e) Bracing.

C. Construction services:

- 1. BFSS' Professional Engineer's comments on Submittals.
- 2. Other construction documents, as required.

1.5 ENGINEER RESPONSE TO DELEGATED DESIGN SUBMITTALS

A. Engineer response will of the following:

- 1. Refer to Section 01 33 00 – Submittal Procedures

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 42 19

### REFERENCE STANDARDS

#### 1.1 GENERAL

##### A. Referenced Standards and Design Codes:

The standards referred to, except as modified, shall have full force and effect as though printed in this Specification, and shall be the latest edition or revision thereof in effect on the bid opening date, unless a particular edition or issue is indicated. Copies of these standards are not available from the District. The Engineer will furnish, upon request, information as to how copies may be obtained. Abbreviations and terms, or pronouns in place of them, shall be interpreted as follows:

AAMA:	Architectural Aluminum Manufacturer's Association
AAR:	Association of American Railroads
AASHTO:	American Association of State Highway and Transportation Officials, Standard Specifications
AATCC:	American Association of Textile Chemists and Colorists
ABMA:	American Bearing Manufacturers Association, Inc.
ACI:	American Concrete Institute International, Standards
AGA:	American Gas Association
AGC:	Associated General Contractors of America
AGMA:	American Gear Manufacturers Association
AHAM:	Association of Home Appliance Manufacturers
AHIA	American Horticulture Industry Association
AI:	The Asphalt Institute
AIA:	The American Institute of Architects
AISC	American Institute of Steel Construction
AISI:	American Iron and Steel Institute

AITC:	American Institute of Timber Construction
AMCA:	Air Moving and Control Association International, Inc.
AMPP	Association for Materials Protection and Performance
ANS:	American Nuclear Society
ANSI:	American National Standards Institute
APA:	The Engineered Wood Association
API:	American Petroleum Institute
APWA:	American Public Works Association
ASA:	Acoustical Society of America
ASABE:	American Society of Agricultural and Biological Engineers
ASCE:	American Society of Civil Engineers
ASHRAE:	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME:	American Society of Mechanical Engineers
ASQ:	American Society of Quality
ASSE:	American Society of Sanitary Engineering
ASTM:	ASTM International
AWG:	American Wire Gauge
AWPA:	American Wood Protection Association
AWS:	American Welding Society
AWWA:	American Water Works Association
BHMA:	Builders Hardware Manufacturer's Association
CAL/OSHA:	California/Occupational Safety and Health Administration
CBC:	California Building Code
CCR:	California Code of Regulations
CEMA:	Conveyors Equipment Manufacturers Association

CGA:	Compressed Gas Association
CISPI:	Cast Iron Soil Pipe Institute
CLFMI:	Chain Link Fence Manufacturers Institute
CMAA:	Crane Manufacturers Association of America
CMC:	California Mechanical Code
CPC:	California Plumbing Code
CRSI:	Concrete Reinforcing Steel Institute
CSS:	CalTrans Standard Specifications, State of California, Department of Transportation
DOSH:	Division of Occupational Safety and Health, State of California, Department of Industrial Relations
EIA:	Electronic Industries Alliance
ETL:	ETL Testing Laboratory
FED/OSHA:	Federal Occupational Safety and Health Administration, Standards
IBC:	International Building Code
ICC:	International Code Council
ICEA:	Insulated Cable Engineers Association
ICRI:	International Concrete Repair Institute
IEEE:	Institute of Electrical and Electronic Engineers
IES:	Illuminating Engineering Society
IME:	Institute of Makers of Explosives
IP:	Institute of Petroleum (London)
IPC:	Institute of Printed Circuits
IPCEA:	Insulated Power Cable Engineers Association
ISA:	International Society of Automation
ISO:	International Organization for Standardization



ITE:	Institute of Transportation Engineers
MBMA:	Metal Building Manufacturers Association
MPTA:	Mechanical Power Transmission Association
MSS:	Manufacturers Standardization Society
MTI:	Marine Testing Institute
NAAM:	National Association of Architectural Metal Manufacturers
NACE:	National Association of Corrosion Engineers
NIST:	National Institute of Standards and Technology
NCCLS:	National Committee for Clinical Laboratory Standards
NCMA	National Concrete Masonry Association
NEC:	National Electric Code
NEMA:	National Electrical Manufacturers Association
NFPA:	National Fire Protection Association
NFPA 5000:	Building Construction and Safety Code
NGLI:	National Lubricating Grease Institute
NMA:	National Microfilm Association
NWMA:	National Woodwork Manufacturers Association
OSHA:	Occupational Safety and Health Administration
PCA:	Portland Cement Association
RIS:	Redwood Inspection Service, Standard Specifications
RVIA:	Recreational Vehicle Industry Association
RWMA:	Resistance Welder Manufacturer's Association
SAE:	Society of Automotive Engineers
SAMA:	Scientific Apparatus Makers Association
SDI:	Steel Door Institute

SIS:	Swedish Standards Association
SMA:	Screen Manufacturer's Association
SMACNA:	Sheet Metal and Air Conditioning Contractors National Association
SPR:	Simplified Practice Recommendation
SSBC:	Southern Standard Building Code, Southern Building Code Congress
SSPC:	Society for Protective Coatings
SSPWC:	Standard Specifications for Public Works Construction
STLE	Society of Tribologists & Lubrication Engineers
TAPPI:	Technical Association of the Pulp and Paper Industry
TFI:	The Fertilizer Institute
UPC:	Uniform Plumbing Code
UL:	Underwriters Laboratories
WCLIB:	West Coast Lumber Inspection Bureau
WIC:	Woodwork Institute of California
WRI:	Wire Reinforcement Institute
WWPA	Western Wood Products Association

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

## SECTION 01 43 11

### SEISMIC QUALIFICATION AND CERTIFICATION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. All products to be furnished under this contract shall be designed, constructed, and installed in conformance with the seismic requirements contained in the California Building Code (CBC) as modified below and in the related sections.
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures
  - 2. Section 01 42 19 – Reference Standards
  - 3. Section 01 81 02 – Seismic Design Criteria
  - 4. Section 05 05 19 – Mechanical Anchoring to Concrete and Masonry
  - 5. Section 33 12 01 – Basic Mechanical Materials and Methods

##### 1.2 STRUCTURAL INTEGRITY AND ANCHORAGE

- A. Structural integrity of the equipment shall be certified by calculations that demonstrate the adequacy of the equipment housing for seismic forces. These calculations may be based on principles of structural analysis and engineering mechanics, or based on approved shake table tests.
- B. Provide electrical and mechanical equipment and other non-structural components with proper anchorage to the supporting structures designed to resist seismic forces as specified in Section 01 81 02.
  - 1. Provide anchors as specified in Section 05 05 19 for fastening to concrete and masonry.

##### 1.3 PROOF OF COMPLIANCE

- A. For equipment installed in sites or structures designated as seismic design category C, D, E or F, prepare and submit the following:
  - 1. Statement of seismic qualification, or special seismic certification:
    - a. “Statement of Seismic Qualification:” Provide manufacturer’s statement that the equipment satisfies the seismic design requirements of the building code

indicated in Section 01 42 19, including the requirements of ASCE 7, Chapter 13.

- 1) Contractor shall submit for review and approval test data or calculations certified by a Civil or Structural Engineer registered in the State of California to show compliance with the requirements of Article 1.2.
- b. “Special Seismic Certification:” Provide manufacturer’s certification of compliance when subjected to shake table testing, including both operability and containment of hazardous materials as appropriate for the unit being tested. The certification shall be prepared in accordance with:
  - 1) IEEE Std. 693, for equipment listed in Paragraph 1.2.C above. This equipment shall meet or exceed IEEE Std 693 “High seismic level” qualification requirements.
  - 2) ICC-ES AC 156, for equipment not covered in Paragraph 1.2.C. This equipment shall meet the “Post-Test Functional Compliance Verification” requirements for “Components with  $I_p=1.5$ .”
2. Substantiating test data: With seismic qualification and special seismic certification statements, submit results of testing in accordance with applicable standards.
- B. Exemptions: A “statement of seismic qualification” and a “special seismic certification” are not required for the following equipment:
  1. Temporary or moveable equipment.
  2. Equipment anchored to the structure and having a total weight of 20 pounds or less.
  3. Distribution equipment anchored to the structure and having a total unit weight of 5 pounds per linear foot, or less.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

## SECTION 01 45 27

### SHOP INSPECTION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Work includes:

1. Provide the District's Plant Inspection Section with advanced notification for Short Term (three consecutive weeks or less at one facility), and Long Term (more than three consecutive weeks at one facility) inspection assignments, and reimburse the District for travel expenses described in this Section. Also see General Conditions Article 3.2.
2. Provide notification to the District's Plant Inspection Section of all work performed off the project site in fabrication, assembly, and coating plants; provide safe access to all areas where work is being performed.
3. The District reserves the right to use third-party inspectors in lieu of District personnel. All aspects of this section shall also apply to District contracted third-party inspectors.
4. For Long Term assignments provide the following:
  - a. Adequate office space including desk, office chair, lighting, and climate control;
  - b. A large format (up to 11 X 17 paper size) printer/scanner/copier and paper and printer supplies for the duration of the assignment;

B. Ballasted Flocculation System Supplier (BFSS) and its Material Suppliers shall ensure adequate lighting, ventilation, and safety procedures are in place to permit safe and thorough inspection at all times.

C. All inspection and measurement tools and equipment employed by BFSS or Material Suppliers shall be made available to the District and remain in the area for inspection, and shall be subject to regular inspection and verification by the BFSS that such tools and equipment are properly calibrated and in an operable condition.

D. BFSS and its Material Suppliers shall identify in writing the person responsible for the receipt and coordination of all Inspector communications. A representative from the Material Supplier responsible for Quality Control shall be present and available to the Engineer at all times during the course of inspections.

- E. BFSS and its Material Suppliers shall respond promptly to address and correct all fabrication and inspection processes to comply with the Contract Documents. Corrective measures undertaken by the BFSS and/or Material Supplier shall be documented and the documentation made available for review, inspection and copying by the Engineer at all times.
- F. See individual sections, listed in Article 1.4, for specific processes requiring shop inspection.

## 1.2 WITNESS NOTIFICATION

- A. The BFSS shall provide advanced written notification including the following information:
  - 1. The related specification section(s);
  - 2. Details of materials, parts or components to be inspected/tested;
  - 3. Name and location of shop to be visited;
  - 4. Shop's contact information;
  - 5. Approved submittal number; and,
  - 6. Proposed dates for those processes described in this and related Sections (Quality Control) for each shop location.
- B. The shop where the inspections and tests will occur shall contact the District Plant Inspection Section at (510) 287-1132 to schedule all shop inspections. Visits will be scheduled based on Engineer's availability.
- C. Notification Schedule:

ONE-WAY DISTANCE FROM OAKLAND	SHORT TERM ASSIGNMENTS	LONG TERM ASSIGNMENTS
less than 75 miles	5 work days in advance	15 work days in advance
75 to 200 miles	10 work days in advance	15 work days in advance
greater than 200 miles	15 work days in advance	20 work days in advance
International	30 work days in advance	30 work days in advance

D. Shift work outside of standard first shift work hours (7 AM to 5 PM), including changes to previously staffed shift work (excluding cancelation of shift work), require advanced approval by the Engineer. Following approval by the Engineer, shift work shall start no sooner than the first Monday following 10 work days' notice for locations up to 200 miles from Oakland, and the first Monday following 15 work days' notice for locations over 200 miles from Oakland.

E. If the required notification is not given, the District will schedule the witness inspection at its convenience and the activity to be witnessed shall not proceed until the Engineer arrives or the Engineer notifies the BFSS that it is choosing to waive its witness inspections. In the event that the required notification is not given and the activity has occurred in the absence of the Engineer, the Engineer may reject the processes completed to date and require the activity to be redone.

1. Delays resulting from failure to provide the required notification will be non-excusable. Expenses incurred by delays; repeat of the work process; or to correct unacceptable work shall be borne by the BFSS.

F. Out of Country Inspection and Witnessing

1. Equipment and items of supply that are subject to witness inspection by the District as identified in Article 1.4, "Witness Schedule" and other contractually required work and all places to be used for their production or testing, shall be available to District personnel. The District's decision that such equipment, items, or work cannot be safely inspected or observed, including a decision that the country, area, or facility in which production or testing is to occur may not be safe for District personnel shall be final and shall preclude the BFSS's utilization of such country,

area or facility. The District will consult the US Department of State website (<https://travel.state.gov/content/passports/en/alertswarnings.html>) for "Travel Advisories" to countries and regions to determine the safety of international travel. Areas with travel advisories shall not be considered for procurement of items that require District inspection.

G. Confidentiality or Non-Disclosure Agreements

1. Facilities that require execution of a Confidentiality or Nondisclosure Agreement (NDA) shall submit a copy of the agreement for review to the District through the submittal process for the project or purchase agreement prior to requesting District inspection. The NDA will be considered an agreement between the District (not individual inspectors) and the requesting company. The requirements of the California Public Records Act shall supersede the terms of any NDA and language to that effect will be included in the NDA by the District.

1.3 TRAVEL EXPENSES

- A. The BFSS shall include in the bid price all travel expenses for the Engineer to conduct the witness inspections noted if any of the inspections are to be performed at a locality exceeding 125 miles one way from Oakland, CA.
- B. Travel expenses include hotel lodging at an establishment rated three diamond or better by American Automobile Association (AAA), or comparable listing, and a minimum meal and incidental expenses allowance per day, or at the rate established by US General Services Administration (for domestic) or US Department of State (for international), whichever is greater, for the duration of the trip.
- C. If travel exceeds 200 miles one way from Oakland, CA, in addition to the expenses described in 1.3.B, travel expenses shall also include round trip direct route coach airfare from Oakland, CA; San Francisco, CA; Sacramento, CA; or San Jose, CA Airports to manufacturer's plant or testing facility, mid-sized car rental or taxi services, fuel, tolls, ground transportation to and from the airport, and airport parking at the departing airport; the following expenses shall apply as determined by the Engineer:
  1. For international or travel outside the continental United States, per diem rates are those established by the US Department of State for the specific location and dates of travel. Travel expenses may include the direct cost of securing passports, visas, language interpreters, document translators, communications, and internet access.
  2. If weekend stays are requested to defray transportation costs, reimbursement for the Engineers' stay over the weekend will include meal allowance, hotel expenses, phone and internet access charges, rental car or



transportation charges to and from eating establishments, laundry service, language interpreters, or other necessary business expenses or services.

3. Reimburse the District for any inspection that has to be repeated due to repair or rework of unacceptable work. Reimbursement shall include District Engineers' wages, or if done by a District agent, the agent's complete invoice for the needed inspection.
- D. All fees incurred such as airline reservation change fees, loss of fare due to purchase of nonrefundable tickets, hotel cancellation/rebooking fees, etc., due to BFSS-requested changes to the inspection schedule after the initial notification shall be borne by the BFSS.

#### 1.4 WITNESS SCHEDULE

- A. The District will witness the following processes as specified in the applicable specification sections listed below or as required elsewhere in the Contract Documents. For purposes of estimating, anticipate that one Engineer will cover only one shift of shop inspection work per plant site. The costs for additional inspection required by the operation of more than one work shift per day or by more than one shop inspection site per day shall be included in the bid costs.

Spec. Section	Section Title and Description
05 05 24	Shop and Field Welding
05 50 00	Metal Fabrications – All phases of metals fabrication, lining and coating.
09 96 56.05	High-Build Epoxy Coatings – Surface preparation, coating application and testing
09 96 56.10	Fusion-Bonded Epoxy Coatings – Surface preparation, coating application and testing
09 96 57	Mechanical and Electrical Coating Systems – Surface preparation and coating application
46 44 10	Ballasted Flocculation – Shop inspection for welding of stainless steel components and FAT of mechanical equipment

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

## SECTION 01 61 00

### COMMON PRODUCT REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. The Ballasted Flocculation System Supplier (BFSS) shall furnish all materials needed to complete the work and installations required under the terms of this contract, except those materials specified to be furnished by the District.
- B. The BFSS shall submit satisfactory evidence of compliance with the specifications of such materials to be furnished and used in the work as the Engineer may require. Materials incorporated in the work and not specifically covered in the specifications shall be the best of their kind. See Article 4.4 of the General Conditions.
- C. Similar products shall be by the same manufacturer unless otherwise specified.
- D. Provide identical products when products are required in quantity.
- E. Materials in Contact with Drinking Water
  - 1. All materials, equipment, or products that will be in contact with drinking water (potable water) shall be tested and certified as meeting the specifications of NSF/ANSI 61 Standard in accordance with California Code of Regulations, Title 22, Section 64591. Examples include, but are not limited to, valves, pumps, flow meters, protective materials (coatings, linings, liners), joining and sealing materials, pipes, tanks, pipe fittings, filters, cleaning chemicals and lubricants.
  - 2. All materials, equipment, or products that will be in contact with drinking water (potable water) or may contain lead shall be tested and certified as “lead-free” per California Health and Safety Code Section 116875.
- F. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures

##### 1.2 APPROVAL OF MATERIALS

- A. The BFSS shall furnish without additional cost to the District such quantities of construction materials as may be required by the Engineer for test purposes. The BFSS shall place at the Engineer's disposal all available facilities for and cooperate with the Engineer in the sampling and testing of all materials and workmanship. The BFSS shall prepay all shipping charges on samples. No samples are to be submitted with the bids unless otherwise specified.

- B. Each sample submitted shall be labeled. A letter, in duplicate, submitting each shipment of samples shall be mailed to the Engineer by the BFSS. Both the label on the sample and the letter of transmittal shall indicate the material represented, its place of origin, the names of the producer and the BFSS, the Specification number and title, and a reference to the applicable drawings and specification paragraphs.
- C. Materials or equipment of which samples are required shall not be used on the work until approval has been given by the Engineer in writing. Approval of any sample shall be only for the characteristics or for the uses named in such approval and no other. No approval of a sample shall be taken in itself to change or modify any contract requirement.
- D. Failure of any material to pass the specified tests will be sufficient cause for refusal to consider under this contract any further sample of the same brand or make of that material.

### 1.3 SPECIAL TOOLS, HARDWARE, AND SOFTWARE

- A. Furnish any special tools necessary for normal operation, and/or maintenance of all equipment, systems, and devices furnished under this contract.
- B. Furnish all hardware devices and software necessary for operation, maintenance, calibration, setup, adjustment, testing, programming/reprogramming, and any other activity associated with the equipment or systems furnished under this Contract. This includes all hardware devices necessary to interface with standard PCs. Furnish a minimum of one copy of all software and include all licenses and a minimum of 1 year software service agreement (where applicable).
- C. The BFSS shall make all subcontractors, suppliers, and manufacturers furnishing products under this contract aware of these requirements.
- D. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance and operations. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

### 1.4 HANDLING

- A. Deliver manufactured products in the manufacturers' original unbroken containers or packaging, with identifying labels intact and legible.
- B. Immediately on delivery, assure and document product compliance with requirements of Contract Documents and reviewed submittals, and verify that products are properly protected and undamaged.
- C. Handle products and packages in a manner to avoid soiling or damaging.

- D. Promptly remove damaged or defective products from the site and replace at no cost to the District.

## 1.5 INSPECTION

- A. One copy of each of the BFSS's purchase orders for materials forming a portion of the work shall be furnished to the Engineer, if requested. Each such purchase order shall contain a statement that the materials included in the order are subject to inspection by the Engineer. Materials purchased locally will be inspected at the point of manufacture or supply, and materials supplied from points outside the San Francisco Bay Area will be inspected upon arrival at the job, except when other inspection requirements are provided for specific materials in other sections of this Specification.

## 1.6 STORAGE

- A. Store manufactured products in accordance with the manufacturer's instructions, with seals and labels intact and legible.
  - 1. Store products subject to damage by the elements in weathertight enclosures.
  - 2. Maintain temperature and humidity within the ranges specified by the manufacturers.
- B. Exterior Storage
  - 1. Store fabricated products above the ground, on blocking or skids, to prevent soiling and staining.
  - 2. Cover products subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.
  - 3. Store loose granular material in a well-drained area on solid surfaces to prevent mixing with foreign matter.
- C. Arrange storage to facilitate inspection.
- D. Periodically inspect stored products to ensure that specified conditions are maintained, and the products are free from damage or deterioration.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

## SECTION 01 61 01

### ELECTRICAL REQUIREMENTS FOR MECHANICAL PACKAGE SYSTEMS

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

###### A. Work included:

1. Furnish the electrical control panels and instrumentation devices part of a packaged mechanical system. This Section shall govern these panels when supplied skid-mounted on the mechanical unit or when furnished separately for floor or wall mounting.
2. In general package equipment interconnecting conduit and wire are not shown on the drawings. Furnish and install all conduits and wiring associated with a packaged mechanical system for a fully functioning and operational system.
3. All mounting and ancillary equipment required as part of the mechanical packaged system necessary for a fully functioning and operational system.

###### B. Related sections:

1. The equipment covered under this Section shall be provided as part of packaged process, HVAC, and mechanical systems furnished under the detailed technical Sections of these Specifications and Division 33, Division 40, and Division 46.
2. Where conflicts occur between this Section and the specific product Technical Specifications as noted, the latter shall govern.

##### 1.2 QUALITY ASSURANCE

- ###### A.
- All materials shall be listed by UL or other equivalent nationally recognized independent testing laboratory. All built-up control panels shall be similarly labeled and have the markings required by the National Electric Code, Article 409.110.

##### 1.3 SUBMITTALS

- ###### A.
- Submit in accordance with Section 01 33 00 – Submittal Procedures.
- ###### B.
- Submit the following for all control panels provided as part of mechanical packaged system:
1. Control panel internal and external elevations showing all components provided.
  2. Complete Bill of Materials.

3. Control schematic (elementary) with functional comments describing all controls, alarms, and interlocks. Provide rung and wire numbering for schematics. All relay contacts shall be cross-referenced to the associated relay coils using the rung numbers and each coil shall be tagged clearly identifying its function in the control scheme.
  4. Wiring diagrams showing terminal numbers for all terminal strips and identifying all wiring points and devices located external to the control panel.
  5. Scaled drawings for all skid mounted panels showing location on the skid and all interconnecting conduit and wire fill. Drawing shall show conformance with all clearance requirements required per the National Electrical Code including requirements for final installation in the field.
  6. Letter of certification of testing. See Article 3.1.
- C. Software programming logic for any PLCs provided in the panels. PLC logic submittals shall be in conformance with the requirements of Division 40. Submit hardcopies of programming logic for submittal review. Logic shall include abundant comments in sufficient detail to determine compliance with the detailed control descriptions included in the individual technical specifications of these specifications.
  - D. Submit O&M Manuals in accordance with Section 01 33 00. Submittal shall include copies of the final field verified shop drawings. Submit hardcopies and electronic copies on CD-ROM and/or via the CMIS, of the final as-left PLC programs with the system O&M documentation.
  - E. Submit test data or calculations demonstrating compliance to the anchoring requirements per Sections 01 43 11 – Seismic Qualification and Certification, 01 81 02 – Seismic Design Criteria, and 33 12 01 – Basic Mechanical Materials and Methods.

## PART 2 - PRODUCTS

### 2.1 ELECTRICAL DEVICES FURNISHED WITH MECHANICAL EQUIPMENT

- A. The drawings detail only the major components, required for the first named mechanical system. Interconnecting conduit and wire is not shown. Provide all electrical, instrumentation, and control hardware, conduit and/or wiring which is required for complete system operation.
- B. The systems governed by this Section shall contain control panels which include instrumentation and control equipment furnished by the mechanical system supplier. In some instances, the panels, along with instruments, motors, and connecting wiring, are completely mounted on the units furnished. In other cases, the panels are furnished separately for floor or wall mounting. All panels and equipment requiring field interconnection wiring shall be provided with terminal connections which are clearly marked. BFSS shall furnish a complete field wiring diagram showing all required

interconnections of the supplied equipment, labeled consistently with the terminal markings.

- C. Provide panels rated for the NEMA environment shown on the electrical drawings. Provide stainless steel NEMA 4X enclosures in NEMA 4X areas unless indicated otherwise. Access doors or panels shall have continuous stainless steel hinges, oil resistant gasketing, and approved latching of fastening means to allow access. Front panels or sections containing instruments shall be reinforced to prevent warping or distortion.
- D. All panel equipment shall be factory-mounted, on suitable racks or subpanels and wired on or within the cabinet. Any process or sensor piping shall remain outside of the panel. Wiring shall comply with latest National Electrical Code. Wiring shall be grouped in plastic wireways and wired to sequentially arranged and uniquely numbered terminal blocks. Power and low voltage dc signal wiring shall be routed in separate wireways. Wiring troughs shall not be filled to more than 60 percent visible fill. Wiring trough covers shall be match marked to identify placement. If component identification is shown on covers for visibility, the ID shall also appear on the mounting subpanel. Wiring trough for supporting internal wiring shall be plastic type with snap-on covers. The side walls shall be open top type to permit wiring changing without disconnecting. Terminal blocks shall be arranged in vertical rows and separated into groups (power, ac control, dc signal, alarm, graphic, etc.). Provide minimum 30 percent spare of each type of terminal block. Direct interlock wiring between equipment will not be allowed. Only one side of a terminal block row shall be used for internal wiring. The field wiring side of the terminal shall not be within 6-inches of the side panel or adjacent terminal.
- E. A 120 VAC convenience outlet and a switched overhead internal LED light shall be provided for panel over 24" width and 36" height. Print storage pockets shall be provided on the inside of each panel. Print pockets shall be of sufficient size to hold all of the prints required to service the equipment.
- F. Nameplates shall be provided for all front of panel mounted equipment. The nameplates shall be approximately 1-inch by 3-inch constructed of black and white laminated, phenolic material having engraved letters approximately 1/4-inch high, extending through the white face into the black layer. Nameplates shall be attached to panels by self-tapping screws.
- G. Power wire size shall be as required but no less than 12 AWG. Wire type shall be THWN stranded, insulated and rated for 600 volts unless specified otherwise. Wire color shall be:
  - 1. Line power – black
  - 2. Neutral or common – white
  - 3. AC control – red
  - 4. DC control – blue

5. DC return – white with blue stripes
  6. Equipment or chassis ground – green
  7. Specified externally powered circuits – yellow
  8. Each wire shall be provided with a numbered heat shrink tubing identification markers at both ends. Identification markers shall be pretyped. Handwritten markers or paper markers will not be permitted. When externally powered circuits are present, provide 1-inch by 3-inch yellow and black laminated phenolic nameplates inscribed “CAUTION: FOREIGN VOLTAGES PRESENT”. Engraved letters shall be approximately ¼-inch high, extending through the yellow face into the black layer.
- H. Panels containing door mounted controls or instruments shall utilize individual covers, window kits, NEMA rated devices or other mechanism as approved by the Engineer to maintain the overall NEMA rating of the panel.
- I. Each panel shall be provided with an isolated copper grounding bus for all signal and shield ground connections. Shield grounding shall be in accordance with the instrumentation manufacturer's recommendations. Each panel shall be provided with a separate copper power grounding bus (safety) in accordance with the requirements of the National Electrical Code.
- J. Each panel, where applicable, shall be provided with analog signal isolation (I/I) where analog signals are sent from one panel or console to another. Each panel shall be provided with surge suppression protection (electrical transients) for connections between AC power systems and electrical and electronic equipment. Surge suppressor grounding shall be in accordance with the manufacturer's recommendations.
- K. All panels shall be protected from internal corrosion by the use of corrosion-inhibiting vapor capsules as manufactured by Northern Instruments Model Zerust VC; Hoffman Engineering Model A-HCI; or equal as approved by the Engineer.
- L. All panels housing electrical equipment shall be designed for front access only unless otherwise noted.
- M. Conductors extending beyond a panel to other auxiliary equipment which is prewired on a skid type or package base shall be protected by galvanized rigid steel conduit. Where terminating at a motor or other similar device requiring frequent movement or which produces excessive vibration liquid-tight type flexible conduit shall be used. Liquid-tight flexible conduit will be limited to three feet maximum length at any termination.
- N. Gasketed type conduit hubs will be used for all conduit penetrations of the panel.
- O. If a programmable logic controller is used to implement the specific controls, provide Allen-Bradley CompactLogix or Contrologix family of processors, no substitutions, to match existing District equipment. PLCs shall conform to the requirements of Section 40 94 43.



- P. Provide a single main power disconnect for each panel. The main panel power disconnect handle shall be externally mounted (operable with the enclosure door closed) and padlockable in the off position. Disconnect shall be interlocked with the door to ensure panel is de-energized when the door is open. Provide a disconnect defeat mechanism to allow access to the panel interior components while energized by authorized personnel for maintenance and troubleshooting. A main panel power disconnect device shall be an integral part of the panel and shall be one of the following types:
1. A molded case thermal magnetic circuit breaker for 480 volt, 1 phase or 3 phase panels.
  2. A circuit breaker or fractional horsepower manual motor starter switch without overloads for 120-volt, 1-phase panels.
- Q. Unless otherwise noted all panels supplied with a 480-volt power feeder shall be provided with an integrally mounted dual winding 120-volt power or control power transformers with KVA as required. Control power transformers shall have primary and secondary fusing. Power transformers shall have circuit breaker primary and secondary protection. All transformers shall have the neutral grounded.
- R. Starters incorporated into panels shall be of the combination motor circuit protector type with ambient compensated thermal type overload relays in each ungrounded conductor. Overloads shall be adjustable for either manual or automatic reset. Provide Size 1 NEMA starter size minimum.
- S. All devices shall be of a heavy-duty industrial-type quality. Devices mounted in panel interiors shall be suitable for use in non-ventilated panels subjected to a 40 degree C ambient without de-rating the system.
- T. Schematic (elementary) diagrams, wiring (interconnection) diagrams, riser (interconnection with external components) diagrams, panel interior and exterior elevation drawings and equipment lists shall be furnished for all panels. For panels containing a complex control scheme, a written operational theory shall be cross referenced to the schematic diagram. The wiring diagram in its "as-built" form shall be fastened to the panel door. The Bill of Materials shall identify the manufacturer, manufacturer's part or model number and a cross reference as to its location in the panel.
- U. Contacts for external alarms or equipment interlocking shall be of the isolated contact type and provided as required per individual equipment specifications and drawings. Contacts shall be rated at 10 amps continuous pilot duty. Unless noted otherwise, alarm contacts shall be of the maintained contact type requiring manual reset at the control panel via a suitably labeled reset pushbutton. Configure all alarm contacts for external connection to the PLC to be fail-safe (i.e. on loss of continuity or loss of power.) Alarm contact should fail to the alarm or the inoperative condition unless otherwise indicated

- V. All analog instrumentation signals shall be 4-20 ma DC and provided as required per the specifications and the drawings.
- W. Auxiliary devices (solenoid valves, pressure switches, flow switches, etc.) located remotely from panels but furnished with the equipment shall have enclosures in conformance with the area classification noted on the Electrical Drawings. Provide fuse protection for all circuits to external devices.
- X. Unless otherwise noted control panels furnished under this section shall contain door mounted control pushbuttons, selector switches, push-to-test red-run-lights, etc., as required for proper system operation, control, and monitoring. This equipment shall be mounted on the door of the control panel and comply with the panel NEMA rating.
- Y. The electrical short circuit interrupting rating of the starters and circuit breakers supplied shall be adequate for its location in the system and shall be rated minimum of 65,000 AIC.
- Z. Panels containing 480 V (power) and low voltage (less than 120 VAC or DC) digital or 4-20 ma DC analog control devices and circuits or PLC components shall be compartmentalized with full height plexiglass isolation barriers between the low voltage and 480-volt power devices within the panel.

## PART 3 - EXECUTION

### 3.1 FACTORY QUALITY CONTROL

- A. Control panels furnished on skids or separately mounted shall be UL 508 certified and tested at the factory with the mechanical equipment prior to being shipped. A letter of certification stating that the packaged system and controls have been satisfactorily tested shall be submitted to the Engineer prior to shipping the package.
- B. NOT USED

### 3.2 FIELD QUALITY CONTROL

- A. BFSS' representative shall be present during startup and testing per the requirements of the technical specifications. Installed systems shall be inspected prior to startup and testing per Section 01 75 17.

END OF SECTION

## SECTION 01 75 17

### FIELD TESTING AND STARTUP

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes: Perform Commissioning and startup of installed equipment and systems, as well as other manufacturer services. The Ballasted Flocculation System Supplier (BFSS) shall be responsible for providing services and participating in activities specified herein and coordinating with the District/Engineer, General Contractor (Assignee) and other manufacturers working under the Assignee for the Project.
- B. All Commissioning shall comply with the requirements of this section. Additional field testing requirements are specified in other sections.
- C. For factory acceptance testing and other testing requirements, see technical sections.
- D. District Furnished Services: The District will furnish non-potable water required for testing unless otherwise specified.
- E. This document only pertains to services and materials provided by the BFSS.

##### 1.2 DEFINITIONS

- A. Commissioning (Cx): In general, commissioning is the process of verifying that equipment, a system or a subsystem meets specified contract requirements prior to handover to the District at the Ready for Service (RFS) milestone. This process involves pre-commissioning activities, field functional and performance equipment testing, and systems startup testing. The Commissioning process ends following successful completion of an Operational Startup Test.
- B. Factory Acceptance Testing (FAT): Quality control testing conducted at the Manufacturer's facility to demonstrate components, devices, equipment/systems, and software meets specified performance requirements prior to shipment. Also referred to as source testing
- C. Control Systems Functional Test (CSFT): testing to demonstrate the proper interaction of the facility control systems and related equipment. This primarily includes the electrical power control and monitoring system and pumping plant PLC- and SCADA RTU-based instrumentation and process control system, as well as all related equipment. Unlike other field tests, the District conducts this testing with the Assignee's and BFSS' assistance. The BFSS shall support District staff during Control System Functional Testing.
- D. Functional Test: The field testing required to determine if installed equipment or system will operate in a satisfactory manner and as specified. The Functional Test is a

point-by-point test to confirm that all components associated with the equipment or system is operating properly. Functional testing is not intended to measure efficiency and performance.

- E. Manufacturer's Certificate of Proper Installation: The form is submitted to the Engineer prior to Functional Testing to confirm that the equipment/system is installed in conformance with the Contract Documents. The form is provided in Appendix A.
- F. Operational Startup Test: A test of all systems operating together to demonstrate satisfactory performance of the facility as a whole for a continuous period. Unlike other field tests, the District Operations staff conducts this testing with the BFSS' assistance.
- G. Performance Test: The field testing required to demonstrate the individual equipment or system meets all of the specified performance requirements.
- H. Startup: The process of performing startup testing of the facility.
- I. Test Procedures: Test procedures shall include testing methods, acceptance criteria, procedures, and test data forms for functional and performance tests.

### 1.3 NOT USED

### 1.4 QUALITY ASSURANCE

- A. All tests shall be subject to approval of the Engineer, and shall be witnessed by the District. No testing shall be scheduled by the Assignee or BFSS without Engineer-approved test submittals. Provide a minimum of 5 work days' notice in Kahua confirming testing dates to the Engineer to enable witnessing of the testing.

### 1.5 SUBMITTALS

- A. The Assignee shall submit the following within 90 days of Project NTP
  - 1. Comprehensive Testing Schedule
- B. Submit the following at least 60 calendar days prior to factory and field testing:
  - 1. Factory Acceptance Test procedures for all witnessed and unwitnessed tests
  - 2. Functional, Performance, and System test procedures and test forms for all field tests.
  - 3. BFSS' representative's resumé demonstrating their qualifications and ability to perform the specified services
  - 4. Comprehensive training plans with manufacturer's training instructor resume 40 days prior to first training session

5. Prior to field testing, submit current NIST traceable Calibration certificates for all instruments to be used during testing.

C. Test Reports:

1. Test Reports shall be submitted for complete systems; which is typically by specification section. Submitting partial test reports is not acceptable. Test submittals shall include the Specification Section number and Equipment Name in the title. Test report cover page shall include description and asset numbers of equipment tested.
2. Upon completion of testing for each equipment item or system, the BFSS shall submit word processed test reports and forms for review and acceptance within 10 calendar days of completed testing. Submit test results with signed statement by BFSS' representative that results meet specification requirements and manufacturer standards; when a BFSS' representative is not required to be present during testing, this signed statement shall be provided by the Assignee. Upon acceptance, all test reports (including all factory and field testing) shall be inserted by the BFSS into their respective O&M manuals.

## 1.6 BFSS' SERVICES

- A. BFSS' authorized representative shall perform all services when manufacturer's services are specified in the technical sections. The authorized representative shall be factory trained and experienced in the technical applications, installation, operation, and maintenance of the equipment, subsystem, or system. Additional qualifications may be specified elsewhere.
- B. BFSS' representatives shall be subject to acceptance by the Engineer. No substitute representatives will be allowed without prior written approval by the Engineer.
- C. BFSS' on-site services as specified in the Contract Documents include the following:
  1. Assistance during Inspection, Commissioning and Process Start-up. BFSS representatives shall be regularly engaged and experienced in all aspects of commissioning and process start-up, equipment/systems of similar size, type, and capacity as this project.
  2. Provide daily copies of representatives field notes and data to the Engineer.
  3. Provide technical instruction for commissioning and process start-up.
  4. Carefully review the additional testing requirements in the Contract Documents and coordinate with requirements specified in this Section.

## 1.7 NOT USED

## 1.8 TEST PROCEDURES

- A. The BFSS' representative shall compose test procedures and forms for each required Factory test, field Functional and Performance test for all equipment as specified in the individual equipment specifications. Test procedures shall not be submitted as part of the technical equipment submittal.
- B. Unless otherwise noted, submit individual Field Test Procedures and Field Functional Test Data forms by specification section. Grouping test procedures for multiple specification sections into a single submittal is not acceptable. If functional tests are submitted together with performance tests, then separate each procedure and clearly identify each test by name: Functional Test, or Performance Test.
- C. Coordinate with the Engineer to determine the operating requirements of adjacent or related systems that may be required to complete any Functional, Performance, CSFT or Operational Startup Test.
- D. Prior to submitting for Engineer review, the BFSS shall review all test procedures to verify completeness and compliance with the specifications.
- E. All test procedures shall be comprehensive, neatly organized, and word-processed. Test procedures shall include the following:
  - 1. Approach to testing including test objective, procedures, schedule, and details of support to be required from the District.
  - 2. Detailed test methods including sample calculations as required.
  - 3. Test setup procedures including details of all necessary adjustments, balancing, required equipment isolations or configurations, testing equipment, and testing instruments.
  - 4. Step-by-step testing procedures (number each step). Specifically identify each test instrument (including tag numbers) used during testing.
  - 5. Acceptance Criteria: For each test phase, specifically indicate what is considered an acceptable test result.
  - 6. Test Data Forms: Include test name, equipment (with tag numbers as applicable) or system name, specification section and paragraph number, test instrument tag numbers, test date, space for testing personnel names, test data names and units, reference equations for all calculated values, and signature lines for BFSS' representative, Assignee, and District witness.
  - 7. Field Functional Test Data Form: A template for a field functional test data form is included in Appendix A. The BFSS may use this template as a starting point when developing specific field functional test data forms, or the BFSS may

develop their own data form provided that the data forms include all required information as specified in the template. A Microsoft Word electronic version of the field functional test data form template will be made available upon request.

8. Test Procedures: Testing procedures and BFSS representative's resumé's shall be approved by the Engineer prior to performing any tests.

#### 1.9 FACTORY ACCEPTANCE TESTS (FAT)

- A. Prior to Field Functional Testing and shipment of equipment, test components, devices, and equipment/system for proper performance at point of manufacture or assembly as required in technical specifications.
- B. FAT requirements are specified in technical sections and include:
  1. Un-witnessed: District's representatives not present during testing
  2. Witnessed: District's representatives present during testing
- C. District-witnessed factory testing or shop inspection notification shall meet notification requirements per Section 01 45 27, Article 1.2. and shall not be scheduled prior to the approval of the factory test procedures.
- D. If not specified otherwise in the technical specification section, any process, control or electrical equipment FAT test procedure submittal shall include:
  1. Purpose and goals of the test
  2. Identification of each item of equipment/system, including system designation, location, tag number, control loop identifier, etc.
  3. Description of the pass/fail criteria that will be used
  4. Listing of pertinent reference documents (Contract Documents and industry standards or specifications applicable to the testing)
  5. Complete description, including drawings or photographs, of test stands and/or test apparatus
  6. Calibration records for the test equipment
  7. Detailed, step-by-step test procedures:
    - a. The level of detail shall be sufficient for any witness with a rudimentary technical aptitude to be able to follow the steps and develop confidence that the tests were being performed as planned.

8. Sample data logs and data recording forms. Sample computations or analyses with the results in the same format as the final report to demonstrate how data collected will be used to generate final results.
  9. Detailed outline of the FAT report
- E. Prepare and submit test reports for all witnessed and un-witnessed FATs for approval by the Engineer prior to shipment of equipment to job site. Include a record punchlist item identified during witnessed FAT and sign-off that each items was addressed prior to shipment.

#### 1.10 INSTALLATION COMPLETION

- A. Installation completion refers to the stage in the pre-commissioning process when:
1. The quality control inspections were performed,
  2. All of the equipment and (sub) systems including mechanical and piping systems, electrical, instrumentation, and control systems have been installed and are ready for testing, and
  3. The Contract Documents required for commissioning have been submitted and approved.
- B. Following Installation Completion and prior to starting Functional Testing, the BFSS representative shall ensure that copies or the below listed approved documents are provided to the Engineer and are present at the job site.
1. Interconnection diagrams (when required)
  2. Control and Protection Settings
  3. HMI configuration files and PLC logic files
  4. Approved preliminary Asset List
  5. As-builts
  6. Manufacturer's Certificate of Proper Installation
  7. District approved equipment or system technical submittal
  8. Approved draft O&M Manuals with all factory test results and certificates excluding field functional testing and as-builts
  9. All FAT test reports if required per technical specifications.
  10. NIST traceable calibration certificates (for all instruments used during testing)
  11. Engineer-approved Field Functional Test Procedures and Test Data Forms



## 1.11 FUNCTIONAL TESTS

- A. Functional Testing shall be performed by Assignee with technical support from the BFSS.
- B. Testing Notification and Qualification:
  - 1. All tests shall be subject to approval of the Engineer, and shall be witnessed by the Engineer. No testing shall be scheduled by the Assignee
  - 2. without Engineer-approved test submittals.
  - 3. BFSS shall utilize only full-time technicians or engineers who are regularly employed by the firm. Where applicable to power and powered equipment, only electrically-qualified employees are permitted to perform testing or assistance of any kind.
- C. Functional tests include:
  - 1. Mechanical, Electrical, Communications, and Equipment Control Tests
  - 2. Installation Inspection: Check for proper rotation, adjustment, alignment, mechanical and electrical connections, wire labeling, proper lubrication, and any other conditions which may damage or impair functioning.
  - 3. Operation Check: Check for the proper operation of all system components.
  - 4. Controls Check: Demonstrate proper function of all local and remote controls, instrumentation, and other equipment functions.
  - 5. Alarms Check: Simulate alarm conditions and verify the proper operation of each alarm at the specified set point. Simulations shall be by means of direct element stimulation whenever possible, or by other means when direct element stimulation is not practical as determined by the Engineer.
  - 6. Run Check: Each system or equipment item shall be operated continuously for 1 hour, minimum, to verify satisfactory operation. Additional operating time may be required as specified in the individual technical specifications, or as recommended by the BFSS.
  - 7. The individual technical specifications or the BFSS may specify additional functional test requirements for each component or system.
  - 8. If any part of a unit shows evidence of unsatisfactory or improper operation during the one-hour test period, or the test period specified by equipment technical specifications, correction or repairs shall be made, and the full test operation, as specified herein, shall be repeated after all parts operate satisfactorily.

## 1.12 PERFORMANCE TESTS

- A. Performance tests shall not proceed until the Functional Test has been successfully completed.
- B. Copies of all prior test results (factory, and field functional tests) shall be available on-site, prior to proceeding with performance tests.
- C. Performance tests shall demonstrate that the equipment or system meets all specified performance requirements; see technical specification sections.

## 1.13 CONTROL SYSTEMS FUNCTIONAL TESTS

- A. Control Systems Functional Testing (CSFT) demonstrates the proper interaction of the facility control systems and related equipment including but not limited to all loops and programming as indicated in Section 40 80 00. CSFT also demonstrates control modes as local manual/automatic, remote manual/automatic from all interface locations (local and remote).
- B. CSFTs will be completed by District staff with the primary assistance of a BFSS-qualified representative.
- C. The District will not begin control systems functional testing until the Assignee and BFSS have satisfied all prerequisites below:
  - 1. Completed requirement for “Ready for Integration Programming”
  - 2. All field functional and performance testing has been completed.
  - 3. Copies of all District approved test reports (factory, field functional, and performance tests), redline drawings and preliminary O&M manuals shall be available on-site.
  - 4. All special tools and equipment related to instruments, controllers, and control systems furnished under this contract, including but not limited to HART communicators, shall be provided prior to the start of CSFT.
  - 5. All District training has been satisfactorily provided as described in Section 01 79 00.
- D. The BFSS control systems representative, Assignee, and other manufacturer’s representatives shall assist District staff in resolving potential conflicts between the control systems and other equipment or systems installed under the contract. The BFSS representative shall be on-site during CSFTs and shall be dedicated only to those activities identified by the Engineer.

## 1.14 OPERATIONAL STARTUP TEST

- A. The operational startup test shall not proceed until all of the following have been completed:
  - 1. The District has successfully completed all control systems functional testing work specified in this Section during the designated period allotted for the work after “Ready for Integration Programming”.
  - 2. All other required tests have been completed and accepted by the Engineer. At the Engineer’s discretion, selected performance tests may be conducted during the Startup Test period.
  - 3. Copies of all prior tests (factory, field functional, and performance tests) shall be available on-site.
- B. Operational Startup tests shall be scheduled no sooner than 7 calendar days after the projected completion of Functional Testing on all related systems and after completion of CFSTs. All equipment/systems required by these specifications shall be included in the Startup Test.
- C. The BFSS shall coordinate with the Assignee and District staff to startup the facility equipment and systems. The District will conduct a seven (7) day Operational Startup test with support of the Assignee, subcontractors and BFSS Representatives as required by the Engineer to demonstrate to the Engineer’s satisfaction that all equipment and systems required by these specifications operate together as intended
- D. The BFSS shall provide qualified personnel to support startup and testing, and appropriate construction trade personnel to correct malfunctions and deficiencies at any time during the Startup Test. Only District personnel shall operate the equipment and systems.
- E. The District will provide BFSS-trained operating personnel for the duration of the Startup Test. The District’s operating personnel shall be monitored by the BFSS’ representative and/or the Assignee to ensure each system is being operated as intended.
- F. The District will determine facility operating parameters such as plant flow rates, chemical dosages, and which systems or equipment will be operated at any given time. All systems and equipment will be operated within their normal operating ranges.
- G. All defects in operation, materials, or workmanship that appear during the Startup Test shall be immediately corrected by the BFSS and Assignee. In case of a system interruption, the BFSS shall repeat the Operational Startup Test of the affected systems and any other system directly related to the operation of the affected system. The Startup Test shall not be accepted as complete until all systems have successfully operated together to the satisfaction of the Engineer for a continuous seven (7) day period. All costs for corrective work and retesting shall be borne by the BFSS.

H. System interruptions include the following:

1. Malfunction or deficiency that results in a shut down or partial shutdown of any system
2. Malfunction or deficiency in any backup system that cannot be corrected by the Assignee and/or BFSS within 4 hours after notification of the problem
3. Malfunction or deficiency that results in system or equipment performance that is less than specified

I. The BFSS shall maintain the qualified staff or vendor representatives (either onsite or on-call) to be able to respond immediately (24-hours per day) to system or equipment related questions and to correct deficiencies. The BFSS shall provide a list of qualified staff or vendor representatives to perform troubleshooting services during the Operational Startup period. On call staff shall report to the site within 2 hours of being informed of a deficiency.

J. The Engineer will maintain a log of equipment or system deficiencies along with the date and time when the BFSS was notified of the deficiency and the date and time when the BFSS notifies the Engineer that the deficiency has been corrected. All corrected deficiencies must be inspected and approved by the Engineer.

K. The BFSS shall maintain a log of equipment or system deficiencies along with a description of the required repairs necessary to correct the problem. The BFSS shall furnish up-to-date copies of this log to the Engineer upon request.

L. If the Operational Startup Test is interrupted through no fault of the BFSS, the test may resume at the earliest mutually agreeable time at no additional cost to the District.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. The BFSS shall support the Assignee to perform all functional and performance testing of installed equipment unless otherwise specified. The Assignee shall be present during all testing, even if the specific functional or performance test is performed by a BFSS representative.

B. The BFSS shall complete all testing in accordance with the District approved test procedures.

C. The BFSS, at a minimum, shall maintain and provide to the Engineer, the following records:

1. Daily logs indicating all equipment testing and startup activities and activities of all manufacturers' representatives

2. Records of all tests, calibrations, inspections, adjustments, services and corrective actions taken
  3. Copies of all test data collected at the end of each day of testing
- D. In addition to the tests specified in the individual technical specifications, the BFSS shall perform additional tests as required by the Engineer to demonstrate to the Engineer's satisfaction that all equipment and systems required by the specifications will operate as intended.
  - E. If the testing of any equipment may affect the operation of existing District facilities, the testing shall be done under direct supervision of the Engineer. The BFSS shall comply with directions given by the Engineer.
  - F. Table 1 is a summary of equipment/systems that require functional, and performance tests. Additional testing may be required when specified elsewhere.

Table 1: Testing Summary			
(Additional tests may be required in other specification sections.)			
Specification Section	System / Equipment Name	Functional Test Required	Performance Test Required
33 12 16.05	Miscellaneous Valves	X	
40 20 20	Mechanical Piping	X	
46 41 34.01	Vertical Shaft Flocculator Units	X	X
46 44 10	Ballasted Flocculation System	X	X
All equipment/systems required by these specifications shall be included in the Startup Test.			

### 3.2 CONTROL SYSTEMS FUNCTIONAL TESTS

- A. All systems designed for control through DCS, PLC, or SCADA will require testing. The BFSS' qualified representative shall be on-site and available to assist the Engineer with CFST. If the Engineer identifies deficiencies in workmanship, installation, materials, products, or anything else associated with the BFSS work that delays the progress of the CSFT, then the Engineer may require additional time to complete the testing to compensate for actual time lost due to troubleshooting and correcting the deficiencies as well as additional time to compensate for testing inefficiencies.

### 3.3 FIELD TESTING COORDINATION MEETINGS

- A. The BFSS shall prepare materials for and attend periodic testing coordination meetings. During periods when field testing occurs regularly, the Engineer will schedule weekly or biweekly field testing coordination meetings. The BFSS' Testing Coordinator shall attend all meetings, and the BFSS shall provide suitable representation so that informed decisions can be made during the meetings.

END OF SECTION

## SECTION 01 79 00

### DEMONSTRATION AND TRAINING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Work includes:

1. Perform training of District personnel for furnished or installed equipment, systems and facilities operation. Develop training program including scheduling, and coordination of training activities and training materials. Specific training procedures and requirements found in the technical sections shall also apply.

- ###### B. Ballasted Flocculation System Supplier (BFSS) shall plan, coordinate, submit deliverables, and execute the training and demonstration requirements for District personnel responsible for operating and maintaining or overseeing the operation and maintenance of furnished, upgraded, or installed equipment, systems, and facilities.

- ###### C. BFSS shall designate a Training Coordinator to serve as the primary contact for the District throughout the duration of the contract unless otherwise requested by the Engineer or agreed upon in writing by the Engineer and the BFSS.

- ###### D. The training for each installed equipment, system, or facility shall consist of a minimum of two identical training sessions. BFSS shall be available to meet with the Engineer and/or assigned representative to coordinate and align technical training planning efforts.

###### E. Related Sections:

1. Section 01 31 23.10 – Construction Management Information System
2. Section 01 75 17 – Field Testing and Startup

##### 1.2 SUBMITTALS

- ###### A. BFSS shall submit the following items for review and approval via the Construction Management Information System (CMIS) – see Section 01 31 23.10.

1. The name and contact information of the BFSS' Training Coordinator.
2. Training Agenda: A training agenda shall be tailored to the project and the Section that it addresses and submitted 60 days before the training is scheduled. It shall include a 1) detailed descriptive course overview, 2) course objectives, 3) course outline, and 4) estimated timing of each topic.
  - a. The submittal and agenda topics shall cite the applicable section and paragraph of the Contract Documents that it fulfills and identify what

participants are expected to 1) learn and 2) be able to demonstrate post-training.

- b. The agenda shall include separate sections that detail topics and learning objectives for 1) classroom instruction and 2) field demonstration.
  - c. Organize training agenda so that O&M Manual topics, Operations topics, and Maintenance topics are separate sections.
  - d. Submit separate agenda for each equipment, system, and facility that requires training.
3. Training Schedule: The proposed training schedule shall include the dates and times for all training sessions. Coordinator shall propose the timing of training in consideration of project milestones and finalize and confirm the number of training sessions and attendees per training session with the Engineer.
  4. Course Materials: Electronic copies of course presentations, manual, and all other related course materials including any pre-training instructions, if applicable. Electronic copies must be submitted in a searchable PDF format (i.e., may not be scanned copies or images).
  5. Resume: The resume or biography of the proposed technical trainer(s) that demonstrates their qualifications and ability to perform the specified training services.

### 1.3 PLAN

- A. Prior to delivery of training, equipment and systems for which training is specified shall successfully pass Functional Testing and all related submittals, including the O&M Manuals shall have been submitted and approved by the Engineer.

BFSS shall meet with the Engineer to review training requirements, plans, schedules, and other details as determined by the BFSS or Engineer. The training meeting shall occur prior to commencement of Functional Testing. Training shall be completed prior to Startup Testing and “Ready for Service” handoffs.

Unless otherwise stated, the meeting shall be held at the District Administration Building (375 11<sup>th</sup> Street, Oakland), or at other location as determined by the Engineer. Subsequent meetings may be required until all issues are adequately addressed.

Approved training representatives of the manufacturer(s) shall be present at the training meeting; however, if unable to attend, the BFSS shall make an effort to include them via teleconference. The BFSS shall submit Operations & Maintenance (O&M) Manuals for Engineer review and approval prior to the meeting for all equipment and systems for which technical training is specified. The final approved O&M Manuals shall be provided to the Engineer (in print and electronic format) prior to the meeting.



B. Training shall include a thorough review of the final approved O&M manual, project maps, drawings, and diagrams (e.g. single-line). Topics shall specifically address the maintenance and operation of applicable equipment/systems/facilities.

1. Review of O&M manual contents including:
  - a. Procedures for contacting the manufacturer's representative for equipment field service
  - b. Procedures for ordering parts
  - c. Discussion of equipment warranty
2. Maintenance of applicable equipment/system/facility including:
  - a. Learning objectives
  - b. Routine and preventive maintenance procedures
  - c. Adjustment procedures
  - d. Overhaul procedures
  - e. Identify lubrication and adjustment locations
  - f. Maintenance access locations
  - g. Maintenance safety precautions
  - h. Troubleshooting guide
  - i. Field test procedures
3. Operations of applicable equipment/system/facility including:
  - a. Learning objectives
  - b. Principles of operation
  - c. Discussion of all design features
  - d. Startup, shutdown, and emergency operating procedures
  - e. Operational safety precautions

#### 1.4 TRAINING COORDINATOR

A. The BFSS Training Coordinator shall coordinate with equipment vendors to prepare and submit a training agenda and a schedule to the Engineer. See Submittals for document requirements.

- B. The BFSS Training Coordinator shall coordinate with the Engineer and vendors to organize and plan training sessions in advance. Responsibilities include, but are not limited to:
1. Contribute to planning and coordinating the logistics and supervision of each training session.
    - a. Unless otherwise specified, minimum class duration of 4 hours (exclusive of travel time). Typical class size is 12 attendees but may vary. Each training event required in the Contract Documents, regardless of duration, requires delivery of two separate sessions with the second instance being a repeat of the first instance.
    - b. More than one training session shall not be scheduled on the same day without prior approval from the Engineer. Training sessions lasting less than 8 hours shall be completed within the same day.
    - c. Training sessions shall not be scheduled concurrently unless approved by the Engineer.
    - d. Training shall be conducted during normal District work hours and scheduled on Tuesday through Thursday, unless approved by the Engineer.
    - e. Technical training shall take place at District facilities in the San Francisco Bay area, Upcountry, or other locations as determined by the Engineer unless otherwise specified.
    - f. BFSS Training Coordinator shall provide equipment or accessories needed to deliver training including laptop computer, cables, power cord, overhead projector, screen, white board, flip chart, etc. BFSS Training Coordinator shall notify Engineer in advance of any District-supplied equipment requirements.
  2. Coordinate and schedule manufacturer visits for training.
    - a. Coordinator shall familiarize training representatives with the installation site prior to training.
  3. Ensure that copies of training agenda, manuals, and handouts are printed and available for all training attendees.
  4. Advise the Engineer in writing and at least 10 working days in advance of the need to coordinate equipment outages to support training or demonstration of equipment and systems.

PART 2 - NOT USED

PART 3 - EXECUTION

### 3.1 DESCRIPTION

- A. Table 1 summarizes the equipment, systems, or facilities for which training is required. Table 1 may not be all-inclusive. BFSS shall fulfill all training indicated in the Contract Documents whether or not it is listed in Table 1.
- B. Training, as specified in Table 1 of this section or referenced in the other sections of the contract documents, shall include both classroom instruction and hands-on field demonstrations. With Engineer approval, classroom instruction may be conducted in the field.
- C. The Coordinator shall ensure that all equipment and materials required to properly train and demonstrate operational and maintenance procedures as specified in the corresponding section and paragraph are provided.
- D. The Training Coordinator shall ensure that the training room is returned to original condition after each training session is finished.
- E. Training Acceptance: Training shall meet the criteria listed below. Training not meeting the criteria shall be corrected and re-delivered at the BFSS's expense inclusive of District labor costs.
  - 1. All information necessary to properly operate and maintain the system or equipment shall be presented and demonstrated.
  - 2. Training delivered shall be consistent with the submitted and approved training lesson plan.
  - 3. The trainer's expertise shall be sufficient to accurately respond to District questions related to system or equipment operation, maintenance, or principles of operation.
  - 4. The trainer shall demonstrate strong presentation skills and English language proficiency.
  - 5. Training shall be efficient and without unrelated or irrelevant discussion. Breaks during training sessions shall be limited to 10 minutes per two hours of instruction, or one 15-minute break per four hours of instruction.
  - 6. Training Evaluation: Attendees will evaluate the training at the end of each session. The evaluations are one means the District uses to determine if the training adequately instructed District personnel on the proper operation and maintenance of the systems and equipment provided. A typical training evaluation form is included in Appendix A.
- F. Table 1 is a summary of equipment/systems that require training. Additional training might be required when specified elsewhere.

<p style="text-align: center;"><b>Table 1: Training Summary</b>            (Additional Training may be required in other Sections)</p>	
Specification Section & Paragraph	System / Equipment, or Facility
46 44 10	Ballasted Flocculation System
46 44 10 Paragraph 2.6	Vertical Shaft Flocculator Units and Mixers
46 44 10 Paragraph 2.7	Microsand Pumps

END OF SECTION

## SECTION 01 81 02

### SEISMIC DESIGN CRITERIA

#### PART 1 - GENERAL

##### 1.1 REFERENCES:

- A. ASCE 7, American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures.

##### 1.2 RELATED SECTIONS:

- A. Insurance Requirements
- B. Section 01 33 00 – Submittal Procedures
- C. Section 01 42 19 – Reference Standards
- D. Section 01 43 11 – Seismic Qualification and Certification
- E. Section 05 05 19 – Mechanical Anchoring to Concrete and Masonry

##### 1.3 SYSTEM DESCRIPTION

###### A. Design Requirements:

1. Architectural elements, mechanical and electrical components, equipment housings and their attachments, supporting structures, and anchorages shall comply with the requirements of ASCE 7, using the following values:
  - a. Design spectral acceleration at short periods,  $S_{DS} = 1.109g$
  - b. Design spectral acceleration at 1-second periods,  $S_{D1} = 0.800g$
  - c. Risk Category: IV
  - d. Seismic Design Category, D
  - e. Component importance Factor,  $I_p = 1.50$
  - f. Seismic Importance Factor,  $I_e = 1.5$
  - g. Component amplification factor,  $a_p$ : In accordance with ASCE 7, Tables 13.5-1 and 13.6-1.
  - h. Component response modification factor,  $R_p$ : In accordance with ASCE 7, Tables 13.5-1 and 13.6-1.

- i. Overstrength Factor,  $\Omega$ : In accordance with ASCE 7, Tables 13.5-1 and 13.6-1 for anchorage in concrete.
2. Do not use friction to resist sliding due to seismic forces.
3. Do not use more than 60 percent of the weight of the mechanical and electrical equipment for designing anchors for resisting overturning due to seismic forces.
4. When designing anchors for uplift due to seismic forces, include the vertical seismic load effects ( $\pm 0.2SDSW_p$ ) and reduced dead loads as required by the Basic Load Combinations of ASCE 7-160. For example: use only 60 percent of the equipment or tank dead load for resisting overturning.
5. Resist seismic forces through direct bearing on anchors and fasteners. Do not design or provide connections that use friction to resist seismic loads.
6. Anchoring and fastening to concrete and masonry.
  - A. Use cast-in anchors (anchor bolts or welded studs) whenever possible for anchors at connections that resist seismic forces.
  - B. Do not use concrete anchors, flush shells, sleeve anchors, screw anchors, powder actuated fasteners, or other types of post-installed anchors unless indicated on the Drawings or accepted in writing by the Engineer.

#### 1.4 SEISMIC QUALIFICATION AND CERTIFICATION

- A. The equipment and all components listed in this specification shall not undergo loss of their intended function after application of the Code prescribed seismic forces as specified in Section 01 43 11.
- B. Certification that the equipment is seismically qualified for the above requirements shall be submitted as prescribed in Section 13.2 of ASCE 7.

#### 1.5 SUBMITTALS

- A. Shop drawings and calculations: Complete shop drawings and seismic calculations in accordance with Section 01 33 00 – Submittal Procedures.
- B. When evaluating the strength of a structural element, indicate applied stresses compared to strength, or show Demand/Capacity ratios.
- C. Evaluating the results by stating “Okay by Inspection” is not acceptable.
- D. Calculations and details shall be prepared, stamped and signed by a Civil or Structural Engineer registered in the State of California with a minimum of three (3) years of experience in water or wastewater projects.

- E. If the Ballasted Flocculation System Supplier (BFSS) has not provided a complete and acceptable submittal by the second submission, the District, at its discretion, may provide the required seismic design services at the BFSS' expense. The cost of providing the required seismic design services shall be deducted from the BFSS' monthly progress payments.
- F. Reference Drawings: include plans, sections, details and equipment information necessary to understand the seismic calculations. Reference plans shall show the location of all relevant equipment and related items for loading calculations.
- G. Proof of Compliance for anchorage system per Article 1.5.
- H. Seismic Qualification and Certification shall be verified by an approved calculation that demonstrates the adequacy of the system for seismic forces. This calculation may be based on principles of structural analysis and engineering mechanics, or based on similarity to approved shake table tests as specified in Section 01 43 11.
- I. Contractor shall submit for review and approval test data or calculations signed and sealed by a Civil or Structural Engineer registered in the State of California to show compliance with the above requirements.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

SECTION 01 81 04  
WIND DESIGN CRITERIA

PART 1 - GENERAL

1.1 SUMMARY

- A. Wind design requirements for the following:
  - 1. Anchorage of mechanical and electrical equipment
  - 2. Wind design of tanks and anchorage of tanks.
  - 3. Other structures or items as specified or indicated on the Drawings.
- B. Related sections:
  - 1. Section 01 42 19 – Reference Standards
  - 2. Section 05 05 19 – Mechanical Anchoring and Fastening to Concrete and Masonry

1.2 SYSTEM DESCRIPTION

- A. Design Requirements:
  - 1. Building code criteria: Design for wind in accordance with the California Building Code as specified in Section 01 42 19 – Reference Standards:
    - a. Risk category: IV
    - b. Basic wind speed: 103 miles per hour
    - c. Exposure category: B
    - d. Topographic factor, Kzt: 1.0
  - 2. Resist wind forces through direct bearing on anchors and fasteners. Do not design or provide connections that use friction to resist wind loads.
  - 3. Anchoring and fastening to concrete and masonry
    - a. Provide anchors specified in Sections 05 05 19.
    - b. Use cast-in and built-in anchors (anchor bolts and welded studs) whenever possible for anchors at connections that resist wind forces.



- c. Wind loads shall be resisted by assemblies of welded plates, and anchor bolts embedded in concrete or bolts fastened to steel frames. All steel assemblies, anchor bolts and fasteners shall be of Type 316 Stainless Steel, unless otherwise indicated on Drawings.

1.3 Do not use concrete anchors, flush shells, sleeve anchors, flush shells, screw anchors, powder actuated fasteners, or other types of post-installed anchors unless indicated on the Drawings or accepted in writing by the Engineer.

1.4 Submittals

- A. Shop drawings and calculations: Complete shop drawings and wind design calculations.
- B. Calculations for wind design shall be signed and stamped by a Civil or Structural Engineer licensed in the State of California.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

## SECTION 01 91 13.10

### ASSET IDENTIFICATION TAGS

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Work includes: Development of Asset List Spreadsheet for all equipment, valves, cabinets, and instruments as listed on the drawings and as specified herein. General Contractor (Assignee) shall furnish and install equipment tags.
- B. Related work specified elsewhere:
  - 1. Division 33 – Utilities
  - 2. Appendix A – Asset List Instruction Sheet
  - 3. Appendix A – Preliminary Asset List Spreadsheet Sample

##### 1.2 SUBMITTALS

- A. The Asset List Spreadsheet: The Ballasted Flocculation System Supplier (BFSS) shall use the MS Excel spreadsheet provided by the District for all Asset List Spreadsheet submittals. All submittals of this spreadsheet shall be in MS Excel electronic format; pdf or other formats are not acceptable for these submittals.
- B. Submit prior to tag procurement:
  - 1. Descriptive Literature for the Tags: The literature and drawings shall contain the manufacturer's name, description, manufacturers' product data, and the full item number or designation.
  - 2. Preliminary Asset List Spreadsheet: The Asset List Spreadsheet (see preliminary list samples in Appendix A) listing all new and existing devices that require equipment tags, including any revisions or additions of equipment that occurred during the Work. The Preliminary Asset List shall include all known equipment information from approved technical submittals. Refer to the Asset List Instruction Sheet included in Appendix A for detailed explanation of list requirements and examples.
    - a. For projects involving multiple facility numbers, the Preliminary Asset List Spreadsheet will be provided as a MS Excel workbook. Within the workbook, a separate asset list spreadsheet (tab) will be provided for each facility.
    - b. The Engineer will provide information in Columns 1 through 6 for assets added via Design Change (DC) to the BFSS. Add the specific equipment

information from approved technical submittals. Maintain and update the Asset List during the contract. Ensure the updated Preliminary Asset List is accurate and submit it to the Engineer for approval prior to tag procurement.

C. Submit prior to Ready for Service (Operational Completion) Milestone:

1. Final Asset List Spreadsheet: After all tags have been installed and accepted by the Engineer and prior to reaching the Ready for Service (Operational Completion) milestone, complete columns for drawing number, manufacturer name, model number, and serial number for all new assets and verify all other information in the Preliminary Asset List is accurate.
2. Submit a Final Asset List Spreadsheet for each facility with all applicable columns completed for all new and existing devices, which includes all tags actually installed with any revisions or additions to the Preliminary Asset List Spreadsheet. Submit completed Final Asset List Spreadsheet in MS Excel format via the CMIS for Engineer approval.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION



**EAST BAY MUNICIPAL UTILITY DISTRICT  
OAKLAND, CA**

**WALNUT CREEK WATER TREATMENT PLANT -  
PRETREATMENT PROJECT DESIGN SERVICES –  
BALLASTED FLOCCULATION PRE-SELECTION**

**RFQ 2505**

**TECHNICAL SPECIFICATIONS**

**SUBMITTAL**

**VOLUME 2 OF 3**

**FEBRUARY 2025**

Handwritten signature of Peter Briggs von Bucher in black ink.



**Date Signed: 01/28/2025**

Handwritten signature of Madison Edwards in black ink.



**Date Signed: 01/28/2025**



**EAST BAY MUNICIPAL UTILITY DISTRICT**  
**WALNUT CREEK WATER TREATMENT PLANT -**  
**PRETREATMENT PROJECT DESIGN SERVICES –**  
**BALLASTED FLOCCULATION PRE-SELECTION**

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## SECTION 05 05 19

### MECHANICAL ANCHORING TO CONCRETE AND MASONRY

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section includes:

1. Cast-in anchors:
  - a. Anchor bolts.
  - b. Anchor rods.
  - c. Welded studs.
2. Post-installed anchors – Adhesive.
3. Post-installed anchors – Mechanical:
  - a. Concrete anchors.
  - b. Sleeve anchors.
  - c. Screw anchors.

###### B. Appurtenances for anchoring and fastening:

1. Anchor bolt sleeves.
2. Isolating sleeves and washers.
3. Thread coating for threaded stainless steel fasteners.

###### C. Related sections:

1. Section 01 33 00 – Submittals.
2. Section 01 42 19 – Reference Standards.
3. Section 01 81 02 – Seismic Design Criteria.
4. Section 05 12 00 – Structural Steel.
5. Section 05 50 00 – Metal Fabrications.

## 1.2 REFERENCES

### A. American Concrete Institute (ACI):

1. 355.2 – Qualification of Post-Installed Mechanical Anchors in Concrete & Commentary.

### B. American National Standards Institute (ANSI):

1. B212.15 – Cutting Tools - Carbide-tipped Masonry Drills and Blanks for Carbide-tipped Masonry Drills.

### C. American Welding Society (AWS):

1. D1.1 – Structural Welding Code – Steel.
2. D1.6 – Structural Welding Code - Stainless Steel.

### D. ASTM International (ASTM):

1. A29 – Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought.
2. A36 – Standard Specification for Carbon Structural Steel.
3. A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
4. A108 – Standard Specification for Steel Bars, Carbon and Alloy, Cold Finished.
5. A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
6. A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
7. A193 – Standard Specification for Alloy Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
8. A194 – Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
9. A240 – Standard Specification for Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
10. A308 – Standard Specification for Steel Sheet, Terne (Lead-Tin Alloy) Coated by the Hot-Dip Process.

11. A496 – Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
  12. A563 – Standard Specification for Carbon and Alloy Steel Nuts.
  13. B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
  14. B695 – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
  15. E488 – Standard Test Methods for Strength of Anchors in Concrete Elements.
  16. F436 – Standard Specification for Hardened Steel Washers.
  17. F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength.
- E. International Code Council Evaluation Service, Inc. (ICC-ES):
1. AC01 – Acceptance Criteria for Expansion Anchors in Masonry Elements.
  2. AC106 – Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry.
  3. AC193 – Acceptance Criteria for Mechanical Anchors in Concrete Elements.

### 1.3 DEFINITIONS

- A. Built-in anchor: Headed bolt or assembly installed in position before filling surrounding masonry units with grout.
- B. Cast-in anchor: Headed bolt or assembly installed in position before placing plastic concrete around.
- C. Overhead installations: Fasteners installed on overhead surfaces where the longitudinal axis of the fastener is more than 60-degrees above a horizontal line so that the fastener resists sustained tension loads.
- D. Passivation: Chemical treatment of stainless steel with a mild oxidant for the purpose of enhancing the spontaneous formation of the steel's protective passive film.
- E. Post-installed anchor: Fastener or assembly installed in hardened concrete or finished masonry construction, typically by drilling into the structure and inserting a steel anchor assembly.



- F. Terms relating to structures or building environments as used with reference to anchors and fasteners:
1. Corrosive locations: Describes interior and exterior locations as follows:
    - a. Locations used for delivery, storage, transfer, or containment (including spill containment) of chemicals used for plant treatment processes.
  2. Wet and moist locations: Describes locations, other than “corrosive locations” that are continuously or periodically submerged, are immediately above liquid containment structures, or are subject to frequent wetting, splashing, or wash down. Includes:
    - a. Exterior portions of buildings and structures.
    - b. Liquid-containing structures:
      - 1) Locations at and below the maximum operating liquid surface elevation.
      - 2) Locations above the maximum operating liquid surface elevation and:
        - a) Below the top of the walls containing the liquid;
        - b) At the inside faces and underside surfaces of a structure enclosing or spanning over the liquid (including walls, roofs, slabs, beams or walkways enclosing the open top of the structure).
    - c. Liquid handling equipment:
      - 1) Bases of pumps and other equipment that handles liquids.
    - d. Indoor locations exposed to moisture, splashing or routine wash down during normal operations, including floors with slopes toward drains or gutters.
  3. Other locations:
    - a. Interior dry areas where the surfaces are not exposed to moisture or humidity in excess of typical local environmental conditions.

#### 1.4 SUBMITTALS

##### A. General:

1. Submit information listed for each type of anchor or fastener to be used.

B. Submittals:

1. Product data:

a. Cast-in anchors:

- 1) Manufacturer's data including catalog cuts showing anchor sizes and configuration, materials, and finishes.

b. Post-installed anchors:

- 1) For each anchor type, manufacturer's data including catalog cuts showing anchor sizes and construction, materials and finishes, and load ratings.

2. Samples:

- a. Samples of each type of anchor, including representative diameters and lengths, if requested by the Engineer.

3. Certificates:

a. Cast-in anchors:

- 1) Mill certificates for steel anchors that will be supplied to the site.

b. Post-installed anchors:

- 1) Manufacturer's statement or certified test reports demonstrating that anchors that will be supplied to the site comply with the materials properties specified.

4. Test reports:

a. Post-installed anchors: For each anchor type used for the Work:

- 1) Current ICC-ES Report (ESR), IAPMO-UES (ER) or equivalent acceptable to the Engineer demonstrating:

- a) Acceptance of that anchor for use under the building code specified in Section 01 42 19.
- b) That testing of the concrete anchor included the simulated seismic tension and shear tests of AC193, and that the anchor is accepted for use in Seismic Design Categories C, D, E, or F and with cracked concrete.

5. Manufacturer's instructions:
  - a. Requirements for storage and handling.
  - b. Recommended installation procedures including details on drilling, hole size (diameter and depth), hole cleaning and preparation procedures, anchor insertion, and anchor tightening.
  - c. Requirements for inspection or observation during installation.
6. Qualification statements:
  - a. Post-installed anchors: Installer qualifications:
    - 1) Submit list of personnel performing installations and include date of manufacturer's training for each.

#### 1.5 QUALITY ASSURANCE – TO BE PERFORMED BY ASSIGNEE

##### A. Qualifications:

1. Post installed anchors shall be in accordance with building code specified in Section 01 42 19.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver post-installed anchors in manufacturer's standard packaging with labels visible and intact. Include manufacturer's installation instructions.
- B. Handle and store anchors and fasteners in accordance with manufacturer's recommendations and as required to prevent damage.
- C. Protect anchors from weather and moisture until installation.

#### 1.7 PROJECT CONDITIONS

- A. As specified in Section 01 81 02.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURED UNITS

#### A. General:

1. Furnish threaded fasteners with flat washers and hex nuts fabricated from materials corresponding to the material used for threaded portion of the anchor:
  - a. Cast-in anchors: Provide flat washers and nuts as listed in the ASTM standard for the anchor materials specified.
  - b. Post-installed anchors: Provide flat washers and nuts supplied for that product by the manufacturer of each anchor.
2. Size of anchors and fasteners, including diameter and length or minimum effective embedment depth: As indicated on the Drawings or as specified in this Section. In the event of conflicts, contact Engineer for clarification.
3. Where anchors and connections are not specifically indicated on the Drawings or specified, their material, size and form shall be equivalent in quality and workmanship to items specified.

#### B. Materials:

1. Provide and install anchors of materials as in this Section.

### 2.2 CAST-IN ANCHORS

#### A. Anchor bolts:

1. Description:
  - a. Straight steel rod having one end with integrally forged head, and one threaded end. Embedded into concrete with the headed end cast into concrete at the effective embedment depth indicated on the Drawings or specified, and with the threaded end left to project clear of concrete face as required for the connection to be made.
  - b. Furnish anchor bolts with heavy hex forged head or equivalent acceptable to Engineer:
    - 1) Rods or bars with angle bend for embedment in concrete (i.e.: "L" or "J" shaped anchor bolts) are not permitted in the Work.

2. Materials:

a. Type 316 stainless steel:

- 1) Surfaces descaled, pickled, and passivated in accordance with ASTM A308.
- 2) Bolts: ASTM A193, Grade B8M, Class 1, heavy hex.
- 3) Nuts: ASTM A194, Grade 8M, heavy hex.
- 4) Washers: Type 316 stainless steel.

b. Type 304 stainless steel:

- 1) Surfaces descaled, pickled, and passivated in accordance with ASTM A308.
- 2) Bolts: ASTM A193, Grade B8, Class 1, heavy hex.
- 3) Nuts: ASTM A194, Grade 8, heavy hex.
- 4) Washers: Type 304 stainless steel.

c. Galvanized steel:

- 1) Hot-dip galvanized coating in accordance with ASTM A153.
- 2) Bolt: ASTM F1554, Grade 36, Grade 55\_, heavy hex.
- 3) Nuts: ASTM A563, Grade A, heavy hex.
- 4) Washers: ASTM F436.

B. Anchor rods:

1. Description: Straight steel rod having threads on each end or continuously threaded from end to end. One threaded end is fitted with nuts or plates and embedded in concrete to the effective depth indicated on the Drawings, leaving the opposite threaded end to project clear of the concrete face as required for the connection to be made at that location.

2. Materials:

a. Stainless steel: Type 316:

- 1) Surfaces descaled, pickled, and passivated in accordance with ASTM A308.

2) Rod: ASTM A193, Grade B8M, Class 1.

3) Nuts: ASTM A194, Grade 8M.

4) Washers: Type 316 stainless steel.

5) Plates (embedded): ASTM A240.

b. Stainless steel: Type 304:

1) Surfaces descaled, pickled, and passivated in accordance with ASTM A308.

2) Rod: ASTM A193, Grade B8, Class 1.

3) Nuts: ASTM A194, Grade 8.

4) Washers: Type 304 stainless steel.

5) Plates (embedded): ASTM A240.

c. Galvanized steel:

1) Hot-dip galvanized with coating in accordance with ASTM A153.

2) Rod: ASTM F1554, Grade 36, Grade 55.

3) Nuts: ASTM A563, Grade A.

4) Washers: ASTM F436.

5) Plates (embedded): ASTM A36.

C. Welded studs:

1. Description: Anchor with forged head for embedment into concrete on one end, and welding ferrule for attachment to steel on the other. Welded to steel members or plates to provide anchorage for steel connections to concrete.

2. Acceptance criteria:

a. Welded studs in accordance with AWS D1.1, Type B.

3. Manufacturers:

a. Nelson Stud Welding Company: H4L Concrete Anchors or S3L Shear Connectors as indicated on the Drawings.

- b. Stud Welding Products: Headed Concrete Anchors (HCA) or Headed Shear Connectors (HSC) as indicated on the Drawings.
  - c. Or equal as approved by the Engineer.
4. Materials:
- a. Stainless mild steel: Type 316L, ASTM A29:
    - 1) Yield strength: 35 kips per square inch (ksi).
  - b. Galvanized steel:
    - 1) Hot-dip galvanized after fabrication with coating in accordance with ASTM A123.
    - 2) Steel: Carbon steel in accordance with ASTM A108 with 50,000-pounds per square inch minimum yield strength, and 60,000-pounds per square inch minimum tensile strength.
- D. Steel plates or shapes for fabrications including assemblies with welded studs or deformed bar anchors:
- 1. Stainless steel: Type 316L or Type 304L:
    - a. Plates (embedded): ASTM A240.
  - 2. Galvanized steel:
    - a. Hot dip galvanized in accordance with Section 05 05 14.
    - b. Steel: ASTM A36.

### 2.3 POST-INSTALLED ANCHORS – ADHESIVE

- A. Description: Adhesive Anchors or Epoxy Anchors Anchor consisting of all-thread rods embedded in concrete and bonded using an epoxy on one end and bolted to steel members or plates to provide anchorage or steel connections to concrete.
- B. Epoxy bonding of reinforcing bars, all thread rods, and threaded inserts in concrete:
  - 1. Manufacturers:
    - a. Hilti, Inc., Tulsa, OK: RE500 V3.
    - b. Or equal as approved by the Engineer.

## 2.4 POST-INSTALLED ANCHORS – MECHANICAL

### A. General:

1. Post-installed anchors used for the Work shall hold a current ICC Evaluation Service Report or IAPMO Uniform Evaluation Service (IAPMO-UES) Report demonstrating acceptance for use under the building code specified in Section 01 42 19. Reports prepared by other recognized evaluation agencies may be submitted for consideration if acceptable to the Engineer>
  - a. Conditions of use: The acceptance report shall indicate acceptance of the product for use under the following conditions:
    - 1) In regions of concrete where cracking has occurred or may occur.
    - 2) To resist short-term loads due to wind forces.
    - 3) To resist short-term loading due to seismic forces for the Seismic Design Category of the structure where the product will be used.
2. Substitutions: When requesting product substitutions, submit calculations, indicating the diameter, effective embedment depth and spacing of the proposed anchors, and demonstrating that the substituted product will provide load resistance that is equal to or greater than that provided by the anchors listed in this Section:
  - a. Calculations shall be prepared by and shall bear the signature and sealed of a Civil or Structural Engineer licensed in the State of California.
  - b. Decisions regarding the acceptability of proposed substitutions shall be at the discretion of the Engineer.

### B. Concrete anchors:

1. Description. Concrete Anchor or Expansion Anchor or Wedge Anchor is a post-installed anchor assembly consisting of a threaded stud and a surrounding wedge expansion sleeve that is forced outward by torquing the center stud to transfer loads from the stud to the concrete through bearing, friction, or both. (Sometimes referred to as “expansion anchors” or “wedge anchors.”)
  - a. Do not use slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials to develop holding power.
2. Concrete anchors for anchorage to concrete:
  - a. Acceptance criteria. Concrete anchors shall have a current ICC-ES or IAPMO-UES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for



short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and with ICC-ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).

b. Acceptable manufacturers:

- 1) Hilti: Kwik Bolt TZ Expansion Anchor.
- 2) DeWalt: PowerStud+ SD2.
- 3) Simpson Strong-Tie®: Strong Bolt 2 Wedge Anchor.
- 4) Or equal as approved by the Engineer.

c. Materials. Integrally threaded stud, wedge, washer and nut:

- 1) Stainless steel: Type 316.
  - a) Type 304 stainless steel acceptable for use at wet and moist locations when accepted in writing by the Engineer.
- 2) Galvanized: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5).

C. Flush shells:

1. Description: Post-installed anchor assembly consisting of an internally threaded mandrel that is forced into a pre-drilled concrete hole with a setting tool until the top of the anchor is flush with the face of the concrete. Once installed, a removable threaded bolt is installed in the mandrel.
2. Flush shell anchors are not permitted in the Work.

D. Sleeve anchors:

1. Description: Post-installed, torque-controlled anchor assembly consisting of an externally threaded stud with a spacer sleeve near the surface of the base material, and an expansion sleeve on the lower part of the stud. The expansion sleeve is forced outward by torquing of the center stud to transfer load.
  - a. Do not use slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials in order to develop holding power.
2. Sleeve anchors for anchorage to concrete.
  - a. Acceptance criteria. Sleeve anchors shall have a current ICC-ES or IAPMO-UES Report demonstrating that the anchors have been tested and qualified for

performance in both cracked and un-cracked concrete, and for short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and with ICC-ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).

b. Acceptable manufacturers:

- 1) Hilti: HSL-3 Heavy Duty Expansion (sleeve) Anchor.
- 2) DeWalt: Power Bolt+ Heavy Duty Sleeve Anchor.
- 3) Or equal as approved by the Engineer.

c. Materials:

- 1) Stainless steel: Not available.
- 2) Galvanized steel: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5).

E. Screw anchors:

1. Description: Post-installed concrete anchor that develops tensile strength from mechanical interlock provided by creating a helical “key” that is larger than the diameter of the bolt itself along the length of the anchor shaft.
2. Screw anchors for anchorage to concrete:
  - a. Acceptance criteria: Screw anchors shall have a current ICC-ES or IAPMO-UES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and ICC ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).
  - b. Acceptable manufacturers:
    - 1) Hilti: Hex head: HUS-EZ Screw Anchor:
      - a) With internally threaded head: HUS-EZ I Hanger Anchor.
    - 2) Dewalt: Wedge-Bolt+:
      - a) With internally threaded head: Vertigo+ Rod Hanging System.

- 3) Simpson Strong-Tie: Titen HD Screw Anchor:
  - a) With internally threaded head: Titen HD Rod Hanger.

- 4) Or equal as approved by the Engineer.

c. Materials:

- 1) Stainless steel: Type 316.
  - a) Type 304 stainless steel acceptable for use at wet and moist locations when accepted in writing by the Engineer.
- 2) Galvanized steel: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5); or equal

## 2.5 APPURTENANCES FOR ANCHORING AND FASTENING

### A. Anchor bolt sleeves:

1. Having inside diameter approximately 2 inches greater than bolt diameter and minimum 10-bolt diameters long.
2. Plastic sleeves:
  - a. High-density polyethylene, corrugated sleeve, threaded to provide adjustment of location on the anchor bolt.
  - b. Manufacturers:
    - 1) Or equal as approved by the Engineer.
3. Fabricated steel sleeves: Construct as specified in Section 05 50 00:
  - a. At galvanized carbon steel anchor bolts, provide galvanized carbon steel sleeves.
  - b. At stainless steel anchor bolts, provide stainless steel sleeves of same Type (304 or 316) as bolt, except that sleeves shall be constructed from low carbon stainless steel for welding (304L or 316L).
4. Fabricated steel sleeves:
  - a. Fabricate to the following dimensions unless otherwise indicated on the Drawings:
    - 1) Inside diameter: At least 2 inches greater than bolt diameter.

- 2) Inside length: Not less than 10 bolt diameters.
- 3) Bottom plate:
  - a) Square plate with dimensions equal to the outside diameter of the sleeve plus 1/2-inch each side.
  - b) Thickness equal to or greater than one-half of the anchor bolt diameter.
- b. Carbon steel anchor bolts:
  - 1) Fabricated from ASTM A36 plate and ASTM A53, Grade B pipe.
  - 2) Welded connections: Conform to requirements of AWS D1.1.
  - 3) Hot dip galvanized in accordance with ASTM A153.
- c. Stainless steel anchor bolts:
  - 1) Fabricated from ASTM A240 plate and pipe. Type 304L or Type 316L to match Type of the anchor bolt.
  - 2) Welded connections: In accordance with AWS D1.6
- B. Forged steel hardware:
  1. See Section 05 12 00 for forged steel hardware connectors, including: clevises, turnbuckles, eye bolts, eye nuts, and sleeve nuts.
- C. Isolating sleeves and washers:
  1. Manufacturers:
    - a. Central Plastics Company, Shawnee, Oklahoma.
    - b. Corrosion Control Products, PSI Inc., Gardena, CA.
    - c. Or equal as approved by the Engineer.
  2. Sleeves: Mylar, 1/32-inch thick, 4,000 volts per mil dielectric strength, of proper size to fit bolts and extending halfway into both steel washers.
  3. One sleeve required for each bolt.

4. Washers: The inside diameter of all washers shall fit over the isolating sleeve and both the steel and isolating washers shall have the same inside diameter and outside diameter:
  - a. Proper size to fit bolts. 2 insulating washers are required for each bolt.
  - b. Two 1/8-inch-thick steel washers for each bolt.
  - c. G3 Phenolic:
    - 1) Thickness: 1/8-inch.
    - 2) Base material: Glass.
    - 3) Resin: Phenolic.
    - 4) Water absorption: 2 percent.
    - 5) Hardness (Rockwell): 100.
    - 6) Dielectric strength: 450 volts per mil.
    - 7) Compression strength: 50,000 pounds per square inch.
    - 8) Tensile strength: 20,000 pounds per square inch.
    - 9) Maximum operating temperature: 350 degrees Fahrenheit.

D. Coating for repair of galvanized surfaces:

1. Acceptable manufacturers:
  - a. Galvinox.
  - b. Galvo-Weld.
  - c. Or equal as approved by the Engineer.

E. Thread coating. For use with threaded stainless steel fasteners:

1. Acceptable manufacturers:
  - a. Never Seez Compound Corporation, Never-Seez.
  - b. Oil Research, Inc., WLR No. 111.
  - c. Or equal as approved by the Engineer.

## PART 3 - EXECUTION – TO BE PERFORMED BY ASSIGNEE

### 3.1 EXAMINATION

- A. Examine work in place to verify that it is satisfactory to receive the work of this Section. If unsatisfactory conditions exist, do not begin this work until such conditions have been corrected.

### 3.2 INSTALLATION: GENERAL

- A. Where anchors and fasteners are not specifically indicated or specified, make attachments with materials specified in this Section.
- B. Substitution of anchor types:
  - 1. Post-installed anchors may not be used as an alternative to cast-in/built-in anchors at locations where the latter are indicated on the Drawings.
  - 2. Cast-in/built-in anchors may be used as an alternative to post-installed mechanical anchors at locations where the latter are indicated on the Drawings.
- C. Protect products from damage during installation. Take special care to protect threads and threaded ends.
- D. Accurately locate and position anchors and fasteners:
  - 1. Unless otherwise indicated on the Drawings, install anchors perpendicular to the surfaces from which they project.
  - 2. Install anchors so that at least 2 threads, but not more than 1/2-inch of threaded rod, projects past the top nut.
- E. Interface with other products:
  - 1. Where steel anchors come in contact with dissimilar metals (aluminum, stainless steel, etc.), bolt with stainless steel bolts and separate or isolate dissimilar metals using isolating sleeves and washers.
  - 2. Prior to installing nuts, coat threads of stainless steel fasteners with thread coating to prevent galling of threads.

### 3.3 INSTALLATION: CAST-IN ANCHORS

#### A. General:

1. Accurately locate cast-in and built-in anchors:
  - a. Provide anchor setting templates to locate anchor bolts and anchor rods. Secure templates to formwork.
  - b. Brace or tie off embedments as necessary to prevent displacement during placement of plastic concrete or of surrounding masonry construction.
  - c. Position and tie cast-in and built-in anchors in place before beginning placement of concrete or grout. Do not “stab” anchors into plastic concrete, mortar, or grout.
  - d. Do not allow cast-in anchors to touch reinforcing steel. Where cast-in anchors are within 1/4-inch of reinforcing steel, isolate the metals by wrapping the anchors with a minimum of 4 wraps of 10-mil polyvinyl chloride tape in area adjacent to reinforcing steel.
2. For anchoring at machinery bases subject to vibration, use 2 nuts, with 1 serving as a locknut.
3. Where anchor bolts or anchor rods are indicated on the Drawings as being for future use, thoroughly coat exposed surfaces that project from concrete or masonry with non-oxidizing wax. Turn nuts down full length of the threads, and neatly wrap the exposed thread and nut with a minimum of 4 wraps of 10-mil waterproof polyvinyl tape.

#### B. Anchor bolts:

1. Minimum effective embedment: 10-bolt diameters, unless a longer embedment is indicated on the Drawings.
2. Where indicated on the Drawings, set anchor bolts in plastic, galvanized steel or stainless steel sleeves to allow for adjustment. Seal top of sleeve to prevent grout from filling sleeve. Fill sleeves with grout when a machine or other equipment is grouted in place.

#### C. Anchor rods:

1. Install as specified for anchor bolts.

D. Welded studs:

1. Butt weld to steel fabrications with automatic stud welding gun as recommended by the manufacturer.
2. Ensure that butt weld develops full strength of the stud.

3.4 INSTALLATION: POST-INSTALLED ADHESIVE ANCHORS

- A. Epoxy and acrylic adhesive bonding of reinforcing bars, all thread rods, and internally threaded inserts in concrete: As specified in Section 03 21 17.
- B. Epoxy and acrylic adhesive bonding of reinforcing bars, all thread rods, and internally threaded inserts in masonry: As specified in Section 04 05 18.

3.5 INSTALLATION: POST-INSTALLED MECHANICAL ANCHORS

A. General:

1. Install anchors in accordance with the manufacturer's instructions, ACI 355.2, the anchor's ICC-ES or IAPMO-UES Report. Where conflict exists between the Report and the requirements in this Section, the requirements of the ICC-ES or IAPMO-UES Report shall control.
2. Where anchor manufacturer recommends the use of special tools and/or specific drill bits for installation, provide and use such tools.
3. After anchors have been positioned and inserted into concrete or masonry, do not:
  - a. Remove and reuse/reinstall anchors.
  - b. Loosen or remove bolts or studs.

B. Holes drilled into concrete and masonry:

1. Do not drill holes in concrete or masonry until the material has achieved its minimum specified compression strength ( $f'c$  or  $f'm$ ).
2. Accurately locate holes:
  - a. Before drilling holes, use a reinforcing bar locator to identify the position of all reinforcing steel, conduit, and other embedded items within a 6-inch radius of each proposed hole.
  - b. If the hole depth exceeds the range of detection for the rebar locator, the Engineer may require radiographs of the area designated for investigation before drilling commences.



3. Exercise care to avoid damaging existing reinforcement and other items embedded in concrete and masonry:
    - a. If embedments are encountered during drilling, immediately stop work and notify the Engineer. Await Engineer's instructions before proceeding.
  4. Unless otherwise indicated on the Drawings, drill holes perpendicular to the concrete surface into which they are placed.
  5. Drill using anchor manufacturer's recommended equipment and procedures:
    - a. Unless otherwise recommended by the manufacturer, drill in accordance with the following:
      - 1) Drilling equipment: Electric or pneumatic rotary type with light or medium impact. Where edge distances are less than 2 inches, use lighter impact equipment to prevent micro-cracking and concrete spalling during drilling process.
      - 2) Drill bits: Carbide-tipped in accordance with ANSI B212-15. Hollow drills with flushing air systems are preferred.
  6. Drill holes at manufacture's recommended diameter and to depth required to provide the effective embedment indicated.
  7. Clean and prepare holes as recommended by the manufacturer and as required by the ICC-ES or IAPMO-UES Report for that anchor:
    - a. Unless otherwise recommended by anchor manufacturer, remove dust and debris using brushes and clean oil-free compressed air.
    - b. Repeat cleaning process as required by the manufacturer's installation instructions.
    - c. When cleaning holes for stainless steel anchors, use only stainless steel or non-metallic brushes.
- C. Insert and tighten (or torque) anchors in full compliance with the manufacturer's installation instructions:
1. Once anchor is tightened (torque), do not attempt to loosen or remove its bolt or stud.

D. Concrete anchors: Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Concrete Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum required member thickness
	In concrete	In grouted masonry	
3/8 inch	2-1/2 inch	2-5/8 inch	6 inch
1/2 inch	3-1/2 inch	3-1/2 inch	8 inch
5/8 inch	4-1/2 inch	4-1/2 inch	10 inch
3/4 inch	5 inch	5-1/4 inch	12 inch

E. Flush shell anchors:

1. Flush shell anchors are not permitted in the Work.
2. If equipment manufacturer's installation instructions recommend the use of flush shell anchors, contact Engineer for instructions before proceeding.

F. Sleeve anchors:

1. Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Sleeve Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum Member Thickness
	In concrete	In grouted masonry	
M8 (1/2 inch)	70 mm (2-3/4 inch)	Not accepted	100 mm (8 inch)
M10 (5/8 inch)	76 mm (3 inch)	Not accepted	250 mm (10 inch)
M12 (3/4 inch)	80 mm (3-1/4 inch)	Not accepted	300 mm (12 inch)

2. Install with the sleeve fully engaged in the base material.

G. Screw anchors:

1. Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Screw Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum Member Thickness
	In concrete	In grouted masonry	
3/8 inch	2-1/2 inch	3-1/4 inch	6 inch
1/2 inch	3-1/4 inch	4-1/2 inch	8 inch
5/8 inch	4 inch	5 inch	10 inch
3/4 inch	5-1/2 inch	6-1/4 inch	12 inch

2. Install screw anchors using equipment and methods recommended by the manufacturer. Continue driving into hole until the washer head is flush against the item being fastened.

H. Undercut concrete anchors:

1. Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Sleeve Anchors			
Nominal Diameter (bolt)	Minimum Effective Embedment Length		Minimum Member Thickness <sup>1</sup>
	In concrete	In grouted masonry	
M10 (3/8 inch)	100 mm (4 inch)	Not accepted	200 mm (8 inch)
M12 (1/2 inch)	125 mm (5 inch)	Not accepted	350 mm (14 inch)
M16 (5/8 inch)	190 mm (7-1/2 inch)	Not accepted	460 mm (18 inch)
M20 (7/8 inch)	250 mm (10 inch)	Not accepted	510 mm (20 inch)
Notes:	1. Thickness indicated is for pre-set units. If through-set units are accepted, obtain minimum member thickness requirements from the Engineer.		

2. Installations of undercut anchors shall not be allowed where edge distances are less than 12 times the nominal diameter of the anchor stud.
3. Undercut bottom of hole using cutting tools manufactured for this purpose by the manufacturer of the undercut anchors being placed.

### 3.6 FIELD QUALITY CONTROL

- A. Assignee shall provide quality control over the Work of this Section as specified herein.
  - 1. Expenses associated with work described by the following paragraphs shall be paid by the Assignee.
- B. Post-installed anchors:
  - 1. Review anchor manufacturer's installation instructions and requirements of the Evaluation Service Report (hereafter referred to as "installation documents") for each anchor type and material.
  - 2. Observe hole-drilling and cleaning operations for conformance with the installation documents.
  - 3. Certify in writing to the Engineer that the depth and location of anchor holes, and the torque applied for setting the anchors conforms to the requirements of the installation documents.

### 3.7 FIELD QUALITY ASSURANCE

- A. The Engineer will provide on-site observation and field quality assurance for the Work of this Section:
  - 1. Expenses associated with work described by the following paragraphs will be paid for by the District.
- B. Field inspections and special inspections:
  - 1. Work will be observed during construction for conformance to the approved Contract Documents, the accepted submittals, and manufacturer's installation instructions for the products used.
- C. Special inspections: Anchors cast into concrete and built into masonry:
  - 1. Special inspection will be performed during positioning of anchors and placement of concrete or masonry (including mortar and grout) around the following anchors:
    - a. Anchor bolts.
    - b. Anchor rods.
    - c. Welded studs.

2. During placement, continuous special inspection will be performed at each anchor location to verify that the following elements of the installation conform to the requirements of the Contract Documents:
    - a. Anchor:
      - 1) Type and dimensions.
      - 2) Material: Galvanized steel, Type 304 stainless steel, or Type 316 stainless steel as specified in this Section or indicated on the Drawings.
      - 3) Positioning: Spacing, edge distances, effective embedment, and projection beyond the surface of the construction.
      - 4) Reinforcement at anchor: Presence, positioning, and size of additional reinforcement at anchors indicated on the Drawings.
  3. Following hardening and curing of the concrete or masonry surrounding the anchors, periodic special inspection will be performed to observe and confirm the following:
    - a. Base material (concrete or grouted masonry):
      - 1) Solid and dense concrete or grouted masonry material within required distances surrounding anchor.
      - 2) Material encapsulating embedment is dense and well-consolidated.
- D. Special Inspections: Post-installed mechanical anchors placed in hardened concrete and in grouted masonry:
1. Special inspection will be performed during installation of the following anchors:
    - a. Concrete anchors.
    - b. Sleeve anchors.
    - c. Screw anchors.
  2. Unless otherwise noted, periodic special inspection will be performed during positioning, drilling, placing, and torquing of anchors:
    - a. Continuous special inspection will be performed for post-installed anchors in “overhead installations” as defined in this Section.

3. Periodic special inspection:
  - a. Items listed in the following paragraphs will be verified for conformance to the requirements of the Contract Documents and the Evaluation Report for the anchor being used. The special inspector will observe the initial installation of each type and size of anchor, and subsequent installation of the same anchor at intervals of not more than 4 hours:
    - 1) Any change in the anchors used, in the personnel performing the installation, or in procedures used to install a given type of anchor, shall require a new “initial inspection”.
  - b. Substrate: Concrete or masonry surfaces receiving the anchor are sound and of a condition that will develop the anchor’s rated strength.
  - c. Anchor:
    - 1) Manufacturer, type, and dimensions (diameter and length).
    - 2) Material (galvanized, Type 304 stainless steel, or Type 316 stainless steel).
  - d. Hole:
    - 1) Positioning: Spacing and edge distances.
    - 2) Drill bit type and diameter.
    - 3) Diameter, and depth.
    - 4) Hole cleaned in accordance with manufacturer’s required procedures. Confirm multiple repetitions of cleaning when recommended by the manufacturer.
    - 5) Anchor’s minimum effective embedment.
    - 6) Anchor tightening/installation torque.
4. Continuous special inspection:
  - a. The Special Inspector will observe all aspects of anchor installation, except that holes may be drilled in their absence provided that they confirm the use of acceptable drill bits before drilling, and later confirms the diameter, depth, and cleaning of drilled holes.

E. Field tests:

1. The Engineer may, at any time, request testing to confirm that materials being delivered and installed conform to the requirements of the Specifications:
  - a. If such additional testing shows that the materials do not conform to the specified requirements, the Assignee shall pay the costs of these tests.
  - b. If such additional testing shows that the materials do conform to the specified requirements, the District will pay the costs of these tests.
2. Field testing: Post-Installed Anchors:
  - a. Proof load testing:
    - 1) In addition to performing special inspections, the Engineer may select up to 10 percent of each type and size of post-installed mechanical anchor for proof-load testing for pullout or shear. Tests will be non-destructive whenever possible.
    - 2) Tension testing will be performed in accordance with ASTM E488.
  - b. Torque load testing:
    - 1) A calibrated torque wrench will be used to apply manufacturer's recommended installation torque.
  - c. Acceptance criteria:
    - 1) Minimum anchor embedment, proof load for pullout and shear, and torque shall be as specified in this Section.
    - 2) Anchors that fail to resist their designated proof load or installation torque requirements shall be regarded as non-performing.
    - 3) If more than 20 percent of the tested anchors fail to achieve their specified torque or proof load, all anchors of the same diameter and type as the failed anchors shall be tested.
    - 4) Remediate non-performing anchors as specified in "Non-Conforming Work".

### 3.8 NON-CONFORMING WORK

- A. Remove misaligned or non-performing anchors.
- B. Fill empty anchor holes and repair failed anchor locations using high-strength, non-shrink, non-metallic grout.

- C. If more than 20 percent of all tested anchors of a given diameter and type fail to achieve their specified torque or proof load, the Engineer will provide directions for required modifications. Make such modifications, up to and including replacement of all anchors, at no additional cost to the District.

### 3.9 SCHEDULES

- A. Stainless steel: Provide and install stainless steel anchors at the following locations:

1. “Corrosive locations” as defined in this Section: Type 316 stainless steel.
2. “Wet and moist locations” as defined in this Section: Type 316 stainless steel.
3. “Other locations: Type 316 stainless steel”:
  - a. For connecting aluminum members to concrete or masonry.
  - b. For connecting fiber-reinforced plastic (FRP) members to concrete or masonry.
4. At locations indicated on the Drawings:

- B. Galvanized: Provide and install galvanized carbon steel anchors at the following locations:

1. Locations not requiring stainless steel.
2. At locations indicated on the Drawings.

- C. Provide and install anchor materials as scheduled in the following Table:

Table – Required Anchoring Materials by Location		
Location / Exposure	Materials	Notes
1	Anchors into concrete and grouted masonry for attachment of carbon steel, including structural steel and other steel fabrications:	
a)	Interior dry areas:	Carbon steel – galvanized
b)	Locations with galvanized steel structures or fabrications:	Stainless steel – Type 304 or 316 1
c)	Exterior and interior wet and moist locations:	Stainless steel – Type 316 1
d)	Corrosive locations:	Stainless steel – Type 316 1
2.	Anchors into concrete and grouted masonry for attachment of aluminum, stainless steel, or fiber-reinforced plastic (FRP) shapes and fabrications.	
a)	Interior dry areas:	Stainless steel – Type 304 or 316 1



Table – Required Anchoring Materials by Location		
b) Exterior and interior wet and moist locations:	Stainless steel – Type 316	1
d) Corrosive locations:	Stainless steel – Type 316	1
3. Anchors for attaching equipment and its appurtenances		
a) All locations	Stainless steel – Type 316 (unless Type 304 is specifically indicated in the specifications for the equipment.)	1
<u>Notes:</u> Where anchors are in contact with a metal that differs from that of the anchor, 1. provide isolation sleeves and washers.		

END OF SECTION

SECTION 05 05 24  
SHOP AND FIELD WELDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Use this section for welding requirements of the related sections as described in 1.1.B and as listed in 1.1.C.
- B. Section includes:
  - 1. Shop welding, to be completed by the BFSS, of steel pipe, fittings, and appurtenances.
  - 2. Shop welding, to be completed by the BFSS, of structural steel and metals fabrication.
  - 3. Third-party independent inspection and examination of welds.
- C. Related Sections:
  - 1. Section 01 31 19 – Project Meetings.
  - 2. Section 01 33 00 – Submittal Procedures.
  - 3. Section 01 45 27 – Shop Inspection.
  - 4. Section 05 12 00 – Structural Steel Framing.
  - 5. Section 05 50 00 – Metal Fabrications.
  - 6. Section 40 20 20 – Mechanical Piping.
  - 7. Section 46 44 10 – Ballasted Flocculation.

1.2 APPLICABLE CODES AND STANDARDS

- A. ASME Boiler & Pressure Vessel Code, Section V, Nondestructive Examination, Latest Edition including addenda, supplements, and interpretations.
- B. ASME Boiler & Pressure Vessel Code, Section VIII, Rules for Construction of Pressure Vessels, Latest Edition including addenda, supplements, and interpretations.

- C. ASME Boiler & Pressure Vessel Code, Section IX, Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators, Latest Edition including addenda, supplements, and interpretations.
- D. AWS D1.1 – Structural Welding Code – Steel, 2020 edition.
- E. AWS D1.6 – Structural Welding Code – Stainless Steel, latest edition.
- F. AWS 3.0 – Standard Welding Terms and Definitions, latest edition.
- G. AWS A2.4 – Standard Symbols for Welding, Brazing and Nondestructive Examination, latest edition.

### 1.3 TERMS AND DEFINITIONS

- A. Certified Welding Inspector (CWI) – A person certified as a welding inspector as given in AWS QC1- Latest Edition, Standard for AWS Certification of Welding Inspectors.
- B. Nondestructive Examination (NDE) – The act of determining the suitability of some material or component for its intended purpose using techniques that do not affect its serviceability.
- C. NDE Level II Technician/Operator (NDE Level II): An individual certified at Level II as defined in American Society for Nondestructive Testing (ASNT) Recommended Practice SNT-TC-1A specific to the NDE method used.
- D. Procedure Qualification Record (PQR) – A record of welding variables used to produce an acceptable test weldment and the results of tests conducted on the weldment to qualify a welding procedure specification.
- E. Welding Procedure Specification (WPS) – A document providing the required welding variables for a specific application to assure repeatability by qualified welders and welding operators. WPSs that are not prequalified by Code shall be supported with a PQR.
- F. Standard Welding Terms and Definitions: See AWS 3.0, Standard Welding Terms and Definitions.

### 1.4 SUBMITTALS

- A. Qualification of Welders and Welding Procedures:
  - 1. For pipe welding submit records consistent with: Paragraph 1.5.A for procedure qualifications; Paragraph 1.5.B for shop welder qualifications; and, Paragraph 1.5C for field welder qualifications.

- B. Qualification of Inspectors and NDE Examiners:
  - 1. Submit verifiable evidence of the current CWI certification of all third-party CWIs.
  - 2. Submit verifiable evidence of the certification of all personnel performing NDE or interpreting the test results to ASNT-TC-1A Level II as a minimum.
- C. Submit complete fabrication and erection drawings for the Engineer's approval prior to cutting or fabrication. Shop drawings shall show the details of fabrication with weld symbols in accordance with AWS A2.4 for all joints to be welded.
- D. Provide all submittals to the Engineer consistent with the requirements of Section 01 33 00 with sufficient review time for approval prior to start of welding. Welding shall not proceed until the related submittals are approved by the Engineer.

## 1.5 QUALIFICATIONS AND INSPECTIONS

- A. Pipe-Welding Procedure Specifications:
  - 1. All welds shall be completed in accordance with a qualified WPS.
    - a. The BFSS may use a prequalified WPS conforming to the provisions of AWS D1.1 – Clause 5 or AWS D1.6 – Clause 5, Prequalification of WPSs.
  - 2. All WPSs that are not prequalified as given above shall be qualified in accordance with one of the following:
    - a. ASME Boiler & Pressure Vessel Code, Section IX.
    - b. AWS D1.1 – Clause 6.
    - c. AWS D1.6 – Clause 6.
  - 3. A CWI shall review and stamp all WPSs and PQRs.
- B. Pipe Welding, Shop:
  - 1. Welders shall be qualified under ASME Boiler & Pressure Vessel Code, Section IX, Part QW, AWS D1.1 – Clause 6, or AWS D1.6 – Clause 6, for the welding processes, positions, and procedures to be used for this project.
  - 2. Welders shall have verifiable evidence they have maintained their qualifications in accordance with AWS D1.1 – Clause 6, AWS D1.6 – Clause 6, or ASME Boiler & Pressure Vessel Code, Section IX, Part QW-322.
  - 3. Welder Qualification(s) shall be witnessed and stamped indicating acceptance by a CWI.

C. Structural Steel Welding as specified in Section 05 12 00 – Structural Steel Framing:

1. The BFSS or Assignee shall qualify all welders and welding procedures in accordance with the latest edition of AWS D1.1, Clause 6; AWS D1.2, Clause 3; or, AWS D1.6, Clause 6. Notify the Engineer in advance of welder and welding procedure qualification so the Engineer may witness qualification.
2. All fabrication and erection of steel elements shall conform to AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings" and the "Code of Standard Practice for Steel Buildings and Bridges" except as modified by the applicable building codes, unless specified otherwise.
3. Welding shall be by the shielded metal arc (SMAW), gas tungsten arc (GTAW), gas metal arc (GMAW-spray arc mode), gas shield flux cored arc (FCAW-dual shield) or submerged metal arc welding (SAW) processes and shall be in accordance with AWS D1.1, Structural Welding Code-Steel or D1.6, Structural Welding Code-Stainless Steel.
4. Electrodes used for the gas metal arc (GMAW) process shall conform to AWS A5.18. Electrodes used for the flux cored arc welding (FCAW) process shall conform to AWS A5.20. See AWS D1.1, Table 5.4 for details.
5. Low hydrogen electrode storage shall be in accordance with AWS D1.1, Clause 7, Fabrication, 7.3.2.1, Low Hydrogen Electrode Storage Conditions.

D. Metal Fabrication Welding as specified in Section 05 50 00 – Metal Fabrications:

1. Aluminum welding shall conform to ANSI/AWS D1.2 latest edition Structural Welding Code - Aluminum "Suggested Specifications for Structures of Aluminum Alloys 6061-T6" unless otherwise noted.
2. Stainless Steel welding shall conform to ANSI/AWS D1.6 latest edition – Structural Welding Code – Stainless Steel.
3. Carbon Steel welding shall conform to ANSI/AWS D1.1 latest edition – Structural Welding Code – Steel.
4. Certification of Welders:
  - a. Submit verifiable evidence of initial qualification for each welder.
  - b. Submit verifiable evidence each welder has maintained current qualification(s).
5. Submit WPSs with supporting PQRs for approval per 1.5.C above.

E. Testing and Inspection:

1. The BFSS shall provide independent inspection of all structural steel framing welds and nondestructive examination (NDE). The District will perform direct visual verification of these inspections and tests. Notify the District's Plant Inspection Section at (510) 287-1132 for all shop inspections and tests. Advanced notification requirements are specified in Section 01 45 27.
2. Welding inspection personnel shall be certified in accordance with AWS QC1 at the level of Certified Welding Inspector.
3. NDE personnel shall be certified in accordance with ASNT-TC-1A Level II as a minimum.
4. Inspections and test results shall comply with AWS D1.1 Clause 8 for the related inspection and test method.
5. The costs of all shop inspections and tests, including retests after repair, shall be borne by the BFSS.

F. Tolerances:

1. Dimensional tolerances and allowances for fit shall be in accordance with applicable AWS Standards unless shown otherwise. Tolerances and allowances shall be shown on the BFSS' erection or working drawings.

1.6 RETESTING OF WELDERS BASED ON QUALITY OF WORK:

- A. When the quality of a welder's work appears to be below the requirements of this specification or referenced Codes, the Engineer may require that the welder demonstrate an ability to produce sound welds by requiring complete requalification in accordance with the latest edition of AWS D1.1, Clause 4; AWS D1.2, Clause 3; or, AWS D1.6, Clause 6. All re-qualifications will be at the BFSS' expense.

1.7 NONDESTRUCTIVE EXAMINATION-GENERAL

A. Types of NDE and Acceptance Criteria:

1. Radiographic Examination (RT) per Paragraph UW-51, Section VIII, ASME Boiler & Pressure Vessel Code.
2. Liquid Penetrant (PT) per Section V, ASME Boiler & Pressure Vessel Code. Acceptance criteria shall be as given by AWS D1.1 – Clause 8, Part C.
3. Magnetic Particle (MT) per Section V, ASME Boiler & Pressure Vessel Code. Acceptance criteria shall be as given by AWS D1.1 – Clause 8, Part C.

## B. Nondestructive Examination of Production Welds:

1. In addition to any NDE required, the Engineer may elect to perform additional NDE of in-process or completed shop welds to verify weld quality. Any additional NDE may be performed by District personnel or the Engineer may request the BFSS perform or subcontract these examinations.
2. Cost of Examinations:
  - a. The cost of NDE identified for specific welded connections shall be borne by the BFSS.
  - b. The cost of additional NDE requested by the District will be borne by the District in the event that all examined welds are found to be acceptable. In the event of a rejected weld, the BFSS shall bear the costs of all NDE, including NDE of weld seams found to be acceptable, as well as the costs of repairs, re-inspection and re-examination of the rejected weld.
  - c. The cost of NDE performed by District personnel will be borne by the District. The costs of repairs, re-inspection and re-examination resulting from a rejected weld shall be borne by the BFSS.

### 1.8 CLEANING AND PASSIVATING OF STAINLESS STEEL WELDMENTS

- a. Pipe joints and structural steel, including the entire heat-affected zone (HAZ), shall be:
  - 1) Cleaned in accordance with ASTM A380. The joints shall be visually inspected to be free of paint, oil, grease, welding flux, slag, heat-treating and hot-forming scale, dirt, trash, metal and abrasive particles and chips, and other gross contamination. Dust may be present on the exterior surfaces, but should not be on the interior surfaces.
  - 2) De-scaled (pickled) with citric acid per in accordance with ASTM A380 Table 2.1, Part III. Perform intermittent scrubbing as required to assure a completely cleaned surface. Do not use a steel wire brush.
  - 3) Passivated per ASTM A380 with final cleaning per ASTM A380 Table 2.1, Part II, and in accordance with ASTM A967. The finish shall be inspected to be free of contaminating iron particles, heat-tint oxides per AWWA C220, weld scale, and other impurities.
  - 4) Follow immediately with a thorough rinse and water-jet spray to remove excess acid to prevent attack of the base metal.
  - 5) Both the exterior and interior of the joint and HAZ shall be treated. Inaccessible interior joints, as approved by the Engineer, shall be omitted from this process.

- b. The weld and HAZ shall be tested per ASTM A967 to be free of contaminating iron particles and other impurities. The ASTM A967 test method used shall be approved by the Engineer.

## 1.9 VERIFICATION

### A. General Requirements:

1. All welds shall be visually inspected and accepted by the BFSS' third-party CWI and the Engineer prior to performance of all NDE, including hydrostatic and air tests. Final visual inspection shall be performed after the weld has cooled to ambient temperature.
2. All visual inspections and nondestructive examinations shall be completed and confirmed as acceptable by the Engineer prior to further processing that could interfere with access to the welded joint for repairs, inspection and NDE.

### B. Required NDE, Shop Welding, Pipe:

1. Unless otherwise shown in the tail of the weld symbol on the Drawings, NDE of the finished weld for steel pipe 24" and larger shall be:
  - a. Full-penetration groove welds on specials and fittings shall be radiographed for the complete length of each seam on each pipe. All weld seams shall be visually accepted and results documented by Fabricator's Quality Control prior to initial radiography.
    - 1) Film radiography shall comply with ASME (latest edition) Section V Article 2 Mandatory Appendix II utilizing hole-type IQI revealing 2T sensitivity per Table T-276 in addition to IQI placement per Section T -277.1-C placed on weld. Each film shall be identified with unique numbering as a minimum with the EBMUD Spec Number, date, cylinder and/or mark number. Welds shall conform to ASME Section VIII Paragraph UW-51.b.1, 2, 3 and 4. Final determination of conformance to ASME Section V for film sensitivity and ASME Section VIII for weld acceptability is at the discretion of the Engineer.
  - b. Results of radiographic examinations shall be reviewed by the Fabricator's ASNT TC-1A Level II or AWS certified radiographic interpreter. The BFSS' independent ASNT-TC-1A certified Level 2 or AWS certified radiographic interpreter and the Engineer will review radiographic film and inspection reports. Welds shall be verified as being acceptable based on ASME Section VIII criteria prior to further processing of the cylinder. BFSS shall pay for all film radiographic examinations.



- c. Final determination of conformance to ASME Section V for film sensitivity and ASME Section VIII for weld acceptability is at the discretion of the Engineer.
    - d. Alternate NDE method for welds that cannot be radiographed due to weld configuration or pipe size shall be approved by the Engineer.
  2. Unless otherwise shown in the tail of the weld symbol on the Drawings, NDE of the finished weld for steel pipe smaller than 24" shall be MT or PT.

C. Radiograph Records:

1. All radiographs, including information only examinations, will become the property of the District.
  - a. The Fabricator shall provide to the District all hardware and software necessary to review the radiographs. The Fabricator shall provide one set of hardware and software to the District prior to the start of radiography for retention by the District.
  - b. The BFSS shall provide the District with one new film viewer as follows: LC NDT FV-2010-T-PLUS High Intensity Portable LCD Film Viewer with Built-in Densitometer and Electronic Masking, or equal as approved by the Engineer.

D. Shop Inspection, Pipe:

1. The Engineer will perform inspections and witness tests during all phases of pipe fabrication.
2. Provide notification for Engineer to be present for testing. See Section 01 45 27 for inspection advance notification requirements and District travel expenses.
3. Failure to notify the Engineer to inspect or witness tests at the manufacturer's plant will result in rejection of all materials and items processed.
4. The BFSS shall provide third-party independent CWIs and NDE Examiners for all pipe fabrications. Third-party inspectors and examiners shall be independent from work production and schedule responsibilities. Third-party CWIs shall provide daily reports to the Engineer for all inspections performed. Welding inspections shall include as applicable: verification of welder and weld procedure specification; joint fit-up and tack; preheat; root or first pass inspection; verification of any required in-process NDE; interpass temperature; final visual inspection including weld quality and item dimensions, orientation, and configuration. The reports shall provide a clear summary of the inspection activities performed, direct traceability to the work, and a determination of acceptability.

5. The Engineer will verify that the third-party independent inspections and NDEs comply with these requirements, including referenced Codes and Standards, and will review and accept (or reject) the reports of the CWIs and Examiners. The Engineer may at any time verify by direct inspection or surveillance the acceptability of all phases of welding and third-party independent inspection and NDE activities.

#### 1.10 CHARPY V-NOTCH (CVN) TESTING

- A. For welding of steel pipe, specials and fittings with a thickness of 0.406-inch and greater, heat input control and CVN testing is required:
  1. WPS for shop welding shall be qualified in accordance with ASME Boiler Pressure Vessel Code Section IX and shall include Supplementary Essential Variables.
  2. WPS for field welding shall be qualified in accordance with AWS D1.1 – Clause 6, Part B.
  3. PQRs shall be qualified for notch tough welding with consideration for thickness of steel, test temperature, and CVN values. Refer to AWS D1.1 – Clause 6, Part D, Requirements for CVN Testing.
  4. The number of CVN test specimens shall be per AWS D1.1 – 6.27.2, Option 1 – 3 specimens.
  5. As required to be specified by AWS D1.1 – 6.27.5, the CVN test temperature shall be 40-degF unless otherwise specifically called out on the drawings.

PART 2 - NOT USED

PART 3 - EXECUTION

#### 3.1 GENERAL PROCEDURES

- A. Use Shielded Metal Arc Welding (SMAW), Flux Cored Arc Welding (FCAW), Gas Tungsten Arc Welding (GTAW), or Gas Metal Arc Welding (GMAW-Spray or Globular modes only), unless the Engineer approves another process prior to use:
  1. Gas Metal Arc Welding (Short-Circuit) is not allowed.
- B. All welds shall be made according to an approved WPS.
- C. Each step of the welding process will be inspected and approved before proceeding to the next step.
- D. Welding shall be performed in at least two layers. Passes shall not exceed 1/4 inch in throat dimension.

- E. Welds shall be thoroughly cleaned after each pass.
- F. Welds shall be fully fused with base metal, uniform in appearance, free from cracks and reasonably free from irregularities. Weld shall blend smoothly and gradually into the base material.
- G. Restart in weld zone on clean and sound metal.
- H. Remove defective welds by chipping, grinding, flame gouging, or air-arc gouging and repair by re-welding.
- I. No undercut is allowed.
- J. Use procedures or welding sequences that will minimize eccentric stresses, shear or distortion in the weld.
- K. Butt welds, where authorized, shall have complete penetration and fusion.
- L. Finished weld bead shall be central to the seam.
- M. Artificial or forced cooling of welded joints is not permitted.
- N. Low hydrogen electrode storage shall be in accordance with AWS D1.1 – 5.3.2.1.
- O. See District Standard Drawings 323-EA, 324-EA, and 325-EA for welding of flanges.
- P. Joining Dissimilar Metals:
  - 1. When joining carbon steel to various stainless steels, the following filler material shall be used unless otherwise called out on the drawings:
    - a. Carbon steel to stainless steel: 309L filler material.
    - b. Carbon steel to type 316 or 316L stainless steel: 309L or 316L filler material.

### 3.2 SUPPLEMENTS – NOT USED

END OF SECTION

## SECTION 05 05 26

### FLANGE BOLTING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes: Furnish and install bolts, washers, and nuts for flanged connections.
- B. All stainless steel fasteners are subject to additional material verification by the District at the District's expense. Nonconforming bolts shall be segregated, identified and replaced with conforming bolts. Nonconforming bolts may be subjected to additional independent laboratory analysis at the BFSS' expense.
- C. Related sections:
  - 1. Division 33 – Utilities.
  - 2. Section 40 20 20 – Mechanical Piping.

##### 1.2 REFERENCES

- A. American National Standards Institute (ANSI):
  - 1. ANSI B1.1 – Unified Inch Screw Threads (UN and UNR Thread Form).
  - 2. ANSI B16.1 – Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250.
  - 3. ANSI B18.2.1 – Square and Hex Bolts and Screws, Inch Series.
  - 4. ANSI B18.2.2 – Square and Hex Nuts, Inch Series.
  - 5. ANSI B18.22.1 – Plain Washers.
- B. ASTM International (ASTM):
  - 1. ASTM A193 – Specification for Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service.
  - 2. ASTM A194 – Specification for Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
  - 3. ASTM A449 – Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.
  - 4. ASTM A563 – Specification for Carbon and Alloy Steel Nuts.

5. ASTM D2000 – Standard Classification System for Rubber Products in Automotive Applications.
  6. ASTM F436 – Specification for Hardened Steel Washers.
  7. ASTM F844 – Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.
  8. ASTM F2329 – Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- C. American Water Works Association (AWWA):
1. AWWA C207-13 – Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm through 3,600 mm).
- D. SAE International (SAE):
1. SAE J429 – Mechanical and Materials Requirements for Externally Threaded Fasteners.
  2. SAE J995 – Mechanical and Material Requirements for Steel Nuts.

### 1.3 SUBMITTALS

- A. Submit manufacturer's literature and application schedule for all bolting to demonstrate conformance with these specifications.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. All elastomers (e.g. EPDM) shall meet the requirements indicated in Section 33 12 01 – Basic Mechanical Materials and Methods.

B. Standard bolting:

Carbon Steel	Bolts:	Galvanized: ASTM A449 Type 1	
	Nuts:	1/4" to 1":	Galvanized: ASTM A563 Grade B, standard hexagonal flat nuts
		1-1/8" to 1-1/2":	ASTM A563 Grade B, heavy hexagonal flat nuts
	Washers:	Diameter 1-1/2" and smaller:	ASTM F436 Type 1
Coating:	Hot-Dip Galvanized	ASTM F2329 for A449 bolts, A563 nuts and F436 washers	
Stainless Steel, Standard	Bolts:	ASTM A193 Class 1, B8 (Type 304) or B8M (Type 316). Type 316 only where submerged.	
	Nuts:	ASTM A194, Grade 8 (Type 304) or Grade 8M (Type 316), Standard Hex. Type 316 only where submerged.	
	Washers:	Type 304 or 316 to match bolts and nuts. Type 316 only where submerged.	
<p>1. Refer to standard drawing 323-EA, 324-EA or 325-EA for the specific bolt grade that corresponds to the pipe pressure of the application.</p> <p>2. Refer to section 40 20 20 for the Mechanical Bolting Application Schedule that calls out stainless or galvanized dependent upon the location of the application.</p>			

2.2 CONSTRUCTION

Bolts	ANSI B18.2.1, standard hexagonal heads
Nuts	ANSI B18.2.2
Washers	ANSI B18.22.1 Type A, Narrow

2.3 BOLTING MATERIAL OTHER THAN STEEL

- A. Threading and dimensions shall conform to the requirements for steel heads and nuts.
- B. Class 3 Fit ANSI B1.1.

## 2.4 BOLT MARKING

- A. Identification symbols shall be applied to each bolt head to identify the material and grade of each bolt. The bolt identification symbols shall be as follows:
  - 1. Carbon Steel: Three radial lines, 120 degrees apart.
  - 2. Stainless Steel: B8 (type 304), B8M (type 316).

## 2.5 LENGTH OF BOLT

- A. After assembly, the bolts shall extend a minimum distance of two threads beyond the nut. In addition, the bolt length shall be no longer than 1-inch beyond the nut and shall not interfere with any appurtenance or the operation of any device.

## 2.6 THREADS

- A. Coarse thread series – Class 2 Fit ANSI B1.1.

## 2.7 BOLT THREAD ANTI-SEIZE COMPOUND

- A. Compound shall be food grade meeting NSF code H1 standards for incidental contact, and shall be designed to prevent rusting, seizure and galling of bolt threads.
- B. Acceptable products:
  - 1. Loctite Food Grade Anti-Seize.
  - 2. Saf-T-Eze, by Saf-T-Lok<sup>®</sup>.
  - 3. Or equal as approved by the Engineer.

## 2.8 FLANGE GASKETS

- A. Potable Water:
  - 1. General Requirements: See Section 01 61 00, Article 1.1.E – Materials in Contact with Drinking Water. NSF-61 certified: required.
  - 2. Potable Water Service Conditions: Suitable for chloraminated water and in accordance with Standard Drawings 323-EA – Steel Pipe Flanges, Low Pressure, 324-EA – Steel Pipe Flanges, High Pressure, and 325-EA – Steel Pipe Flanges, Extra-High Pressure.
  - 3. Composition Gasket: PTFE with aluminosilicate or hollow glass microspheres, meeting the requirements of AWWA C207-13. Full-face type gaskets shall be used for flat-faced flange sets and ring-type gaskets that extend outward to the

inside of the bolt hole circle shall be used for raised-face flange sets. Thickness as shown on the Standard Drawings listed above:

- a. At a minimum, gaskets shall be rated for 750 psig @ 0 deg F and 0 psig @ 400 deg F; shall meet ASTM F36 compressibility  $\geq 25\%$  and recovery  $\geq 25\%$ ; ASTM D1708 Tensile Stress  $\geq 2000$  psi; ASTM F38 creep relaxation  $\leq 40\%$ ; and an ASTM F586 design “m” factor  $\geq 2.0$ , and a design “y” factor  $\geq 1500$  psi for 1/16" and 1/8" thick gaskets.
  - 1) Acceptable products:
    - a) Garlock 3505 EPIX.
    - b) Garlock 3505.
    - c) Teadit TF1572 SAN.
    - d) Or equal as approved by the Engineer.
4. Rubber Gasket: EPDM in accordance with Section 33 12 01 and ASTM D2000, Shore Type A 60 - 90 durometer, full-faced type. Rated for 175 psig and -40 – 275 deg F. Full-face type. Thickness as shown on the Standard Drawings listed above.
  - a. Acceptable products:
    - 1) Garlock 98206.
    - 2) AmericanBiltrite AB-576.
    - 3) American Toruseal.
    - 4) Or equal as approved by the Engineer.
- B. Raw Water: Composition Gasket; Synthetic fibers with nitrile (Buna-N) binder 1/8-inch thick; suitable for water, hydrocarbons, oils, and gasoline; 400 deg F continuous operating temperature; 500 psi maximum pressure. NSF-61 certified. Full-face type gaskets shall be used for “low pressure” steel flat-faced flange sets and “high pressure” steel flanges mating to a valve or appurtenance with cast iron flanges, while ring-type gaskets, which extend outward from the ID to only the inside of the bolt circle, shall be used for raised-face flange sets and “high pressure” steel flange sets. “Low pressure” and “High pressure” are defined on drawings 323-EA - Steel Pipe Flanges, Low Pressure and 324-EA - Steel Pipe Flanges, High Pressure.
  1. Acceptable products:
    - a. Garlock “Multi-Swell” Style 3760-U.
    - b. Or equal as approved by the Engineer.



## 2.9 FLANGE INSULATION SETS

- A. General Requirements: See Section 01 61 00 Article 1.1.E – Materials in Contact with Drinking Water.
- B. Insulating Gasket: NSF-61 certified, 1/8" full face NEMA grade G10 glass reinforced epoxy retainer with minimum 750 volts/mil dielectric strength and minimum 65,000 psi compressive strength, EPDM sealing element on the retainer, 200 deg F (minimum) at rated pressure, with NEMA grade G10 insulating sleeves and washers, and stainless steel backup washers.
- C. Acceptable products:
  - 1. Advance Products & Systems, Inc., APS Voltaccept™ Trojan G-10.
  - 2. GPT LineBacker® 61.
  - 3. Lamons Isoguard.
  - 4. Or equal as approved by the Engineer.

## PART 3 - EXECUTION

### 3.1 FLANGE BOLTING PROCEDURES

- A. All flange bolt torque values shall be verified using a properly calibrated torque wrench. The Assignee shall provide the torque wrench certificate of calibration upon request. Refer to Drawings 323-EA, 324-EA, and 325-EA for torque procedure details. Install the appropriate gasket.
- B. Install washers under both bolt heads and nuts. Verify that the OD of the washers does not extend past the OD of the flange.
- C. Coat bolt threads with anti-seize compound.

### 3.2 BOLTING APPLICATION SCHEDULE

- A. See Section 40 20 20 – Mechanical Piping.

END OF SECTION

## SECTION 05 12 00

### STRUCTURAL STEEL FRAMING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes: BFSS to furnish and Assignee to install structural steel elements as specified herein.
- B. Related sections:
  - 1. Section 01 45 27 – Shop Inspection.
  - 2. Section 05 05 24 – Shop and Field Welding.
  - 3. Section 05 50 00 – Metal Fabrications.

##### 1.2 QUALITY ASSURANCE

- A. Qualifications of Workers:
  - 1. A foreman experienced in the work being done shall be on the job at all times.
  - 2. The BFSS and Assignee shall qualify all welders and welding operators as specified in Section 05 05 24.
  - 3. Welds shall comply with the applicable provisions of Section 05 05 24 – Shop and Field Welding.
- B. Codes and Standards:
  - 1. All fabrication and erection of steel elements shall conform to AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings" and the "Code of Standard Practice for Steel Buildings and Bridges" except as modified by the applicable building codes, unless specified otherwise.
- C. Testing and Inspection:
  - 1. See Section 05 05 24 – Shop and Field Welding for welding inspection and testing requirements.
  - 2. The costs of all inspections and tests, including retests after repair, shall be borne by the BFSS for shop welding and Assignee for field welding.

D. Tolerances:

1. Tolerances and allowances shall be shown on the BFSS' erection or working drawings.

E. Mechanical Fasteners:

1. Mechanical fasteners may be added to the structural joints to facilitate field erection. But unless otherwise approved by the Engineer, these fasteners shall not allow the BFSS to waive the required welded connections shown in the structural drawings.

### 1.3 SUBMITTALS

- A. Submit all welding procedures and welder qualification records as specified in Section 05 05 24 – Shop and Field Welding.

- B. Submit certifications, mill tests, or reports from an approved independent testing laboratory for the conformance of structural steel to be used with the specified ASTM requirements.

C. Fabrication Drawings:

1. Submit fabrication drawings for Engineer's review prior to fabrication. Drawings shall not be reproductions of contract drawings. Include complete information for the fabrication and erection of the structure's components, including location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, cuts and cambers. Use AWS standard welding symbols.

D. Erection Drawings:

1. The drawings shall indicate methods of installation, the location of any item substitutions, and details requiring coordination and/or installation by other trades.

E. Substitutions Proposed by the BFSS:

1. Submit the information on substitutions for structural details shown in the drawings for the Engineer's approval. Submit complete design calculations for the substitutions for structural details signed by a California registered Civil or Structural Engineer.

### 1.4 PRODUCT HANDLING

- A. Store and protect materials in a manner to maintain identification, to prevent damage, and to prevent corrosion.

- B. In the event of damage, immediately make all repairs and replacements necessary as approved by the Engineer.

## 1.5 COORDINATION

- A. The Assignee shall coordinate installation of bucks, anchors, blocking, drains, pipes, electrical and mechanical work which is to be placed in or behind partition framing and allow such items to be installed after framing is complete, as appropriate with the BFSS.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Structural Steel: All hot rolled steel plates, shapes, sheet piling, and bars shall be new steel conforming to ASTM A6.
  - 1. Structural steel wide flange and WT-shapes, unless noted otherwise, shall conform to ASTM A992.
  - 2. Structural steel M-shapes, S-shapes, channels and angles, unless noted otherwise, shall conform to ASTM A36.
  - 3. Steel for structural tubes shall conform to ASTM A500, Grade B.
  - 4. Steel for structural pipe members shall conform to ASTM A53, Grade B.
- B. Miscellaneous metal accessories and structures:
  - 1. Steel for miscellaneous metal accessories and structures unless specified otherwise, shall conform to ASTM A992 or A36.
- C. Bolts for structural steel connections: ASTM A325, Type N.
- D. Anchor bolts: ASTM F1554, Grade 36.
- E. Anchor rods: Type 316 stainless steel per ASTM F593, Group 2.
- F. Galvanizing: All metal items situated in pits at any distance at all below main finish floor elevation shall be hot dip galvanized after fabrication.

## PART 3 - EXECUTION – TO BE PERFORMED BY ASSIGNEE

### 3.1 VERIFICATION

- A. Examine areas and conditions under which structural steel elements are to be installed.
- B. Correct conditions detrimental to the proper and timely completion of the work.

- C. Do not proceed until unsatisfactory conditions have been corrected to the Engineer's satisfaction.

### 3.2 FABRICATION

- A. BFSS to coordinate with Assignee such that all structural items shall be carefully fabricated to true dimensions without warp or twist. Welded closures shall be neatly made; and where weld material interferes with fit or is unsightly in appearance, it shall be ground off smooth. All structural steel shall be shop primed. See Section 09 96 56.05 – High-Build Epoxy Coatings:
  - 1. Certify that primers applied to metal surfaces in the shop are compatible with coating to be applied over such primers in the field.

### 3.3 INSPECTION

- A. All materials and workmanship will be inspected to ensure that both fully meet these specifications. Any work found deficient shall be replaced and brought up to full compliance with these specifications.
- B. Provide notification for Engineer to be present for fabrication. See Section 01 45 27 – Shop Inspection for inspection advance notification requirements and District travel expenses.

### 3.4 ERECTION AND INSTALLATION

- A. The Assignee shall take all measurements necessary and coordinate with BFSS to properly fit his work in the field. The Assignee and BFSS shall be responsible for the correct fitting of all metalwork in the field.
- B. Redrilling, reshaping, or forcing to fit any fabricated item will not be permitted. The Assignee shall be responsible for placing anchor bolts or other anchoring devices accurately and making any surfaces which bear against structural elements smooth and true to level. Provide manufacturer's data for installation and testing of anchorages.
- C. Structural items needing a special alignment to preserve straight, level, even, smooth lines shall be rigidly supported and braced and kept braced until concrete, grout, or dry pack cement mortar has hardened for period of not less than 7 calendar days.

END OF SECTION

SECTION 05 50 00  
METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:

1. Miscellaneous metals.
2. Associated accessories to the above items.

B. Related sections:

1. Section 09 96 00 – High Performance Coatings.
2. Section 40 20 20 – Mechanical Piping.

1.2 REFERENCES

A. Aluminum Association (AA):

1. DAF-45: Designations from Start to Finish:
  - a. M12-C22-A41.

B. American Association of State Highway and Transportation Officials (AASHTO):

1. Standard Specifications for Highway Bridges.

C. ASTM International (ASTM):

1. A36 – Standard Specification for Carbon Structural Steel.
2. A48 – Standard Specification for Gray Iron Castings.
3. A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded, and Seamless.
4. A240 – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels for General Applications.
5. A276 – Standard Specification for Stainless Steel Bars and Shapes.
6. A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

7. A380 – Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
8. A489 – Standard Specification for Carbon Steel Lifting Eyes.
9. A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
10. A501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
11. A635 – Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
12. A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
13. A992 – Standard Specification for Structural Steel Shapes.
14. B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
15. B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
16. B308 – Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
17. B429 – Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
18. F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
19. F3125 – Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength.

D. American Welding Society (AWS):

1. A2.4 – Standard Symbols for Welding, Brazing, and Nondestructive Examination.

E. National Association of Architectural Metal Manufacturers (NAAMM):

1. Metal Finishes Manual.

F. Occupational Safety and Health Administration (OSHA).

### 1.3 DEFINITIONS

A. Passivation: Removal of exogenous iron or iron compounds from the surface of a stainless steel by means of chemical dissolution resulting from treatment with an acid solution that removes the surface contamination but does not significantly affect the stainless steel itself.

### 1.4 SUBMITTALS

A. Product Data.

B. Shop drawings:

1. Miscellaneous metals.

C. Quality control submittals:

1. Design data.

2. Welding: See Section 05 05 24 for welding requirements.

## PART 2 PRODUCTS

### 2.1 MATERIALS

A. General: Unless otherwise specified or indicated on the Drawings, structural and miscellaneous metals in accordance with the standards of the ASTM, including the following:

Item	ASTM Standard No.	Class, Grade Type or Alloy No.
Steel		
Galvanized sheet iron or steel	A653	Coating G90
Coil (plate)	A635	--
Structural plate, bars, rolled shapes, and miscellaneous items (except W shapes).	A36	--
Rolled W shapes	A992	Grade 50



Item	ASTM Standard No.	Class, Grade Type or Alloy No.
Standard bolts, nuts, and washers	A307	--
High strength bolts, nuts, and hardened flat washers	F3125	Grade A325 or A490
Eyebolts	A489	Type 1
Tubing, cold-formed	A500	--
Tubing, hot-formed	A501	--
Steel pipe	A53	Grade B
Stainless Steel		
Plate, sheet, and strip	A240	Type 304* or 316**
Bars and shapes	A276	Type 304* or 316**
Bolts (Type 304)	F593	Group 1 Condition CW
Bolts (Type 316)	F593	Group 2 Condition CW
* Use Type 304L if material will be welded.		
** Use Type 316L if material will be welded.		

1. Stainless steels are designated by type or series defined by ASTM.
2. Where stainless steel is welded, use low-carbon stainless steel.

## 2.2 MANUFACTURED UNITS

### A. Miscellaneous stainless steel:

1. Provide miscellaneous stainless steel items not specified in this Section or specified elsewhere:
  - a. Fabricate and install in accordance with the best practices of the trade.
2. Cleaning and passivation:
  - a. Following shop fabrication of stainless steel members, clean and passivate fabrications.

- b. Finish requirements: Remove free iron, heat tint oxides, weld scale and other impurities, and obtain a passive finished surface.
- c. Provide quality control testing to verify effectiveness of cleaning agents and procedures and to confirm that finished surfaces are clean and passivated:
  - 1) Conduct sample runs using test specimens with proposed cleaning agents and procedures as required to avoid adverse effects on surface finishes and base materials.
- d. Pre-clean, chemically descale (pickle), and final clean fabrications in accordance with the requirements of ASTM A380 to remove deposited contaminants before shipping:
  - 1) Passivation by citric acid treatment is not allowed:
    - a) If degreasing is required before cleaning to remove scale or iron oxide, cleaning (pickling) treatments with citric acid are permissible; however, these treatments shall be followed by inorganic cleaners such as nitric-hydrofluoric acid.
  - 2) Provide acid descaling (pickling) in accordance with Table A1.1 of Annex A1 of ASTM A380.
  - 3) After pickling, final cleaning of stainless steel shall conform to Part II of Table A2.1 of Annex A2 of ASTM A380.
- e. After cleaning, inspect using methods specified for “gross inspection” in ASTM A380.
- f. Improperly or poorly cleaned and passivated materials shall not be shipped and will not be accepted at the job site.

B. Miscellaneous structural steel:

- 1. Provide miscellaneous steel items not specified in this Section as indicated on the Drawings or specified elsewhere.
  - a. Fabricate and install in accordance with the best practices of the trade.

## PART 3 EXECUTION – TO BE COMPLETED BY ASSIGNEE

### 3.1 EXAMINATION

A. Verification of conditions:

1. Examine work in place to verify that it is satisfactory to receive the work of this Section.
2. If unsatisfactory conditions exist, do not begin this work until such conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Assignee to install products provided by BFSS, and in accordance with shop drawings and manufacturer's printed instructions, as applicable except where specified otherwise.
- B. Welding
  1. Welds shall comply with the applicable provisions of Section 05 05 24.
  2. For welds that will be galvanized, welds shall have all sharp edges removed and be abrasive blasted. All slag and other weld irregularities such as overlap, undercut, and weld spatter shall be removed.
- C. Stainless Steel:
  1. Welding:
    - a. Assignee to passivate field-welded surfaces:
      - 1) Provide cleaning, pickling and passivating as specified in this Section.
      - 2) Clean using Derustit Stainless Steel Cleaner, or equal as approved by the Engineer.

END OF SECTION

SECTION 09 96 56.05  
HIGH-BUILD EPOXY COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Provide high-build epoxy coatings as shown on the drawings and as specified herein.
- B. Related sections:
  - 1. Section 01 33 00 – Submittal Procedures.
  - 2. Section 01 45 27 – Shop Inspection.
  - 3. Section 09 96 56.10 – Fusion-Bonded Epoxy Coatings.
  - 4. Section 09 96 57 – Mechanical and Electrical Coating Systems.

1.2 REFERENCES

- A. Good Painting Practice, SSPC Painting Manual, Volume 1.
- B. Systems and Specifications, SSPC Painting Manual, Volume 2:
  - 1. SSPC-SP 5 – White Metal Blast Cleaning.
  - 2. SSPC-SP 10 – Near White Blast Cleaning.
  - 3. SSPC-PA 1 – Shop, Field, & Maintenance Painting.
  - 4. SSPC-PA 2 – Procedure for Determining Conformance to Dry Coating Thickness Requirements.

1.3 SUBMITTALS

- A. Product data: Submit manufacturer's current specifications or technical information that proves compliance with the specified requirements.
- B. Manufacturer's instructions: Submit manufacturer's written instructions and recommendations for surface preparation, coating repair, application of coating system, curing of coating system, and maximum recoat time.

- C. Submit list of all coatings proposed for use:
  - 1. Identify each coating by product name and manufacturer, and indicate what items will be painted with the coating.

#### 1.4 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Applicator: Regularly engaged in application of similar coatings for at least two years immediately prior to this work.
  - 2. Workers: Experienced and knowledgeable in preparation for and application of high performance industrial coatings.
- B. Workmanship: Conform to standards and recommendations of SSPC Vol 1, especially Chapters 5.1 and 6.
- C. Weather conditions:
  - 1. Do not abrasive blast when ambient temperature is less than 5 degrees F above dew point.
  - 2. Apply coatings only when conditions are within the limits prescribed by the manufacturer but, in any case, do not apply coating when:
    - a. Metal temperature is less than 50 degrees F.
    - b. Ambient temperature is less than 5 degrees F above dew point.
    - c. Relative humidity is greater than 85 percent.
    - d. Ambient temperature is below 40 degrees F or expected to drop below 40 degrees F within 6 hours.

### PART 2 - PRODUCTS

#### 2.1 COATING SYSTEM MATERIALS

- A. Primer, intermediate, and finish coats shall be of same manufacturer.
- B. Coatings in contact with potable water shall be certified by the National Sanitation Foundation in accordance with ANSI/NSF Standard 61.
- C. Protective interior coatings for valves and hydrants shall conform to the requirements of American Water Works Association coating standard C550.
- D. Liquid-epoxy coating for the interior and exterior of steel water pipelines shall conform to the requirements of American Water Works Association coating standard C210.

E. Acceptable products (Water Contact):

1. High build epoxy coatings:

- a. Scotchkote 306, Scotchkote 314, 3M Corrosion Protection Products, (800) 722-6721.
- b. Amercoat 90HS, Amercoat 233ER, Amercoat 395FD, Amerlock 2, Amerlock 400, Pacific Southwest Coatings, (562) 691-9600 or (714) 777-0300.
- c. Series N140 Pota-Pox Plus, Series N140F Pota-Pox Plus Fast Cure, Tnemec Company, Inc., (800) 4863-6321.
- d. Carboguard 891 or Plasite 4500, Carboline Company, (800) 848-4645.
- e. Or equal as approved by the Engineer.

F. Acceptable products (Air Contact):

1. High build epoxy coatings:

- a. Carboguard 890 or Plasite 4500, Carboline Company, (800) 848-4645.
- b. Hi-Build Epoxy V78 Series, Valspar Corporation, (800) 637-7793.
- c. Tnemec Series N69, Tnemec Co., (707) 792-2646.
- d. Interseal 670 HS, International Protective Coatings. Local supplier: International Paint, (800) 821-2871.
- e. Bar-rust 235, Devoe Coatings Co., local supplier: ICI Paints Store, 3356 Piedmont Avenue, Oakland, CA 94611, (510) 547-4924.
- f. Or equal as approved by the Engineer.

G. Acceptable Products (Top Coat):

1. Urethane coatings (where urethane finish is specified):

- a. Tnemec Co. Series 1075 Urethane.
- b. Carbothane 134 VOC Aliphatic Urethane.
- c. Or equal as approved by the Engineer

H. Thinners and solvents as specified by the coating system manufacturer.

## PART 3 - EXECUTION

### 3.1 SURFACE PREPARATION

- A. Prepare surfaces to be coated in accordance with the manufacturer's instructions but not less than specified herein.
- B. Grind off weld beads, slag, projections, and weld spatter and grind sharp edges of all metal round and smooth, so that it is ready for painting.
- C. Surface preparation shall conform to the following:
  - 1. SSPC-SP 5 for surfaces which will be submerged or buried.
  - 2. SSPC-SP 10 for all other surfaces, except:
    - a. Pretreat galvanized surfaces in accordance with the manufacturer's recommendations.
  - 3. Anchor profile as recommended by coating system manufacturer. If manufacturer does not recommend, anchor profile shall be 1.5 to 3.0 mils.
- D. Blast cleaned surfaces shall be tested for soluble salts prior to the application of coatings. Chloride levels shall be  $10 \mu\text{g}/\text{cm}^2$  or less as determined using the "Chlor-test" method for chlorides or engineer approved equivalent. At least 3 tests shall be performed in each area of  $10 \text{ m}^2$  ( $100 \text{ ft}^2$ ). If any single test is greater than  $10 \mu\text{g}/\text{cm}^2$ , the area shall be water washed and re-blasted. It shall then be retested prior to coating application, and the same limits shall apply.
- E. Install an oil and moisture separator in air line between compressor and blast machine. Use Clemco Triplex filter or equal as approved by the Engineer.

### 3.2 APPLICATION

- A. Mix, thin, and apply all coatings in accordance with the manufacturer's instructions, the applicable requirements of SSPC-PA 1, and as specified herein.
- B. Surface to be painted shall have specified surface preparation at the time of application of coating.
- C. Minimum Dry Film Thickness (DFT) of coating system: 12 mils. Maximum DFT per manufacturer's data.
- D. Coating shall be free of holidays and pinholes.
- E. Apply coatings by air or airless spray except:
  - 1. Stripe all welds, edges, and repairs by brush prior to applying first full coat.

- F. Each coat shall be a different color than the preceding coat. Additional coats, where required, shall be tinted to provide color contrast but final coat shall be color specified.
- G. After each coat and immediately prior to application of a subsequent coat, clean surface as required to remove dirt, dust, overspray, and other contaminants that may affect adhesion of the subsequent coat.
- H. Discard all catalyzed coatings at the end of each work day or at end of manufacturer's recommended pot life, whichever is first.
- I. Final coat shall be well bonded, uniform in color over the entire surface, and smooth to touch with no sags, runs, overspray, cracks, or other surface defects.
- J. Coating repairs in shop:
  - 1. Touch up or refinish all chipped, abraded, or otherwise unsatisfactory portions of the work in accordance with the manufacturer's recommendations.

### 3.3 QUALITY CONTROL

- A. The District may inspect the surface preparation and the application of the coating system. Provide notification for Engineer to be present for abrasive blasting. See Section 01 45 27, Shop Inspection, for inspection advance notification requirements and District travel expenses.
- B. Furnish test equipment and personnel for testing.
- C. BFSS' tests shall be made in the presence of the Engineer. The Engineer may conduct its own coating tests at the shop and after installation.
- D. Measure coating thickness after each coat using non-destructive magnetic dry film gauges and in accordance with SSPC-PA 2.
- E. Adhesion:
  - 1. The adhesion of properly applied and cured coating shall be such that it cannot be removed except by sand or grit-blasting or by power brushing.
  - 2. The second coat shall show complete adhesion to the first coat 72 hours after its application.
  - 3. Adhesion will be determined by use of a sharp scraping tool.
  - 4. Cured coating shall show no peeling of coating from metal or separation between coats.



- F. Test all coated surfaces for holidays and pinholes after application of the final coat and before application of urethane topcoat (if required).
  - 1. Perform test after coating has cured as recommended by the manufacturer.
  - 2. As directed by the Engineer, use either a low voltage wet sponge holiday detector or a high voltage holiday detector.
    - a. Low voltage wet sponge holiday detector shall be equal as approved by the Engineer to K-D Bird Dog or Tinker-Razor M-1. Add a non-sudsing wetting agent, such as Eastman Kodak Photo-Flo to the water used to saturate the sponge.
    - b. High voltage holiday detector shall be equal as approved by the Engineer to Tinker-Razor AP-W or D. E. Stearns Model 14/20. Use in accordance with coating manufacturers recommendations except use voltage of 150 volts per mil of coating.
  - 3. Retest after coating repairs.

#### 3.4 FIELD REPAIR OF COATINGS – BY ASSIGNEE

- A. After installation of coated items, repair damaged areas and any gaps in shop-applied coatings. Gaps are typically from coating hold-back areas for field welds.
- B. Bare Metal: Prior to coating, prepare the bare metal surface per SSPC-SP3 by removing all loose mill scale, loose rust, loose paint, and other loose detrimental foreign matter by power wire brushing, power sanding, power grinding, power tool chipping, and power tool descaling.
- C. Feathered Coating Overlap: Prepare the shop applied coating next to the bare metal by using 80-grit sandpaper to roughen the coating and also uniformly feather the coating from full thickness at 1 inch minimum from the metal edge to bare metal at the metal edge.
- D. Debris left from power tool and sanding preparation shall be removed by blasting with compressed air.
- E. After preparation by power tool, then prepare surface per SSPC-SP1, by removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants from steel surfaces with solvent, vapor, cleaning compound, alkali, emulsifying agent, or steam.
- F. In cold weather, uniformly preheat the bare steel area prior to application as required by the coating manufacturer. The steel surface area temperature shall be measured to be at least 5 degrees-F higher than the measured air dew-point temperature in the work area.

- G. Coat the bare metal and feathered coating overlap areas with the shop coating manufacturer's recommended field repair material. Apply the number of coats as required to obtain a dry film thickness of 12 mils minimum, using brush or spray. Brush shall only be used for touch-up work of less than 3 sq-ft.
- H. Comply with recommendations of the coating manufacturer.

END OF SECTION

## SECTION 09 96 56.10

### FUSION-BONDED EPOXY COATINGS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes: Provide fusion-bonded epoxy coatings as shown on the drawings and as specified herein.
- B. Related sections:
  - 1. Section 01 45 27 – Shop Inspection.
  - 2. Section 09 96 56.05 – High-Build Epoxy Coatings.
  - 3. Section 09 96 57 – Mechanical and Electrical Coating Systems.
- C. Special requirements:
  - 1. Either electrostatic spray method or fluidized bed method of application may be used for shop coating of fabricated piping or miscellaneous metal:
    - a. Depth of fluidized bed shall be a minimum of one foot greater than the longest pipe section.

##### 1.2 REFERENCES

- A. SSPC-1 – Solvent Cleaning.
- B. SSPC-SP 5 – White Metal Blast Cleaning.
- C. SSPC-SP 11 – Power Tool Cleaning to Bare Metal.
- D. SSPC-PA 2 – Procedure for determining conformance to dry coating thickness requirements.
- E. AWWA C116-15 – Protective Fusion-Bonded Epoxy Coating for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings.
- F. AWWA C213-07 – Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.

##### 1.3 SUBMITTALS

- A. Product data: Submit manufacturer's current specifications or technical information that proves compliance with the specified requirements.

- B. Manufacturer's instructions: Submit manufacturer's written instructions and recommendations for field coating and repair of coating system.
- C. Submit list of all coatings proposed for use:
  - 1. Identify each coating by brand name and manufacturer and indicate what items will be painted with the coating.

#### 1.4 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Applicator: Regularly engaged in application of similar coatings for at least two years immediately prior to this work.
  - 2. Workers: Experienced and knowledgeable in preparation for and application of fusion-bonded epoxy coatings.

#### 1.5 JOB CONDITIONS

- A. Environmental conditions:
  - 1. Do not abrasive blast when ambient temperature is less than 5 degrees F above dew point.
  - 2. Apply coatings only when conditions are within the limits prescribe by the manufacturer but, in any case, do not apply coatings when:
    - a. Metal temperature is less than 425 degrees F for fluidized bed.
    - b. Metal temperature is below 55 degrees F for repair work.
    - c. Relative humidity is greater than 70 percent for fluidized bed.
    - d. Relative humidity is greater than 85 percent for repair work.
  - 3. The cleaned pipe surface shall be protected from conditions of high humidity, rainfall, and surface moisture. The pipe surface shall not be allowed to flash rust before coating.
- B. Safety:
  - 1. Comply with the applicable safety recommendations of SSPC-PA-Guide 3 and Good Painting Practice, Chapters 2.4 and 5.3.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Coating: 100 percent solids, fusion-bonded, thermo-setting resin powder.

- B. Approved products:
  - 1. Electrostatic spray: Scotchkote No. 134 (green), 3M.
  - 2. Fluidized bed: Scotchkote No. 203 or No. 206N, 3M.
  - 3. Or equal as approved by the Engineer.

## 2.2 APPROVED APPLICATORS

- A. California Pipe Fabricators, Dixon, CA, (707) 678-3069.
- B. U.S. Pipe Fabrication, Inc., Marysville, CA, (530) 742-5171.
- C. Reliable Powder Coating, San Leandro, CA, (510) 895-5551.
- D. Or equal that is certified by the manufacturer and approved by the Engineer.

## PART 3 - EXECUTION

### 3.1 SURFACE PREPARATION

- A. Prepare surfaces to be coated in accordance with manufacturer's written instructions, but not less than specified herein.
- B. Grind smooth all surface irregularities, welds, and weld spatter.
- C. Grind smooth and round all sharp metal edges.
- D. Abrasive blast surfaces to white metal in accordance with SSPC-SP 5.
- E. Surface anchor profile: 1.5 to 4.0 mils.
- F. Oxidation of the steel prior to coating in the form of "blueing" or other apparent oxide formation is not acceptable. If such oxidation occurs, the pipe shall be cooled to ambient temperature and re-cleaned.
- G. The heat surface shall not leave a residue or contamination on the pipe surface. Graduated "Tempilstik" crayons shall be used and supplied to the District by the BFSS or Assignee to measure the temperature. Only a small spot of pipe shall be touched with the "Tempilstik". Optical pyrometers may be used in addition to, or in lieu of "Tempilstik". The calibration of the optical pyrometer shall be checked at least twice daily.

### 3.2 COATING APPLICATION

- A. Preheating, coating application, and post-curing shall be in accordance with the coating manufacturer's instructions and AWWA C213.

- B. Dry film thickness of cured coating shall be 12 mils minimum (but not less than the coating manufacturer's recommendations), unless otherwise shown.
- C. Coating shall be free of holidays and pinholes.
- D. Finished coating shall be well bonded and have no sags and runs.

### 3.3 QUALITY CONTROL

- A. District may inspect surface preparation and application of the coating system. Provide notification for Engineer to be present for abrasive blasting. See Section 01 45 27 – Shop Inspection, for inspection advance notification requirements and District travel expenses.
- B. The finished coating shall be inspected and tested at the coating plant by the applicator for holidays and for coating thickness. All testing shall be done in the presence of the Engineer.
- C. Thickness shall be measured with a non-destructive paint film thickness gauge such as Mikrotest and in accordance with SSPC-PA 2, Procedure for determining conformance to dry coating thickness requirements.
- D. As directed by the Engineer, test using either a low voltage wet sponge holiday detector or a high voltage holiday detector:
  - 1. Low voltage wet sponge holiday detector, for coatings to 20 mils dry film thickness, shall be equal as approved by the Engineer to K-D Bird Dog or Tinker-Razor M-1. Add a non-sudsing wetting agent, such as Eastman Kodak Photo-Flo to the water used to saturate the sponge.
  - 2. High voltage holiday detector, for coatings more than 20 mils dry film thickness, shall be equal as approved by the Engineer to Tinker-Razor AP-W or D. E. Stearns Model 14/20. Use in accordance with coating manufacturer's recommendations except use voltage of 125 volts per mil of coating.
- E. The finished coating shall have the following physical properties:
  - 1. Adhesion test: 3,000 psi minimum when pulling the appropriate sized dolly from surface coating to which it has been adhered using a DeFelsko PosiTest Automatic Adhesion Tester Model AT-A, or equal as approved by the Engineer.
- F. Any work found deficient shall be repaired and brought to full compliance with these specifications. Retest after coating repairs.

### 3.4 FIELD REPAIR OF COATINGS – BY ASSIGNEE

- A. After installation of coated items, repair damaged areas and any gaps in shop-applied coatings. Gaps are typically from coating hold-back areas for field welds.
- B. Bare Metal: Prior to coating, prepare the bare metal surface per SSPC-SP3 by removing all loose mill scale, loose rust, loose paint, and other loose detrimental foreign matter by power wire brushing, power sanding, power grinding, power tool chipping, and power tool descaling.
- C. Feathered Coating Overlap: Prepare the shop applied coating next to the bare metal by using 80-grit sandpaper to roughen the coating and also uniformly feather the coating from full thickness at 1 inch minimum from the metal edge to bare metal at the metal edge.
- D. Debris left from power tool and sanding preparation shall be removed by compressed air blast.
- E. After preparation by power tool, then prepare surface per SSPC-SP1, by removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants from steel surfaces with solvent, vapor, cleaning compound, alkali, emulsifying agent, or steam.
- F. In cold weather, uniformly preheat the bare steel area prior to application as required by the coating manufacturer. The steel surface area temperature shall be measured to be at least 5 degree-F higher than the measured air dew-point temperature in the work area.
- G. Coat the bare metal and tapered coating overlap areas with the shop coating manufacturer's recommended field repair material. Apply the number of coats as required to obtain a dry film thickness of 12 mils minimum, using brush or spray. Brush shall only be used for touch-up work of less than 3 square-feet.
- H. Comply with recommendations of the coating manufacturer.

END OF SECTION

## SECTION 09 96 57

### MECHANICAL AND ELECTRICAL COATING SYSTEMS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section includes:

1. Coat the steel and cast/ductile iron surfaces as indicated on the drawings and as specified herein.

###### B. Related sections:

1. Section 01 33 00 – Submittal Procedures.
2. Section 01 35 44 – Environmental Requirements.
3. Section 01 45 27 – Shop Inspection.
4. Section 09 96 56.05 – High-Build Epoxy Coatings.
5. Section 09 96 56.10 – Fusion Bonded Epoxy Coatings.

##### 1.2 REFERENCES

###### A. Good Painting Practice, SSPC Painting Manual, Volume 1.

###### B. Systems and Specifications, SSPC Painting Manual, Volume 2:

1. SSPC-SP 1 Solvent Cleaning.
2. SSPC-SP 3 Power Tool Cleaning.
3. SSPC-SP 6 Commercial Blast Cleaning.
4. SSPC-SP 10 Near-White Blast Cleaning.
5. SSPC-PA 1 Shop, Field, & Maintenance Painting.
6. SSPC-PA 2 Measurement of Dry Paint Thickness with Magnetic Gages.
7. SSPC-PA 3 Guide to Safety in Paint Application Guide.
8. SSPC-Vis 1 Pictorial Surface Preparation Standards for Painting Steel Surfaces.
9. SSPC-AB1 Mineral and Slag Abrasives.



10. SSPC-Vis 1 Pictorial Surface preparation Standards for Painting Steel Surfaces.

11. NSF International (NSF): 61 - Drinking Water System Components - Health Effects.

### 1.3 SUBMITTALS

#### A. Product data:

1. Submit list of materials to be provided. Include coatings, thinner, bond solvent, and abrasive blast material.
2. Submit manufacturer's current specifications or technical information that proves compliance with the specified requirements.

#### B. Manufacturer's instructions:

1. Submit manufacturer's written instructions and recommendations for surface preparation, coating repair, application equipment, application of coating system, ventilation, and curing of coating system. Include minimum and maximum surface temperature, maximum time to recoat without special preparation of paint surface, special preparation of paint surface when maximum recoat time has been exceeded, and curing required prior to holiday detector test.
2. Submit manufacturer's recommended product storage temperature range.

#### C. Submit list of all coatings proposed for use:

1. Identify each coating by brand name and manufacturer and identify which items will be painted with the coating.

### 1.4 QUALITY ASSURANCE

#### A. Qualifications:

1. Applicator: Regularly engaged in application of similar coatings for at least two years immediately prior to this work.
2. Workers: Experienced and knowledgeable in preparation for and application of high-performance industrial coatings.

#### B. Workmanship: Conform to standards and recommendations of SSPC Vol 1, especially Chapters 5.1 and 6.

C. Materials handling and use:

1. Paint shall be labeled and used in accordance with SSPC-PA 1, Paragraphs 5.1.1 through 5.1.5.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Deliver coating system materials in original, unopened containers with seals unbroken and labels intact.

B. Storage:

1. Store materials in a single approved location.
2. Store materials at a temperature within the manufacturer recommended range.
3. Keep storage location clean, neat, and free of fire hazards.

C. Handling:

1. Do not spill thinners, solvents, paint products or other materials that contain toxic substances.
2. Remove discarded thinners, solvents, and paint products from the job site daily.

1.6 JOB CONDITIONS

A. Weather conditions:

1. Apply coatings only when conditions are within the limits prescribed by the manufacturer but, in any case, do not apply coating when:
  - a. Metal temperature is less than 50 degrees F.
  - b. Metal temperature is above 120 degrees F.
  - c. Ambient temperature is less than 5 degrees F above dew point.
  - d. Relative humidity is greater than 85 percent.
  - e. Ambient temperature is below 40 degrees F or expected to drop below 40 degrees F within 6 hours.

B. Safety:

1. Comply with the requirements of the latest edition of "Construction Safety Orders" by the California Department of Industrial Relations, and, in particular, with Sections 1530 and 1531 of such orders.

2. Comply with the requirements of the latest edition of "General Industry Safety Orders" by the California Department of Industrial Relations, and, in particular, with Article 1.08 of such orders.
3. Comply with the applicable safety recommendations of SSPC-PA-Guide 3 and Good Painting Practice, Chapters 2.4 and 5.3.
4. Comply with the requirements of all other applicable safety orders, codes, ordinances, or laws.

## PART 2 - PRODUCTS

### 2.1 COATING SYSTEM MATERIALS

#### A. Piping and miscellaneous interior steel and cast/ductile iron:

##### 1. System No. 1:

- a. Primer: High-Build Epoxy Coatings per Section 09 96 56.05, or Fusion-Bonded Coatings per Section 09 96 56.10.
- b. Finish: Tnemec Co. Series 1075 Urethane or equal as approved by the Engineer.

#### B. Miscellaneous exterior steel and cast/ductile iron:

##### 1. System No. 2:

- a. Primer: High-Build Epoxy Coatings per Section 09 96 56.05.
- b. Finish: Tnemec Co. Series 1075 Urethane or equal as approved by the Engineer.

C. Thinners and solvents shall be as specified by the coating system manufacturer. No substitutions will be permitted.

D. The Engineer will select finish coating color during construction.

E. Primer, intermediate, and finish coats shall be of same coating manufacturer.

F. All coatings immersed in drinking water or water that will become drinking water shall be listed under NSF-61 for use in direct contact with potable water.

## PART 3 - EXECUTION

### 3.1 GENERAL

A. Prepare surfaces to be coated in accordance with the manufacturer's instructions but not less than specified herein.

- B. Blast cleaning. Prepare all metal surfaces by abrasive blast cleaning in accordance with the specified standard and to the specified surface profile:
  - 1. Piping and miscellaneous interior steel: SSPC-SP 10 with a surface profile of 1.5 to 3.0 mils.
  - 2. Miscellaneous exterior steel: SSPC-SP 6 with a surface profile of 1.5 to 3.0 mils.
- C. Defects in steel:
  - 1. Repair defects in steel exposed during cleaning.
  - 2. Repair prior to coating.
  - 3. Remove any defects having a depth less than or equal to 12.5 percent of the nominal thickness of the steel by grinding to a smooth contour.
  - 4. Repair defects deeper than 12.5 percent of nominal thickness of steel by repair welding and grinding smooth.
- D. Mix, thin, and apply all coatings in accordance with the manufacturer's instructions, the applicable requirements of SSPC-PA 1, and as specified herein:
  - 1. Any coating found to be thinned or reduced with thinner or solvent other than manufacturer's recommended thinner shall be rejected.
  - 2. Rejected areas shall be abrasive blasted in accordance with paragraph B. above, prior to recoating.
- E. Dry Film Thickness (DFT) of coating system:
  - 1. System No. 1:
    - a. Primer: See Sections 09 96 56.05 and 09 96 56.10.
    - b. Finish: 4.0 mils minimum to 6.0 mils maximum.
    - c. Minimum total DFT: 16.0 mils.
  - 2. System No. 2:
    - a. Primer: See Section 09 96 56.05.
    - b. Finish: 4.0 mils minimum to 6.0 mils maximum.
    - c. Minimum total DFT: 14.0 mils.
  - 3. Additional coats may be required to achieve specified minimum dry film thickness.

- F. All metal surfaces shall be coated except galvanized surfaces, stainless steel, and non-ferrous metals.

### 3.2 SHOP COATING

- A. Apply prime coat to all piping and miscellaneous steel.
- B. Conform to all applicable provisions of this Section.

### 3.3 SHOP QUALITY CONTROL

- A. The Engineer will have an inspector at the shop during the abrasive blasting and priming operation to inspect the surface preparation and the application of the prime coat. The Engineer may extend the inspector's stay should it consider additional inspection necessary.
- B. Provide notification for Engineer to be present for abrasive blasting. See Section 01 45 27, Shop Inspection, for inspection advance notification requirements and District travel expenses.

### 3.4 FIELD EXAMINATION – TO BE PERFORMED BY ASSIGNEE

- A. Verify that all required field welding has been performed.
- B. Verify that all welds and sharp edges have been ground off and that all surface imperfections have been removed.

### 3.5 FIELD PREPARATION – TO BE PERFORMED BY ASSIGNEE

- A. Solvent cleaning: Remove all visible oil, grease, dirt, and other soluble contaminants using the methods of SSPC-SP 1.
- B. Power tool cleaning. Prepare all metal surfaces not shop primed, and all areas where damage to the coating penetrates the prime coat, by power tool cleaning in accordance with SSPC-SP 3.
- C. Clean and roughen all shop primed surfaces after installation and prior to painting. Roughen by light hand sanding. Do not cut through the prime coat.
- D. Mask-off and protect all exposed machined metal surfaces.
- E. Remove all dust and abrasive from surfaces by brushing or blowing with clean dry air.
- F. Silica sand shall not be used for field abrasive blasting.

### 3.6 APPLICATION

#### A. General:

1. Apply finish coatings by air or airless spray except:
  - a. Small areas, less than 3 sq. ft., may be brushed.
  - b. Brush striping of welds and edges.
2. After each coat and immediately prior to application of a subsequent coat, clean surface as required to remove dirt, dust, overspray, and other contaminants that may affect adhesion of the subsequent coat.
3. Each coat shall be a different color than the preceding coat. Additional coats, where required, shall be tinted to provide color contrast but final coat shall be color specified.
4. Final coat shall be uniform in color over the entire surface. Final coat shall be smooth to touch with no sags, runs, overspray, cracks, or other surface defects.
5. Discard all catalyzed coatings at the end of each work day or at end of manufacturer's recommended pot life, whichever is first.

#### B. Field painting, to be performed by Assignee:

1. Recoat or touch-up all damaged shop primed surfaces after installation. Recoating or touch-up shall be in accordance with primer manufacturer's recommendations.
2. Stripe welds and edges by brush prior to applying first full coat.

#### C. Coating repairs:

1. Touch up or refinish all chipped, abraded, or otherwise unsatisfactory portions of the work in accordance with the manufacturer's recommendations.

### 3.7 QUALITY CONTROL

#### A. Measure relative humidity and metal surface temperature and determine dew point each day prior to painting. Repeat measurements as often as the Engineer deems necessary but not less often than every four hours:

1. Engineer will also measure relative humidity and metal surface temperature and determine dew point at least once each day that painting is performed.

#### B. Engineer will evaluate surface preparation using SSPC-Vis 1 and replica tapes. Evaluation of cleanliness will be made immediately prior to coating application.

- C. Verify cleanliness of all spray application equipment prior to, or no later than, time of mixing coating material.
- D. Measure the coating thickness after each coat using non-destructive magnetic dry film gauges:
  - 1. Measurements shall be in accordance with SSPC-PA 2.
  - 2. Engineer will also measure coating thickness, at random locations, after each coat.
- E. Engineer will evaluate cleanliness of coated surface immediately prior to application of a subsequent coat.
- F. Assignee shall test all coated surfaces for pinholes and holidays after application of the final coat:
  - 1. Perform test in presence of Engineer.
  - 2. Perform test after coating has cured 1 to 5 days.
  - 3. As directed by the Engineer, use either a low voltage wet sponge holiday detector or a high voltage holiday detector:
    - a. Low voltage wet sponge holiday detector shall be K-D Bird Dog or Tinker-Razor M-1 or equal as approved by the Engineer. Add a non-sudsing wetting agent, such as Eastman Kodak Photo-Flo to the water used to saturate the sponge.
    - b. High voltage holiday detector shall be Tinker-Razor AP-W or D. E. Stearns Model 14/20 or equal as approved by the Engineer, for coatings greater than 20 mil thickness. Use in accordance with coating manufacturer's recommendations except use voltage of 150 volts per mil of coating.
  - 4. Retest after coating repairs.

### 3.8 CURING

- A. Cure all coatings in accordance with manufacturer's instructions.

### 3.9 CLEAN UP

- A. Upon completion, make a detailed inspection of all work.
- B. Remove all spattering, spits, and blemishes caused by work under this section.

- C. Upon completion, remove from the premises all surplus paint materials, abrasive blast materials, equipment, rubbish, and debris resulting from work under this section:
  - 1. Remove spent abrasive blast material in accordance with Section 01 35 44 – Environmental Requirements.
- D. Clean dust, dirt, and other contaminants from all painted surfaces.

END OF SECTION



## SECTION 26 05 83

### LOW VOLTAGE MOTORS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section includes:

1. AC Motors, up to 500 horsepower, furnished under other Sections of these Specifications, shall be in conformance with the requirements listed in this Section unless otherwise noted.

###### B. Related sections:

1. Section 01 33 00 – Submittal Procedures.
2. Section 01 35 24 – Project Safety Requirements.
3. Section 01 75 17 – Field Testing and Startup.

##### 1.2 REFERENCES

###### A. Motors shall be designed, built, tested, and installed in accordance with the latest editions and revisions of the following:

1. Acoustical Society of America (ASA):
  - a. ANSI/ASA S12.51, Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Precision methods for reverberation test rooms.
2. American Petroleum Institute (API):
  - a. ANSI/API Standard 610 – Centrifugal Pumps for Petroleum, Petrochemical, and Natural Gas Industries.
3. Institute of Electrical and Electronics Engineers (IEEE):
  - a. IEEE Std 43 – IEEE Recommended Practice for Testing Insulation Resistance of Electric Machinery.
  - b. IEEE Std 112 – Standard Test Procedure for Polyphase Induction Motors and Generators.
  - c. IEEE Std 114 – Standard Test Procedures for Single-Phase Induction Motors.

- d. IEEE Std 841 – IEEE Standard for Petroleum and Chemical Industry – Severe Duty Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors – Up To and Including 370 KW (500 HP).
- 4. National Electrical Contractors Association (NECA):
  - a. ANSI/NECA 230 – Standard for Selection, Installing, and Maintaining Electric Motors and Motor Controllers.
- 5. National Electrical Manufacturers Association (NEMA):
  - a. NEMA MG1– Motors and Generators.

### 1.3 SUBMITTALS

- A. Submittals shall be made in accordance with Section 01 33 00.
- B. Provide the following submittal documentation:
  - 1. Clearly mark on submittals that the motors being supplied meet or exceed the requirements of IEEE Std 841.
  - 2. For vertical motors where not all IEEE Std 841 features can be applied, motors shall be designed and labeled as “Meet the Intent” of IEEE-841.
  - 3. Descriptive bulletins, including manufacturer's technical data on features, performance, electrical ratings, and characteristics.
  - 4. Complete nameplate data.
  - 5. Motor dimensioned outline drawing, mounting details, weight, location and size of conduit boxes, location of conduit entries.
  - 6. Motor performance data sheet.
  - 7. Manufacturer’s installation and maintenance manual showing details relating to shipment, handling, storage, foundation requirements, initial installation, normal operation, doweling, disassembly, reassembly, lubrication, recommended renewal parts and procedure to obtain service, relevant cutaway drawings, and troubleshooting matrix.
  - 8. Manufacturer’s recommended renewal parts list. Include both the bearing manufacturer’s and motor manufacturer’s part number for the ODE and DE bearings, along with the current list price for each bearing.
  - 9. Diagrams, including motor lead wiring connection, space heater connection, and temperature detector connection.

- C. Provide the following “typical” prototype performance test data for each motor specified:
1. Speed-torque and speed-current curves at 80 percent and 100 percent nominal line voltage, from zero speed to synchronous speed.
  2. Bearing and winding temperature rise tests at rated horsepower.
  3. Amperes at SF, 100 percent, 75 percent, 50 percent, and 25 percent of full load; no-load amperes; and locked rotor amperes.
  4. Efficiency at SF, 100 percent, 75 percent, 50 percent, and 25 percent of full load.
  5. Power factor at SF, 100 percent, 75 percent, 50 percent, and 25 percent of full load.
  6. Airborne sound power in dBA.
- D. Provide the following additional “typical” test reports:
1. Bearing life calculation.
  2. Acceleration time vs. amperes curve:
    - a. The driven equipment supplier shall provide the load  $WK^2$  and load speed vs. torque curve to the motor supplier in order to construct this curve. Provide curves at 80 percent and 100 percent nominal line voltage.
  3. Equivalent circuit parameters (slip,  $I_1$ ,  $I_2$ ,  $R_1$ ,  $X_1$ ,  $R_2/s$ ,  $X_2$ , and  $X_m$  at both full-load and locked rotor). Include the following additional data:
    - a. Total R, X, Z, and X/R ratio.
    - b. AC time constant.
    - c. DC time constant.
    - d. Open circuit time constant.
    - e. Subtransient reactance.
    - f. R1T at 25 degrees C.
  4. Safe stall time (hot) / thermal limit curve, logarithmic inverse time versus. percent full load current curve.

5. Torsional analysis data:
    - a. Shaft torsional stiffness.
    - b. Effective diameter of shaft extension with keyway.
- E. Factory Testing:
1. All factory testing will be unwitnessed.
  2. Provide the following factory test reports for the actual motor provided (i.e., not typical or calculated data):
    - a. IEEE 841 tests:
      - 1) Winding resistance at 25 degrees C.
      - 2) No-load current, watts, frequency, and speed at rated voltage and frequency.
      - 3) Locked rotor voltage, current, and frequency.
      - 4) Bearing inspection pass/fail.
      - 5) Vibration test pass/fail.
      - 6) High-potential test.
      - 7) Unfiltered vibration velocity in inches/second at no-load, with two readings perpendicular to each other in the radial plane at the DE and ODE bearings as follows (12 total unfiltered radial plane vibration readings):
        - a) Overall.
        - b) 2x RPM.
        - c) 2x line frequency.
      - 8) Unfiltered axial vibration velocity at the ODE bearing.
    - b. Complete test meeting IEEE Standard 112, Method B:
      - 1) Full-load heat run, including temperature rise and winding resistance.
      - 2) Slip, no-load current, locked rotor current and torque, breakdown torque (calculated), and efficiency and power factor at 100 percent, 75 percent, and 50 percent full load.

- 3) Insulation resistance per IEEE Standard 43.
  - 4) Winding resistance at 25 degrees C.
  - c. Sound test performed at no-load per ANSI S12.51 and NEMA MG-1.
  - d. API-610 flange mounting tolerances:
    - 1) Shaft, face, and register runout (TIR) and end play.
    - 2) Shaft extension diameter measurements at minimum five equally spaced intervals.
  - e. If the driven equipment specifications require using the actual job motors for the pump factory performance test, the unwitnessed factory test reports shall be submitted approved by the Engineer prior to shipment of the motors.
- F. A completed data sheet for each motor in the project is required. All data fields should be filled out by the motor and driven equipment vendors. The data sheet at the end of this specification should be used.

#### 1.4 QUALITY ASSURANCE

- A. Single speed, totally enclosed fan cooled, squirrel-cage polyphase induction motors shall be designed and manufactured in accordance with the latest version of IEEE Standard 841.
- B. Unless noted otherwise herein, routine tests shall be performed on representative motors in accordance with IEEE Standard 112 and shall include the information described on NEMA MG1-Part 12. Efficiency shall be determined in accordance with IEEE Publication No. 112, Method B. Power factor shall be measured on representative motors.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery, Handling, and Unloading:
  1. Handle the motor in accordance with the manufacturer's installation, operation, and maintenance manual. Equipment needed to handle motors in the frame size of this specification typically includes a hoist and spreader bar arrangement of sufficient strength to lift the motor safely using the lifting lugs or eyebolts on the machine.
  2. For motors with oil lubricated bearings, do not move motors with oil sumps filled.

B. Acceptance at Site:

1. Upon receipt of the motor, carefully inspect the unit for any signs of damage that may have occurred during shipment.

C. Storage and Protection:

1. Work with the District Construction Inspector to make sure heaters are energized, shafts are rotated, lubrication is properly applied, etc.
2. Store motors indoors in a clean, dry location with space heaters energized to preclude moisture buildup. Connect heaters upon delivery of the motor.
3. Cover the motors with a canvas tarpaulin. Do not wrap the motor in plastic. The cover shall extend to the ground and fit loosely over the motor to allow the captive air space to breath, minimizing the formation of condensation.
4. Coat all machined surfaces, including the shaft extension, with rust preventative material, Rust Veto No. 342 by E.F. Houghton, Co., or equal. Check the coating every month and re-coat as necessary.
5. Rotate the shaft once a month to maintain lubricant film on the bearing races and journals.
6. Bearings:
  - a. Grease:
    - 1) Completely fill grease lubricated cavities with the lubricant specified in the manufacturer's installation, operation, and maintenance manual. Remove the drain plug and fill cavity with grease until grease begins to purge from the drain opening.
    - 2) Inspect grease monthly for moisture and oxidation by purging a small quantity of grease through the drain. If any contamination is present, completely remove and replace the grease.
  - b. Oil:
    - 1) Oil lubricated motors are shipped without oil. Upon delivery of the motor, fill the oil sumps to the maximum capacity indicated on the oil chamber sight gauge window with the oil specified in the manufacturer's installation, operation, and maintenance manual.
    - 2) Do not move the motor with oil in the reservoir. Drain oil before moving to prevent sloshing.

- 3) Apply new thread sealant, Gasoila No. SS08 or equal, to the threads of the drain plug and inside the drain hole each time oil is drained and refilled.
- 4) Inspect oil monthly for evidence of moisture or oxidation. Replace the oil whenever contamination is evident or every twelve months in storage or non-operation, whichever occurs first.

7. Insulation resistance testing:

- a. Disconnect all external accessories that have leads connected to the winding and connect them to a common ground. Connect all other accessories that are in contact with the winding to a common ground.
- b. Perform a one minute insulation resistance test on the winding using 500 VDC for one minute. Correct the reading to 40 degrees C. The minimum acceptable insulation resistance is 5 megohms.
- c. Perform a polarization index (PI) test by taking the ratio of a 10-minute reading to the one minute reading. The minimum acceptable PI is 2.0. If the one-minute insulation resistance reading corrected to 40 degrees C is above 5,000 megohms, disregard the PI reading.

## 1.6 COMMISSIONING

- A. Commission the equipment as specified in Section 01 75 17.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Nidec.
- B. Toshiba.
- C. Siemens.
- D. ABB.
- E. Or equal as approved by the Engineer.

### 2.2 RATING

- A. Each motor shall develop ample torque for its required service throughout its acceleration range at a voltage 10 percent below nameplate rating. Where shown on the drawings or required in the specifications to be operated on a reduced voltage motor starter or variable frequency drive, the motor shall develop ample torque under the conditions imposed by the starting method.

- B. Motors shall not be required to deliver more than its rated nameplate horsepower, at unity (1.0) service factor, under any condition of mechanical or hydraulic loading.
- C. All motors shall be continuous time rated for operation at 40 degrees C ambient and altitudes less than 1,000 meters unless noted otherwise.
- D. Specific motor data such as horsepower, RPM, etc., is specified under the detailed specification for the mechanical equipment with which the motor is supplied.

## 2.3 THREE-PHASE MOTORS

### A. General:

- 1. Unless otherwise specified, motors 1/2-horsepower and larger shall be 3-phase, squirrel cage, induction type.
- 2. Motors one horsepower and above shall meet or exceed the requirements of IEEE 841.
- 3. Unless otherwise specified, the standard voltage rating for all motors shall be 460V at 60Hz, 3-phase.
- 4. Unless otherwise required by the load, all polyphase motors shall be NEMA premium efficiency NEMA Design B and provide normal starting torque. Locked rotor KVA/HP shall not exceed Code Letter G as described in NEMA Standard MG110.37 for motors 20 HP and larger.
- 5. Unless otherwise specified in the driven equipment specifications, vertical motors shall be provided in the vertical solid shaft configuration.

### B. Required features and accessories:

- 1. Motors one horsepower and above shall have the following IEEE-841 features:
  - a. NEMA Premium efficiency:
    - 1) Include thrust-bearing losses in the motor efficiency calculation.
  - b. Corrosion resistant cast iron construction with TEFC enclosure.
  - c. Non-wearing, non-contacting, radial-axial labyrinth bearing isolator (INPRO/SEAL) on both ends for a horizontal motor.
  - d. Non-wearing, non-contacting, radial-axial labyrinth bearing isolator (INPRO/SEAL) on the shaft extension end for a vertical motor.
  - e. 1.15 service factor.
  - f. Ground lug in conduit box.



- g. Ground terminal on frame.
  - h. Class F insulation with Class B (80 deg C) rise at 1.0 Service Factor for TEFC enclosures (Resistance Method).
  - i. Special (“refined”) balance – 0.08 inches/second peak maximum vibration.
  - j. Special shaft run-out (“1/2 NEMA”) tolerance – 0.001 inches maximum.
  - k. Oversized main conduit box.
  - l. NEMA Design B.
  - m. Non-witnessed IEEE 841 enhanced no-load test.
  - n. AFBMA bearing numbers stamped on the motor nameplate.
  - o. 50,000 hour bearing L-10 life:
    - 1) The driven equipment supplier shall provide thrust loads to the motor supplier.
  - p. Warranty:
    - 1) For Frame 447 and smaller: five years from date of installation.
    - 2) For Frame 449 and larger: two years from date of installation.
2. Provide insulation treatment of two cycles of vacuum pressure impregnation of 100 percent solid epoxy resins. Insulation treatment shall meet the NEMA definition for moisture-resistant winding per NEMA MG1-1.27.1.
  3. For motors 40 hp and larger, provide a separate, dedicated, accessory conduit terminal box with terminal strip connectors to terminate the leads of space heaters and thermal protection devices.
  4. Provide 120 V single-phase space heaters for all three-phase motors.
  5. Thermal protection:
    - a. Motors < 250 hp:
      - 1) Provide factory installed, embedded, bi-metallic temperature switches with leads terminating in the main conduit box or separate accessory conduit box, where specified herein. The switches shall have normally closed contacts. Provide three detectors for each motor, one switch per phase. These devices shall protect the motor against damage from overheating caused by single phasing,

overload, high ambient temperature, abnormal voltage, locked rotor, frequent starts or ventilation failure.

b. Motors 250 hp and larger:

1) Stator winding:

- a) Provide two resistance temperature detectors (RTDs) per phase, six per motor. RTDs shall be three-wire, platinum, 100 ohms. Connect leads to terminal strip connectors in an accessory conduit box.

2) Bearings:

- a) Provide one resistance temperature detector (RTD) per bearing, two per motor. RTDs shall be three-wire, platinum, 100 ohms. Connect leads to terminal strip connectors in an accessory conduit box.

6. Finishes:

- a. For distribution pumping plant applications, provide safety yellow enamel exterior finish coating, Federal Standard color No. 13591.
- b. For all other applications, provide safety orange enamel exterior finish coating, ANSI Munsell Spec 5.0YR-6.0/15.

C. Variable Frequency Drive (VFD) applications:

1. Polyphase motors for use with variable frequency drives shall be rated as definite-purpose inverter fed as defined under NEMA MG-1, Part 31.
2. Provide a shaft grounding ring for all VFD-driven motors regardless of size:
- a. Acceptable manufacturers:
- 1) AEGIS SGR.
- 2) INPRO/SEAL CDR.
- 3) Or equal as approved by the Engineer.
3. For VFD-driven motors larger than 100 HP, provide an insulated bearing on the opposite drive end of the motor in order to break the circulating bearing current path.

D. Fractional Horsepower Motors:

1. Fractional horsepower motors shall be premium-efficiency type, TEFC, with a 1.15 service factor.

2.4 SINGLE-PHASE MOTORS

- A. Unless otherwise specified, motors smaller than 1/2 horsepower shall be single phase, capacitor start, with TEFC enclosure. Small fan motors may be split-phase or shaded pole type if such are standard for the equipment. Wound rotor or commutator type single-phase motors are not acceptable unless their specific characteristics are necessary for the application.
- B. Motors shall be rated for operation at 115 or 208 volts, single phase, 60 Hz.
- C. Locked rotor current shall not be greater than specified in NEMA Standard MG1-Part 12, Design "N".
- D. Motors shall be totally-enclosed in conformance with NEMA Standard MG1-Part 1.
- E. Motors shall be provided with sealed ball bearings lubricated for 10 years normal use.

PART 3 - EXECUTION – TO BE PERFORMED BY ASSIGNEE

3.1 PREPARATION

- A. Inspect, clean, and restore the motor to the “as-shipped” condition.
- B. If the motor has been subject to vibration during storage, disassemble and inspect each bearing for damage.
- C. When storage time has been six months or more, change the lubrication (oil and/or grease). For motors with oil lubricated bearings, do not move the motor with oil in the reservoir.

3.2 INSTALLATION

- A. Install all motors in accordance with the manufacturer's printed recommendations and as required under the specific specification sections for the driven equipment.
- B. Bolt the motor to the equipment or rigid foundation using bolts of the largest size permitted by the holes in the motor bracket. Do not install motors in such a way as to restrict motor ventilation.

3.3 PRE-ENERGIZATION CHECKOUT

- A. Conduct a complete inspection of each motor, including checking all accessible connections for tightness and correct torque.

- B. Before replacing terminal box covers, verify that all raceways and conductors are identified and tagged in accordance with the contract drawings and the Assignee's approved interconnection diagrams.
- C. Insulation Resistance Test:
  - 1. Prior to insulation resistance test, remove control power fuses and any other equipment that should not be subjected to DC high potential voltage.
  - 2. Perform an insulation resistance (megger) test on each 480 VAC motor using 1,000 VDC, phase-to-phase and phase-to-ground. Use 500 VDC for motors operating at less than 480 VAC.
  - 3. Replace any fuses removed and reconnect all equipment after this test has been completed.
- D. If possible, remove the external load and turn the shaft by hand to ensure free rotation.

#### 3.4 CLEANING

- A. After the pre-energization checkout has been completed, remove dirt, dust, or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean, lint-free rags. Do not use compressed air.
- B. Replace all covers, and check for pinched wires.

#### 3.5 ENERGIZATION

- A. Only qualified persons shall energize motors for the first time. Assignee's personnel energizing equipment shall have documented and current training for this task as required by NFPA 70E, Article 110.2 (2023 Edition). Reference also the general electrical safety-related work practice requirements in Section 01 35 24.

#### 3.6 SUPPLEMENTS

- A. The following supplements follow END OF SECTION are a part of this section:
  - 1. IEEE-841 Data Sheet for AC Squirrel Cage Induction Motors.
  - 2. Low Voltage Motors Storage Form.

- B. During the submittal process, the motor and driven equipment vendors shall complete all data fields in the IEEE-841 Data Sheet for AC Squirrel Cage Induction Motors 370 kW(500 hp) and below. Complete individual forms for each type of motor on the project.
- C. The Assignee shall use the Low-Voltage Motors Storage Form to document proper storage for each motor on the project during prior to initial energization. Complete individual forms for each motor on the project.

END OF SECTION

# IEEE-841 Data Sheet for AC Squirrel Cage Induction Motors [370 kW(500 hp) and below]

Client: EBMUD  
 Project Title: Specification XXXX  
 Location:  
 Unit:

Engineering Org:  
 Location:  
 Contract No.:  
 Specifier Name:

Spec. No.:  
 Date:  
 Equip No.:  
 Tele. No.:  
 P.O. No.:

Data Provided by: _____ <b>Site Conditions:</b> <input type="checkbox"/> Altitude: _____ m <input type="checkbox"/> Ambient Temp.: Max _____ °C <input type="checkbox"/> Min _____ °C <input type="checkbox"/> Area Class _____ Div _____ Group _____ <input type="checkbox"/> Nonhazardous <input type="checkbox"/> Auto Ignition Temp _____ °C  <b>Data Supplied by User:</b> <input type="checkbox"/> Power: _____ kW _____ hp <input type="checkbox"/> Synchronous Speed: _____ <input type="checkbox"/> Voltage: _____ <input type="checkbox"/> Phase: 3 <input type="checkbox"/> Frequency: 60 Hz <input type="checkbox"/> Insul. System: Random/Form Wound (see note below) <input type="checkbox"/> Enclosure: TEFC TENV <input type="checkbox"/> Coupled Drive: Direct/Belt <input type="checkbox"/> Mounting Position: Horizontal/Vertical <input type="checkbox"/> Shaft Up or Down (Vertical Mtg. Only) _____ <input type="checkbox"/> Service Factor: (see note below) _____ <input type="checkbox"/> Motor Thrust Loads: _____ <input type="checkbox"/> Special Load Conditions: _____ <input type="checkbox"/> Space Heaters: _____  <input type="checkbox"/> Space Heater Maximum Surface Temperature: _____ °C <input type="checkbox"/> Space Heater Leads Location: _____ <input type="checkbox"/> Rotation Direction: _____ <input type="checkbox"/> Starting Method: _____ <input type="checkbox"/> Main Terminal Box Location: _____  <input type="checkbox"/> Other Data: (Bearing type, lubrication method, motor mounting information, unusual service conditions, etc.) _____  <b>NOTES:</b> 1) Motor should be applied within its rating based on service factor of 1.0. 2) Motor insulation system:  - Random wound 600 V class for kW (hp) < 190 (250) - Random/form wound 600 V class for kW (hp) >150 (200) - Form wound 2300 V and 4000 V	<div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; padding-bottom: 5px;"> <span><input type="checkbox"/> Buyer with Request for Quotes</span> <span><input type="checkbox"/> Seller with Proposal</span> <span><input type="checkbox"/> Seller After Order</span> </div> <b>Data Supplied by Manufacturer:</b> • Frame Size: _____ • Full Load Speed: _____ rpm • Full Load Current: _____ ◇ Locked Rotor Current @ Full Voltage: _____ ◇ Locked Rotor Current @ 90% Voltage: _____ • Allowable Stall Time @ Full Voltage: _____ • Allowable Stall Time @ 90% Voltage: _____ • Sound Power Level (No Load): 90 dBA (max.) _____ • Insulation System: Class F Minimum: _____ Random/Form Wound: _____ • Temperature Rise at Rated Load: _____ °C Max. • Service Factor: (see note below) _____ • Motor Terminal Leads: _____  <b>Bearing Information:</b> • Type: _____ • Lubrication Method: _____ ◇ Recommended Lubricant: _____ • Temp. Rise @ Full Load: _____  ◇ Manufacturer & Number: _____ ODE _____ DE _____ • Motor Guaranteed Min. Eff. @ Full Load: _____ • Terminal Box(es) Materials of Construction: _____  • Fan Material: _____ • Space Heater Term. Box Location: _____ • Space Heater Max. Sheath Temperature: _____  • Other Data: _____ <b>Shop Inspection &amp; Tests:</b> <input type="checkbox"/> Shop Inspection Required: (Yes/No) _____ <input type="checkbox"/> Final Tests Witnessed by Customer: (Yes/No) _____ <input type="checkbox"/> Other Special Tests: _____
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## LOW VOLTAGE MOTORS STORAGE FORM

EBMUD Project Title: \_\_\_\_\_

Arrival Date(s): \_\_\_\_\_

Equipment Name / Tag No.: \_\_\_\_\_

Section No.: **26 05 83**

### I. Storage Length of Time:

	<u>Yes</u>	<u>No</u>	<u>NA</u>	Recommendations:	<u>Yes</u>	<u>No</u>	<u>NA</u>
a) Out of Service or in Storage Less than Once Month	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Store motors indoors in clean, dry location with space heaters energized to preclude moisture buildup upon delivery.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Out of Service or in Storage More than One Month but less than Six Months	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Store per Section II. Requirements and III. Monthly Maintenance			
c) Out of Service or in Storage for Six Months or More	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Store per Section II Requirements, III. Monthly Maintenance and IV. Insulation Resistance Testing			

### II. Requirements:

1. Storage	<u>Yes</u>	<u>No</u>	<u>NA</u>	Comments:
Motors should be stored indoors in a clean, dry area. If not possible, motors must be covered with a canvas tarpaulin. Cover should extend to the ground but should not tightly wrap the motor allowing captive air space to breathe, minimizing formation of condensation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Protect the motor from flooding or from harmful chemical vapors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Storage area free from ambient vibration. A unit which must be stored in areas with high ambient vibration must have the shaft locked to prevent any movement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Precautions taken to prevent rodents, snakes, birds or other small animals from nesting inside the motors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Inspect the rust preventative coating on all external machined surfaces, including shaft extensions. If necessary, recoat the surfaces with a rust preventative material, such as Rust Veto No. 342 by E.F. Houghton Co. or equal as approved by the Engineer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Energize motor space heaters or some form of heating must be utilized to prevent condensation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

## LOW VOLTAGE MOTORS STORAGE FORM

EBMUD Project Title: \_\_\_\_\_

Arrival Date(s): \_\_\_\_\_

Equipment Name / Tag No.: \_\_\_\_\_

Section No.: **26 05 83**

<b>2. Bearings</b>	<u>Yes</u>	<u>No</u>	<u>NA</u>	Comments:
Grease-lubricated cavities must be completely filled with lubricant during storage. Remove the drain plug and fill cavity with grease until grease begins to purge from the drain opening.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Oil-lubricated motors are shipped without oil and must be filled to the maximum capacity as indicated on the oil chamber sight gauge window immediately upon receipt. Fill reservoir to maximum level with a properly selected oil containing rust and corrosion inhibitors. Drain oil before moving to prevent sloshing and possible damage, then refill when at new location.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Apply new thread sealant, Gasoila No. SS08 or equal, to the treads of the drain plug and inside the drain hole each time oil is drained and refilled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

<b>III. Monthly Maintenance:</b>	<u>Monthly Checks</u>	Comments:
Oil should be inspected monthly for evidence of moisture or oxidation. Replace oil whenever contamination is noted or every 12 months, whichever occurs first.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Grease-lubricated bearings should be inspected monthly for moisture and oxidation by purging a small quantity of grease through the drain. If any contamination is present, the grease must be completely removed and replaced.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Rotate shaft monthly to insure the maintenance of a coating lubricant film on the bearing races and journals.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	



## LOW VOLTAGE MOTORS STORAGE FORM

EBMUD Project Title: \_\_\_\_\_

Arrival Date(s): \_\_\_\_\_

Equipment Name / Tag No.: \_\_\_\_\_

Section No.: **26 05 83**

### **IV. Insulation Resistance Testing Prior to Removal from Storage:**

Disconnect external accessories that have leads connected to the winding and connect them to a common ground.

Using a megohmmeter, with winding at ambient temperature, apply 500VDC for 60 seconds and take reading. Reading: \_\_\_\_\_

Correct reading to a 40 degrees Celsius base temperature by:

$$R_{40C} = K_t \times R_t$$

$R_{40C}$  = insulation resistance (in megohms)

$R_t$  = measured insulation resistance (in megohms)

$K_t$  = temp coefficient (from Figure 1 or using formula  $K_t = 0.5^{(40-T)/10}$ )

$T$  = winding temperature

Minimum acceptable insulation resistance is 5 megohms.

Perform a polarization index (PI) test by taking the ratio of a 10 minute reading to the one minute reading. Minimum acceptable PI is 2.0. If the one minute insulation resistance reading corrected to 40 deg C is above 5,000 megohms, disregard the PI reading.

### **V. Participants/Witness**

#### **Test conducted:**

By (signature): \_\_\_\_\_ Date: \_\_\_\_\_

Title: \_\_\_\_\_ Company Name: \_\_\_\_\_

#### **EBMUD Witness:**

By (signature): \_\_\_\_\_ Date: \_\_\_\_\_

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

## LOW VOLTAGE MOTORS STORAGE FORM

EBMUD Project Title: \_\_\_\_\_

Arrival Date(s): \_\_\_\_\_

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Section No.: **26 05 83**

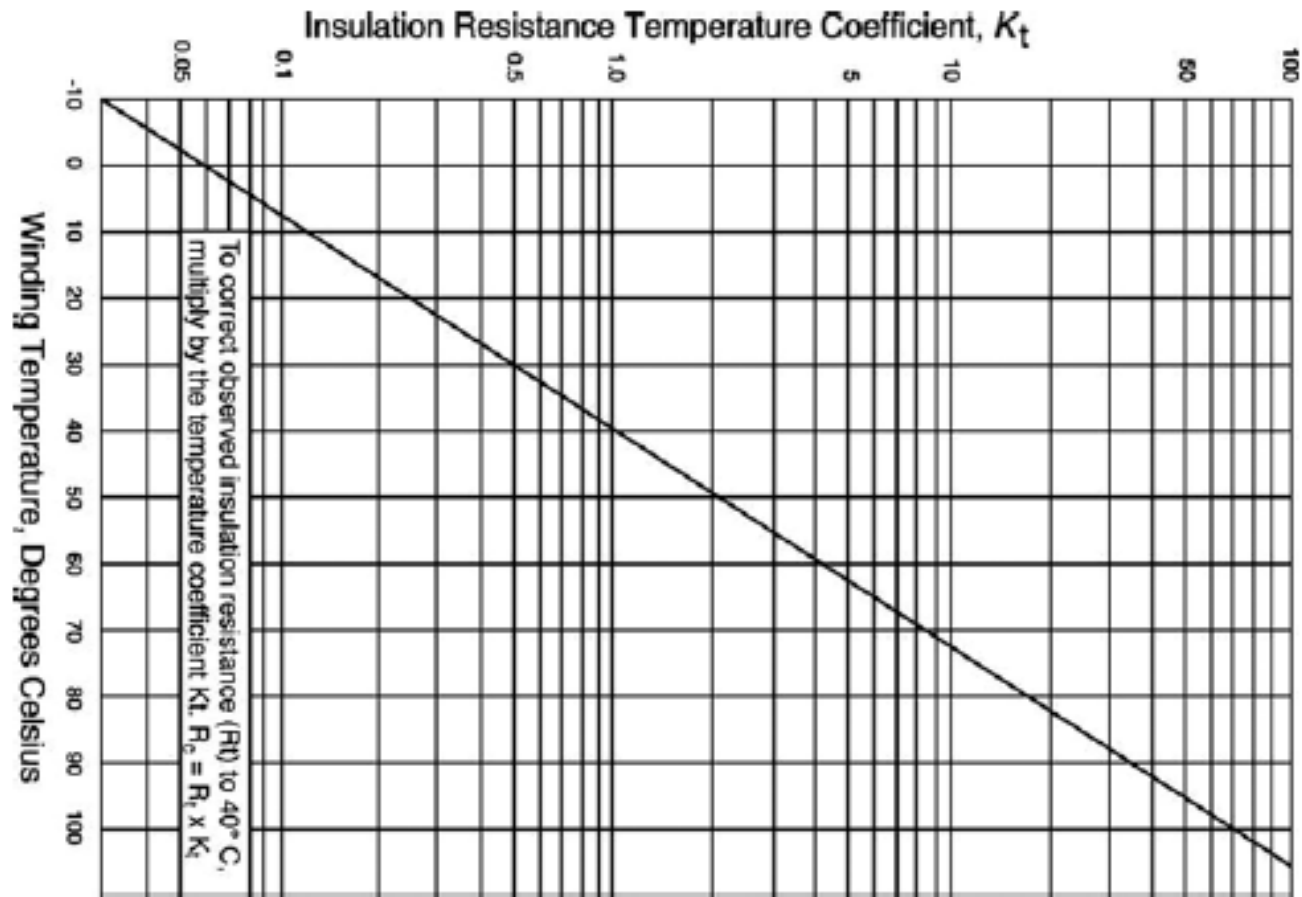


FIGURE 1

## SECTION 33 12 01

### BASIC MECHANICAL MATERIALS AND METHODS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes: Basic design and performance requirements for all mechanical equipment and systems.
- B. Related sections:
  - 1. Section 01 33 00 – Submittals Procedures.
  - 2. Section 01 43 11 – Seismic Qualification and Certification.
  - 3. Section 01 75 17 – Field Testing and Startup.
  - 4. Section 01 77 00 – Closeout Procedures.
  - 5. Section 01 81 02 – Seismic Design Criteria.
  - 6. Section 01 91 13.10 – Asset Identification Tags.
  - 7. Section 05 05 26 – Flange Bolting.
  - 8. Section 05 12 00 – Structural Steel Framing.
  - 9. Section 05 50 00 – Metal Fabrications.
  - 10. Section 09 96 56.05 – High Build Epoxy Coatings.
  - 11. All sections in Division 26 – Electrical.
  - 12. All sections in Division 33 – Utilities.
  - 13. Section 40 20 20 – Mechanical Piping.
- C. Provisions specified under each individual technical equipment specification section prevail over and supersede conflicting provisions as specified in this section.

##### 1.2 REFERENCE STANDARDS FOR DESIGN, INSTALLATION & TESTING

- A. Associated Air Balance Council (AABC): Various.
- B. American Bearing Manufacturers Association (ABMA):
  - 1. ABMA 9 – Load Ratings and Fatigue Life for Ball Bearings.

2. ABMA 11 – Load Ratings and Fatigue Life for Roller Bearings.
  3. Various.
- C. American Gas Association (AGA): Various.
- D. American Gear Manufacturer's Association (AGMA) Standards:
1. ANSI/AGMA 2001-D – Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth.
  2. ANSI/AGMA 6000-B – Specification for Measurement of Linear Vibration on Gear Units.
  3. ANSI/AGMA 6010-F – Standard for Spur, Helical, Herringbone, and Bevel Enclosed Drives.
  4. ANSI/AGMA 6019-B – Standard for Gear motors using Spur, Helical, Herringbone, Straight Bevel or Spiral Bevel Gears.
  5. ANSI/AGMA 6025-D – Sound for enclosed Helical, Herringbone and Spiral Bevel Gear Drives.
  6. Various.
- E. Air Movement and Control Association (AMCA) Manual:
1. 200-3 Fans Application Manual.
  2. Various.
- F. American National Standards Institute (ANSI) Standards:
1. Z535.1 – Safety Color Code.
  2. Various.
- G. American Petroleum Institute (API) Standards:
1. 5L – Specification for Line Pipe.
  2. 541 – Form-wound Squirrel-Cage Induction Motors - 500 Horsepower and Larger.
  3. 598 – Valve Inspection and Testing.
  4. 609 – Butterfly Valves.
  5. 610 – Centrifugal Pumps.

6. 617 – Centrifugal Compressors.
  7. 618 – Reciprocating Compressors.
  8. 619 – Rotary-Type Positive Displacement Compressors.
  9. 650 – Welded Steel Tanks for Oil Storage.
  10. 686 – Machinery Installation and Installation Design (Recommended Practice).
  11. Various.
- H. American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) Standards: Various.
- I. American Society of Mechanical Engineers (ASME):
1. B16.1 – Cast Iron Pipe Flanges and Flanged Fittings.
  2. B16.3 – Malleable Iron Threaded Fittings.
  3. B16.5 – Pipe Flanges and Flanged Fittings.
  4. B16.9 – Factory-Made Wrought Buttwelding Fittings.
  5. B16.11 – Forged Fittings, Socket-Welding and Threaded.
  6. B16.14 – Cast Bronze Threaded Fittings.
  7. B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings.
  8. B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  9. B16.24 – Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 400, 600, 900, 1500, and 2500.
  10. B16.28 – Wrought Steel Buttwelding Short Radius Elbows and Returns.
  11. B16.34 – Valves, Flanged, Threaded and Welding End.
  12. B16.36 – Orifice Flanges.
  13. B16.42 – Ductile Iron Pipe Flanges and Flanged Fittings, Class 150 and 300.
  14. B16.47 – Large Diameter Steel Flanges.
  15. B31.1 – Power Piping.
  16. B31.9 – Building Services Piping.

17. B31.2 – Fuel Gas Piping.
18. B31.3 – Process Piping.
19. B36.10M – Welded and Seamless Wrought Steel Pipe.
20. B36.19M – Stainless Steel Piping.
21. PTC 9 – Displacement Compressors, Vacuum Pumps and Blowers.
22. ASME PTC 8.2 – Performance Test Code for Centrifugal Pumps.
23. ANSI/ASME PTC 10 – Performance Test Code - Compressors and Exhausters.
24. ANSI/ASME PTC 17 – Performance Test Code - Reciprocating Internal-Combustion Engines.
25. ANSI/ASME PTC 11 – Performance Test Code - Measurement of Shaft Horsepower - Instruments and Apparatus.
26. Boiler and Pressure Vessel Code – Section VIII.
27. Various.

J. ASTM International (ASTM):

1. A36 – Standard Specification for Structural Steel.
2. A53 – Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless.
3. A48 – Standard Specification for Gray Iron Castings.
4. A106 – Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
5. A526 – Standard Specification for Steel Sheet, Zinc Coated by the Hot Dip Process, Commercial Quality.
6. A802-2006 – Standard Practice for Steel Castings, Surface Acceptance Standards, Visual Examination.
7. A834-2006 – Standard Specification for Common Requirements for Iron Castings for General Industrial Use.
8. A903-2007 – Standard Specification for Steel Castings, Surface Acceptance Standards, Magnetic Particle and Liquid Penetrant Inspection.

9. A1011 – Standard Specification for Steel, Sheet and Strip, Hot Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low Alloy with Improved Formability.
10. A1018 – Standard Specification for Steel, Sheet and Strip, Heavy Thickness Coils, Hot Rolled, Carbon, Structural, High-Strength Low-Alloy, Columbium or Vanadium, and High-Strength Low-Alloy with Improved Formability.
11. B61 – Standard Specification for Steam or Valve Bronze Castings.
12. B62 – Standard specification for Composition Bronze or Ounce Metal Castings.
13. E527 – Standard Practice for Numbering Alloys and Metals (UNS).
14. D3370-95a – Standard Practices for Sampling Water from Closed Conduits.
15. D6284-02 – Standard Test Method for Rubber Property - Effect of Aqueous Solutions with Available Chlorine and Chloramine.
16. Various.

K. American Water Works Association (AWWA) Standards:

1. C207 – Steel Pipe Flanges.
2. C208 – Dimensions for Fabricated Steel Water Pipe Fittings.
3. C504 – Rubber-Seated Butterfly Valves.
4. C507 – Ball Valves.
5. C508 – Swing Check Valves.
6. C509 – Resilient Seated Gate Valves.
7. C512 – Air Release, Air/Vacuum and Combination Air Valves.
8. C515 – Reduced –Wall, Resilient-Seated Gate Valves.
9. C518 – Dual-Disc Swing Check Valves.
10. C540 – Power-Actuating Devices for Valves and Slide Gates.
11. Various.

L. American Welding Society (AWS) Standards:

1. A2.4 – Standard Symbols for Welding, Brazing and NDE.

2. A3.0 – Standard Welding Terms and Definitions.
  3. D1.1 – Structural Welding Code.
  4. Various.
- M. Compressed Gas Association (CGA) Standards: Various.
- N. Crane Manufacturers Association of America (CMAA) Specifications:
1. CMAA No. 70 – Specifications for Top-Running Bridge and Gantry Type Multiple Girder Electric, Overhead Traveling Cranes.
  2. CMAA No. 74 – Specifications for Top Running & Under Running Single Girder Electric Traveling Cranes Utilizing Under Running Trolley Hoist.
- O. Ductile Iron Pipe Research Association (DIPRA) Publications: Various.
- P. EBMUD Engineering Standard Practices (ESPs).
- Q. EBMUD Engineering Standard Drawings:
1. 9494-G-1 and 2, Abbreviations for Water Facilities.
  2. 9492-G-001 thru 007.
  3. Various.
- R. Hydraulic Institute Standards (HI):
1. 1.1-1.5 – Centrifugal Pumps – Nomenclature, Definitions, Application and Operation.
  2. 1.6 – Centrifugal Pump Tests.
  3. 2.1-2.5 – Vertical Pumps – Nomenclature, Definitions, Application and Operation.
  4. 2.6 – Vertical Pump Tests.
  5. 3.1-1.5 – Rotary Pumps – Nomenclature, Definitions, Application and Operation.
  6. 3.6 – Rotary Pump Tests.
  7. 4.1-4.6 – Seal-less Rotary Pumps – Nomenclature, Definitions, Application, Operation and Test.
  8. 5.1-1.6 – Sealless Centrifugal Pumps – Nomenclature, Definitions, Application, Operation and Test.



9. 6.1-6.5 – Reciprocating Power Pumps – Nomenclature, Definitions, Application and Operation.
  10. 7.1-7.5 – Controlled Volume Pumps – Nomenclature, Definitions, Application and Operation.
  11. 9.1-9.5 – Pumps – General Guidelines for Types, Definitions, Application and Sound Measurement.
  12. Various.
- S. Institute of Electrical and Electronic Engineers (IEEE):
1. 803.1 – Recommended Practice for Unique Identification in Power Plants and Related Facilities — Component Function Identifiers.
  2. Various.
- T. Instrumentation, Systems, and Automation Society (ISA) Standards:
1. S5.1 – Instrumentation Symbols and Identification.
  2. S20 – Specification Forms for Process Measurement and Control Instruments, Primary Elements, and Control Valves.
  3. S75.11 – Inherent Flow Characteristics and Rangeability of Control Valves.
  4. Various.
- U. Manufacturers Standardization Society (MSS) Standards:
1. SP-54 – Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components – Radiographic Examination Method.
  2. SP-55 – Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components – Visual Method for Evaluation of Surface Irregularities.
  3. SP-58 – Pipe Hangers and Supports – Materials, Design and Manufacture.
  4. SP-68 – High Pressure Offset Seat Butterfly Valves.
  5. SP-69 – Pipe Hangers and Supports – Selection and Application.
  6. SP-89 – Pipe Hangers and Supports – Fabrication and Installation Practices.
  7. SP-91 – Guidelines for Manual Operation of Valves.
  8. SP-101 – Part-Turn Valve Actuator Attachment.

9. SP-108 – Resilient-Seated Cast-Iron Eccentric Plug Valves.
  10. Various.
- V. National Electrical Testing Association (NETA):
1. MG-1 – Motors and Generators.
  2. Various.
- W. National Fire Code.
- X. National Fire Protection Association (NFPA) Standards:
1. Fire Prevention Code Handbook, 2012 Edition.
  2. NFPA13 – Installation of Sprinkler Systems.
  3. NFPA30 – Flammable & Combustible Liquids Code.
  4. NFPA54 – National Fuel Gas Code.
  5. NFPA58 – Liquefied Petroleum Gas Code.
  6. Various.
- Y. National Sanitation Foundation (NSF) Standards:
1. 14 - Plastics Piping System Components and Related Materials.
  2. 61G – Drinking Water System Components – Health Effects and Lead Content.
  3. 372 – Drinking Water System Components – Lead Content.
  4. Various.
- Z. Overhead Electrical Crane Institute (OECI): Various.
- AA. Occupational Safety and Health Act (OSHA): Various.
- BB. Pipe Fabrication Institute (PFI):
1. ES-3 – Fabricating Tolerances.
  2. ES-4 – Hydrostatic Testing of Fabricated Piping.
  3. ES-24 – Pipe Bending Methods, Tolerances, Process and Material Requirements.

CC. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

1. HVAC Systems Duct Design.
2. Various.

DD. State and Local Codes:

1. CEC-400-2012-004-CMF-Rev 2 – Energy Efficiency Standards for Residential and Nonresidential Buildings, published by California Energy Commission (CEC).
2. California Mechanical Code, published by the International Association of Plumbing & Mechanical Officials (IAPMO), 2013 Edition.
3. California Plumbing Code, published by the International Association of Plumbing & Mechanical Officials (IAPMO), 2013 Edition.
4. Various.

EE. Ten States Standards:

1. Recommended Standards for Water Works.
2. Recommended Standards for Wastewater Facilities.

FF. Underwriters' Laboratories, Inc. (UL) Approvals: Various.

### 1.3 DEFINITIONS

- A. Special Tools: Tools that have been specifically made for use on unit of equipment for assembly, disassembly, repair, or maintenance.
- B. Resonant Frequency: That frequency at which a small driving force produces an ever-larger vibration if no dampening exists.
- C. Rotational Frequency: The revolutions per unit of time usually expressed as revolutions per minute.
- D. Critical Frequency: Same as resonant frequency for the rotating elements or the installed machine and base.
- E. Peak Vibration Velocity: The root mean square average of the peak velocity of the vibrational movement times the square root of 2 in inches per second.
- F. Rotational Speed: Same as rotational frequency.
- G. Maximum Excitation Frequency: The excitation frequency with the highest vibration velocity of several excitation frequencies that are a function of the design of a particular machine.

- H. Critical Speed: Same as critical frequency.
- I. Free Field Noise Level: Noise measured without any reflective surfaces (an idealized situation); sound pressure levels at 3 feet from the source unless specified otherwise.

1.4 MECHANICAL DESIGN DRAWINGS

- A. Mechanical Drawings Developed for the District: Mechanical drawings and material lists developed for the District shall comply with the requirements specified hereinafter in MECHANICAL DESIGN REQUIREMENTS.

1.5 MECHANICAL DESIGN REQUIREMENTS

- A. Site Climatic Conditions:

Summer (0.5%)	97° F DB 68° F WB
Winter	21° F
Mean Daily Range:	30° F

- B. Environmental Conditions:

1. Site Elevations (above mean sea level): 380 feet.
2. 100 Year Flood Elevation: Below site elevation.
3. Max Cooling Water Temperature: 66° F.

- C. Noise Limits and Abatement:

1. The design of any equipment installations shall conform to the maximum acceptable noise level and duration as defined by OSHA, city codes and applicable CEQA documentation. Noise shall be within both workplace limits for personnel exposure and property line limits. Insulation, sound traps, sound enclosures, and silencers shall be used as required to obtain acceptable levels.

- D. Drawings:

1. All drawings prepared for the District shall comply with the following requirements.
2. Prepare all project drawings utilizing District standard drawing symbols, identification systems, equipment ID tagging systems, and abbreviations. The following is a list of District Standard Drawings, which shall be used as a

guideline for drawing preparation; these drawings will also be included in the project drawing list:

Drawing Number	Description
9492-G-000.1	Abbreviations for Water Facilities Design Drawings, A Thru F
9492-G-000.2	Abbreviations for Water Facilities Design Drawings, G Thru R
9492-G-000.3	Abbreviations for Water Facilities Design Drawings, S Thru Z
9492-G-002	General Legend, Symbols, and Abbreviations For P&ID Drawings
9492-G-003	Symbols for P&ID Drawings – Valves, Fittings, and Miscellaneous Symbols, Sheet 1 of 3
9492-G-004	Symbols for P&ID Drawings – Sensing Elements, Sheet 2 of 3
9492-G-005	Symbols for P&ID Drawings – Equipment, Sheet 3 of 3
9492-G-006	Equipment Tag Number Codes and Colors, Sheet 1 of 2
9492-G-007	Equipment Tag Number Codes and Colors, Sheet 2 of 2

3. Abbreviations: Definitions of any abbreviations used in this document can be found on EBMUD Standard Drawings 9494-G-1 & 2, “Abbreviations for Water Facilities”. Use these abbreviations on all drawings.
4. System and Equipment Codes: Definitions of these codes can be found on EBMUD Standard Drawing 9492-G-001.2, G-006 and G-007, “Equipment Tag Number Codes and Colors”. Use these codes in all equipment, valve and instrumentation references in drawings and specifications.
5. Drafting Symbols: Definitions of the symbols for the P&ID drawings can be found on EBMUD Standard Drawings 9492-G-001 thru G-005. Use these symbols on all P&ID drawings and as appropriate on schematic and isometric style drawings and details. Welding symbols shall conform to AWS 2.4.
6. Drawing Detail: Drawings shall contain scale plan, section and detail views. Schematics and isometric drawings may be used for additional detail. Provide sufficient detail to fabricate and install the design. Components shall be called out with sequentially numbered item bubbles. All piping and fittings that are over 2-inches nominal size shall be drawn to scale in a two-line format. Piping that is 2-inches and smaller may be shown with a single line representation. Use Standard District symbols, abbreviations and codes.
7. Piping Dimensions: Drawings shall contain complete piping dimensions for the fabrication of all piping sections over 2" nominal size. Dimensions shall be tiered, with the distance between flanges, tee centerlines and elbow centerlines shall be given on the outer dimension. Provide additional dimensions to the inside of this dimension in order to define the position of other process connections or components. Provide a dimensional reference to a corner of the

structure. Define the position of any wall, roof and floor penetrations with dimensions. Vertical dimensions may be given as elevations, in feet, to the nearest hundredth foot.

8. Drawings Material Lists: The "ITEM" column shall match the individual bubble call-outs. The "REQUIRED" column shall indicate exact quantities of major components. Provide lengths (rounded up) for pipe sizes 3-inches and larger. Quantities of minor components may be indicated with "AS REQD". The "description" column has the following required format:

Component, Size, Material, Ratings, Configuration(s), End Type  
Examples:

PIPE, 2", PVC, SCH 80  
FLANGE, 8", STL, 150 LB, SLIP-ON, FF  
ELBOW, 6", STL, STD WT, 45 DEG, BWE  
THREADED OUTLET, 1" NPT OUTLET X 12" RUN, STL, 3000 LB  
BALL VALVE, 1", BRONZE BODY, 150 LB, SST BALL, TFE SEATS,  
THRD

9. Equipment ID Tagging: Conform the equipment tagging system on P&IDs to Drawing 9492-G-006. Install equipment tags per Section 01 91 13.10, "Asset Identification Tags". Install piping identification per Section 22 05 53.05, "Pipe Identification".

## 1.6 SYSTEM DESCRIPTION

### A. General:

1. Provide equipment and parts that are suitable for stresses, which may occur during fabrication, transportation, erection, and operation.
2. Provide equipment that has not been in service prior to delivery, except as required by tests.
3. Like parts of duplicate units are to be interchangeable.
4. When 2 or more units of equipment for the same purpose are required, provide products of same manufacturer.
5. Equipment manufacturer's responsibility extends to selection and mounting of gear drive units, motors or other prime movers, accessories, and auxiliaries required for proper operation.
6. When necessary, modify manufacturer's standard product to conform to the specified requirements or requirements indicated on the drawings and contained in laws and regulations.

B. Material Requirements:

1. Materials: Suitable for superior corrosion resistance and for services under conditions normally encountered in similar installations.
2. Dissimilar Metals: Separate contacting surfaces with dielectric material.

C. Power Transmission Systems:

1. Power Transmission Equipment: V-belts, sheaves, shaft couplings, chains, sprockets, mechanical variable-speed drives, variable frequency drives, gear reducers, open and enclosed gearing, clutches, brakes, intermediate shafting, intermediate bearings, and U-joints are to be rated for 24 hour-a-day continuous service or frequent stops-and-starts intermittent service, whichever is most severe, and sized with a minimum service factor of 1.5:
  - a. Apply a 1.5 service factor to nameplate horsepower and torque of prime source of power and not to actual equipment loading.
  - b. Apply service factors higher than 1.5 when recommended for continuous 24 hour-per-day operation and shock loadings specified in AGMA 6010-E88, other applicable AGMA standards, or other applicable referenced standards.
  - c. When manufacturer recommends service factor greater than 1.5, manufacturer's recommendation takes precedence.

D. Vibration:

1. Resonant Frequency: Ensure there are no natural resonant torsional, radial, or axial frequencies within 25 percent above or below the operating rotational frequencies or multiples of the operating rotational frequencies that may be excited by the equipment design.
2. Design, balance and align equipment to meet the vibration criteria specified in individual equipment specification sections.

E. Equipment Mounting and Anchoring:

1. Mount equipment on cast iron or welded steel bases with structural steel support frames. Utilize continuous welds to seal seams and contact edges between steel members. Grind welds smooth.
2. Provide bases and supports with machined support pads, dowels for alignment or mating of adjacent items, adequate openings to facilitate grouting, and openings for electrical conduits.
3. Provide jacking screws in bases and supports for equipment weighing over 1,000 pounds.

4. Anchor equipment base to concrete pad. Determine number, size, type, and location of bolts, anchor bolts, or other connections.
5. Provide bolt sleeves for anchor bolts for heavy equipment. Adjust bolts to final location and fill sleeve with non-shrink grout per API 686-96, Machinery Installation and Installation Design (Recommended Practice).

F. Structural Design:

1. Design connections and related details for seismic design criteria as specified in Section 01 81 02.
2. For equipment or piping with operating weight of 400 pounds or more provide calculations for:
  - a. Determination of operating weight and centroid of equipment:
    - 1) Operating weight is to be weight of unit plus weight of fluids or solids normally contained in unit during operation.
  - b. Determination of seismic forces and overturning moments.
  - c. Determination of shear and tension forces in connections.
  - d. Design of connection details based on calculated shear and tension forces.

G. Equipment Units Weighing 50 pounds or more: Provide with lifting lugs or eyes to allow removal with hoist or other lifting device.

## 1.7 SUBMITTALS

A. General:

1. Submittals shall be in accordance with Section 01 33 00 – Submittal Procedures.
2. The following submittal requirements are in addition to the submittal requirements specified under each individual technical specification section.

B. Product Data:

1. For each item of Equipment:
  - a. Design features.
  - b. Load capacities.
  - c. Efficiency ratings.



- d. Material designations by UNS alloy number and ASTM Specification and Grade.
  - e. Data needed to verify compliance with the Specifications.
  - f. Catalog data.
  - g. Name plate data.
  - h. Clearly mark submittal information to show specific items, materials and accessories or options being furnished.
2. Gear Reduction Units:
- a. Engineering information per applicable AGMA standards.
  - b. Gear mesh frequencies.
- C. Shop Drawings:
1. Drawings for Equipment:
- a. Drawings that include outline drawings, cut-away drawings, parts lists, material specification lists, and other information required to substantiate that proposed equipment complies with specified requirements.
2. Outline drawings showing equipment, driver, driven equipment, pumps, seal, motor(s) or other specified drivers, variable frequency drive, shafting, U-joints, couplings, drive arrangement, gears, baseplate or support dimensions, anchor bolt sizes and locations, bearings, and other furnished components.
3. Installation and checkout instructions including leveling and alignment tolerances, grouting, lubrication requirements, and initial start-up procedures.
4. Wiring, control schematics, control logic diagrams and ladder logic or similar for computer-based controls.
5. Recommended or normal operating parameters such as temperatures and pressures.
6. Alarm and shutdown set points for all controls furnished.
- D. Calculations:
1. Calculations and other information to substantiate base plates, supports, and anchor bolts meet minimum design strength requirements and seismic design criteria specified in Section 01 81 02.

2. Bearing L10 life calculations in accordance with ABMA 9 or ABMA 11 calculation methods for drivers, pumps, gears, shafts, motors, and other drive line components with bearings.
  3. Calculations and other information to substantiate that operating rotational frequencies meet the requirements of this Section.
  4. Torsional Analysis of Power Transmission Systems: When torsional analysis is specified in the equipment Sections, provide:
    - a. Sketch of system components identifying physical characteristics including mass, diameter, thickness, and stiffness.
    - b. Results of analysis including first and second critical frequencies of system components and complete system.
  5. Calculations for connection details demonstrating compliance with specified structural design requirements.
  6. Professional Engineer registered in the State of California is required to stamp and sign calculations.
- E. Quality Control Submittals:
1. Source quality control reports and certified test data as specified in Section 01 75 17.
  2. Submit factory test reports before shipment.
  3. Certified static and dynamic balancing reports for rotating equipment.
  4. Final field alignment values (signed and dated by journeyman millwright), to be provided by Assignee.
  5. Field quality control reports and test data as specified in Section 01 75 17, to be provided by Assignee.
  6. Start-up Plan: Proposed plan for field testing equipment as specified in Section 01 75 17.
  7. Certificate of Proper Installation: Provide as required in the individual technical specification sections.
  8. Submit material test reports as specified in the equipment sections.

9. Submit NSF/ANSI 61 certification for all materials in contact with drinking water. If NSF certified before January 4, 2014 the material must be certified as meeting CA low lead requirement (NSF/ANSI 61 Annex G or NSF/ANSI 372).
    - a. Submit NSF 14 potable water certification for plastic piping and related materials in contact with drinking water.
  10. References: Provide references from a minimum of 3 installations currently operating the same model equipment in continuous service for a minimum of 2 years under similar operating conditions. Reference information shall include location, service, contact person, and contact phone number.
- F. Operation and Maintenance Manuals:
1. As specified in Section 01 33 00.
  2. Provide at project site complete and final manuals for use by field personnel and Engineer prior to equipment delivery to the site.
  3. Include manufacturer and model number of every bearing; include calculated ball pass frequencies of the installed equipment for both the inner and outer raceways.
  4. Include motor rotor bar pass frequencies.
  5. Factory and Field Settings: Include a complete and detailed list of all final factory and field settings for all instruments and devices. Insert this information into the final O&M manuals when available. This information shall also be included in all electronic versions of the O&M manuals.

## 1.8 QUALITY ASSURANCE

- A. Qualifications: Equipment manufacturer and system component manufacturers to have a minimum of 5 years' experience in the design, manufacture, and assembly of the specified equipment and components with an established record of successful operation of such equipment and components.
- B. Manufacturer's Field Services:
  1. Provide as required in the individual technical specification sections.

## 1.9 DELIVERY, STORAGE, AND HANDLING

### A. Packing and Shipping:

1. Equipment: Pack in boxes, crates, or otherwise protect from damage and moisture, dust, or dirt during shipment, handling, and storage:
  - a. Include vendors name, model number, and equipment tag number.
2. Bearings: Separately pack or otherwise suitably protect during transport in accordance with manufacturer's instructions.
3. Spare Parts: Deliver spare parts in accordance with Section 01 77 00 and deliver in boxes labeled with contents name, part number, equipment to which spare parts belong, and name of BFSS.

### B. Storage:

1. Equipment Having Bearings: Store in enclosed facilities. Rotate units at least once per month or more often as recommended by the manufacturer to protect rotating elements and bearings.
2. Gear Boxes: Oil filled or sprayed with rust preventive protective coating.

### C. Protection:

1. Equipment: Protect equipment from deleterious exposure.
2. Painted Surfaces: Protect against impact, abrasion, discoloration, and other damage.

## 1.10 SEQUENCING AND SCHEDULING

A. Equipment Anchoring: Obtain from equipment manufacturers' anchoring material and templates or setting drawings in time for anchors to be cast-in-place when concrete is placed.

B. Coordinate details of equipment with other related parts of the work, including verification that structures, piping, wiring, and equipment components are compatible.

C. General Start-up and Testing of Equipment:

1. Perform general start-up and testing procedures after operation and maintenance manuals for equipment have been received.
2. Conduct functional testing of mechanical or electrical systems when each system is substantially complete and after general start-up and testing procedures have been successfully completed.

3. Functional testing requirements as specified in Sections 01 75 17 and 26 08 00 and other individual equipment specification sections.

#### 1.11 MAINTENANCE

##### A. Special Tools:

1. Provide any and all special tools required for operation and maintenance.
2. Mark or tag and list such tools in maintenance and operations instructions. Describe use of each tool.

##### B. Spare Belts:

1. When spare belts are specified, furnish a minimum of 1 spare belt for every different type and size of belt-driven unit, unless otherwise indicated:
  - a. Where 2 or more belts are involved, furnish matched sets.
  - b. Identify as to equipment, design, horsepower, speed, length, sheave size, and use.
  - c. Package in boxes labeled with identification of contents.

##### C. Spare Parts:

1. Assume responsibility until turned over to District.
2. Store in enclosed facilities.
3. Furnish itemized list and match identification tag attached to every part.
4. List parts by generic title and identification number.
5. Furnish name, address, and telephone number of supplier and spare parts warehouse.

#### 1.12 SERVICE CONDITIONS

- A. Treated Water (Potable) Chemistry: Unless otherwise noted materials that contact water covered by this specification will be subjected to water that promotes galvanic corrosion. Materials and coatings shall be suitable for soft water (less than 50 ppm total dissolved solids) with pH from 6.5 to 9.5 and maximum total chlorine residual of 2.5 ppm (in chloramine form). The presence of chloramines in the water shall not have any effect on the manufacturer's warranty.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

#### A. General:

1. Bronze that contacts with water:
  - a. All bronze parts furnished that contact with water shall contain no more than 0.25 percent lead. Stainless steel or Monel might be considered an acceptable substitute for bronze as approved by the Engineer.
  - b. All bronze parts furnished that will contact with water shall contain no more than 16 percent zinc unless otherwise approved by the Engineer. Components made of UNS C87850 (Eco Brass), which contains more than 16 percent zinc, is an exception and is acceptable.
2. Elastomeric Linings, Seals and Gaskets that Contact Water:
  - a. The material for all elastomeric linings, seals and gaskets furnished that contact water shall be certified by the manufacturer to be chloramine resistant.
  - b. EPDM: When the elastomeric material EPDM is specified for water service, it shall be peroxide-cured type and shall be certified by the manufacturer to be chloramine resistant. Sulfur-cured type EPDM is not acceptable:
    - 1) When the elastomeric material EPDM is specified for water service for flange gaskets, assembled push-on, and mechanical joint type gaskets, it shall be peroxide- or sulfur-cured EPDM.
3. The material for all bolting in chemical environments shall be 316 stainless steel. This includes but is not limited to flange bolts, assembly bolts and anchor bolts. Refer to Section 05 05 26 for flange bolting and 05 05 19 for anchor bolts.

#### B. Materials in Contact with Drinking Water:

1. All materials in contact with drinking water (potable water) shall be tested and certified as meeting the specifications of NSF/ANSI 61-2013 in accordance with California Code of Regulations, Title 22, Section 64591. The system code for drinking water is "TWS" – Treated Water System per Drawing 9492-G-007.
2. All materials in contact with drinking water (potable water) shall conform to the "Reduction of Lead in Drinking Water Act" of 2014.

## 2.2 BEARINGS

- A. Type: Oil or grease lubricated, ball or roller antifriction type, of standard manufacture.
- B. Oil Lubricated Bearings: Provide either pressure lubricating system or separate oil reservoir splash type system:
  - 1. Oil Lubrication Systems: Sized to safely absorb heat energy normally generated in bearings under maximum ambient temperature of 50 degrees Celsius; provide external cooler when required, air cooled if water cooling source not indicated on the drawings. Equip with filler pipe and external level gauge.
- C. Grease Lubricated Bearings, Except Those Specified to Be Factory Sealed: Fit with easily accessible grease supply, flush, drain, and relief fittings.
  - 1. Lubrication Lines and Fittings:
    - a. Lines: Minimum 1/4-inch diameter stainless steel tubing.
    - b. Multiple Fitting Assemblies: Mount fittings together in easily accessible location.
    - c. Use standard hydraulic type grease supply fittings:
      - 1) Manufacturer:
        - a) Alenite.
        - b) Zurk.
        - c) Or equal as approved by the Engineer.
- D. Ratings: Rated in accordance with ABMA 9 or ABMA 11 for L10 rating life of not less than 50,000 hours:
  - 1. Higher ratings, when specified in other Sections, supersede preceding requirement.

## 2.3 SAFETY GUARDS

- A. Drive Assemblies: Enclose sprockets, belts, drive chains, gearings, couplings, and other moving parts on drive assemblies in safety enclosures that are in compliance with applicable Laws and Regulations.
- B. Shafts: Provide guards that protect personnel from rotating shafts or components within 7.5 feet of floors or operating platforms.

- C. Hot Surfaces: Insulate all surfaces with normal operating temperatures above 120 degrees Fahrenheit when surface is within 7.5 feet height from any operating floor or level; insulation thickness such that temperature is below 120 degrees; cover insulation with moisture-proof protective jacket.
- D. Guard Requirements:
  - 1. Allow visual inspection of moving parts without removal.
  - 2. Allow access to lubrication fittings.
  - 3. Prevent entrance of rain or dripping water for outdoor locations.
  - 4. Size belt and sheave guards to allow for installation of sheaves 15 percent larger and addition of one belt.
- E. Materials:
  - 1. Sheet Metal: Carbon steel, 12-gauge minimum thickness, hot-dip galvanized after fabrication.
  - 2. Fasteners: Type 304 stainless steel.

#### 2.4 SPRING VIBRATION ISOLATORS

- A. Design Requirements:
  - 1. Telescopic top and bottom housing with vertical stabilizers to resist lateral and vertical forces.
  - 2. Use steel coil springs.
  - 3. Design vibration isolators in accordance with seismic design criteria as specified in Section 01 81 02.
- B. Performance Requirements: Minimum spring deflection of 1 inch under static load and capable of limiting transmissibility to 10 percent maximum at design operating load.
- C. Manufacturers: One of the following or equal as approved by the Engineer:
  - 1. California Dynamics Corporation, Type RJSD.
  - 2. Mason Industries, equivalent product.



D. Materials:

1. Fabricate isolators using welded steel or shatterproof ductile iron in accordance with ASTM A536 Grade CS-45-12.
2. Spring Steel: ASTM A125.

2.5 FABRICATION

A. Nameplates:

1. Engraved or stamped on Type 304 or 316 stainless steel and fastened to equipment at factory in an accessible and visible location.
  2. Indicate following information as applicable:
    - a. Manufacturer's name.
    - b. Equipment model number and serial number.
    - c. Maximum and Normal rotating speed.
    - d. Horsepower.
    - e. Rated capacity.
    - f. Service class per applicable standards.
  3. Nameplates for Pumps: Include:
    - a. Rated total dynamic head in feet of fluid.
    - b. Rated flow in gallons per minute.
    - c. Impeller, gear, screw, diaphragm, or piston size.
  4. Gear Reduction Units: Include:
    - a. AGMA Class of service.
    - b. Service factor.
    - c. Input and output speeds.
- B. Bolt Holes in Equipment Support Frames: Do not exceed bolt diameter by more than 25 percent, up to limiting maximum diameter oversize of 1/4-inch.

C. Coating:

1. Provide factory and field finish coatings with the system and color specified as directed by the Engineer.

2.6 OILS, GREASE AND LUBRICANTS

A. All oils, grease and lubricants used in association with potable water equipment shall be suitable for the intended service and NSF approved for potable water service.

B. Acceptable Products:

1. Wise Solutions (<http://www.wisesolutions.net/index.php/>).
2. Renewable Lubricants ([www.renewablelube.com](http://www.renewablelube.com)).
3. Or equal as approved by the Engineer.

2.7 RUST INHIBITOR

A. Carbon steel flange faces shall be coated with a lubricant or rust inhibitor conforming to an NSF 116-2000 class H1 (acceptable for incidental food contact) as approved by the Engineer. This inhibitor shall be applied only after application and curing of all other coatings.

PART 3 - EXECUTION – TO BE PERFORMED BY ASSIGNEE

3.1 EXAMINATION

A. Inspect all components for shipping damage, conformance to specifications, and proper torques and tightness of fasteners.

3.2 PREPARATION

A. Metal Work Embedded in Concrete:

1. Accurately place and hold in correct position while concrete is being placed.
2. Clean surface of ferrous metal in contact with concrete immediately before concrete is placed.
3. Embedded metal shall not touch rebar unless otherwise directed by the design documents.

B. Concrete Surfaces Designated to Receive Grout:

1. Give surfaces heavy sandblasting treatment.

2. Clean surfaces of sandblasting sand, grease, oil, dirt, and other foreign material that may reduce bonding of grout.
3. Concrete Saturation: Saturate concrete with water. Concrete surface shall be damp concrete at time grout is placed.

### 3.3 FIELD MEASUREMENTS:

- A. Prior to fabrication of equipment, Assignee to take measurements and coordinate with BFSS for installation of equipment and verify dimensions indicated on the drawings. Assignee and BFSS to ensure equipment and ancillary appurtenances fit within available space. Tolerance for horizontal and vertical positioning of equipment shall be within 0.03' of the dimensions shown on the drawings, unless otherwise shown.
- B. Piping positioning tolerances shall be per Section 40 20 20.
- C. Positioning accuracy:
  1. Horizontal, vertical elevation and true plumb positioning of mechanical equipment, including pump mounting fabrications like pump barrels and sole plates, shall be accurate within:
    - a. Horizontal & vertical: 0.03ft at a 95 percent confidence level.
    - b. Plumb: 30 arc-seconds at a 95 percent confidence level.
  2. Accuracy shall be determined relative to the project survey control established by District Survey and to the corners of the structure(s).
  3. The use of string lines and measuring tapes is not acceptable for final positioning.

### 3.4 INSTALLATION – TO BE COMPLETED BY ASSIGNEE

- A. Install pumps, generators & other equipment in accordance with manufacturer's installation instructions and recommendations, and the related specification sections.
- B. Install and commissioning of piping: In accordance with Section 40 20 20 – Mechanical Piping.
- C. Install and commission instrumentation: in accordance with manufacturer's installation instructions and recommendations.
- D. Valve Access: Valves that can be operated manually and are mounted 6-feet or higher above the finished floor shall be furnished with chain assist mechanisms:
  1. Multiturn valves shall be furnished with chain wheel system, and quarter-turn valves shall be furnished with a chain bar wrench system.

2. Chain pull shall be a maximum of 40 pounds under any operating condition.
  3. Chains shall extend to 3 feet above the floor and shall be provided with holdback devices when the normal chain fall is in a walkway.
- E. Lubrication Lines and Fittings:
1. Lines from Fittings to Point of Use: Support and protect.
  2. Fittings:
    - a. Bring fittings to outside of equipment in manner such that they are readily accessible from outside without necessity of removing covers, plates, housings, or guards.
    - b. Fittings shall have a minimum of 18-inches clear space directly in front of the fitting for easy grease-gun access.
    - c. Mount fittings together wherever possible using factory-mounted multiple fitting assemblies securely mounted, parallel with equipment lines, and protected from damage.
    - d. Fittings for Underwater Bearings: Bring fittings above water surface and mount on edge of structure above.
- F. Alignment of Drivers and Equipment:
1. All alignment procedures shall be completed by a journeyman millwright, or factory machinist:
    - a. All alignment procedures shall be completed in the presence of a District witness. The Assignee shall provide a minimum of 10 working days written notice confirming alignment to District to enable witnessing of the alignment.
  2. Where drive motors or other drivers are connected to driven equipment by flexible coupling, disconnect coupling halves and align driver and equipment after complete unit has been leveled on its foundation.
  3. Comply with procedures of appropriate Hydraulic Institute Standards, AGMA Standards, alignment tolerances of equipment manufacturers and the following requirements to bring components into angular and parallel alignment:
    - a. Maximum Offset Misalignment: 2.0 mils Total Indicator Runout (TIR) in any plane, or per manufacturer's recommendations; whichever value is smaller.

- b. Maximum Angular Misalignment: 0.5 mils/inch (mils gap differential per instrument travel diameter), or per manufacturer's recommendations; whichever value is smaller.
    - c. Utilize jacking screws, wedges, or shims as recommended by the equipment manufacturer and as specified in the equipment sections.
  4. Use Reverse-indicator Arrangement Dial Type or Laser Type Alignment Indicators: Mount indicators on the driver/coupling flange and equipment/coupling flange. Alignment instrumentation accuracy to be sufficient to read angular and offset misalignment at 10 percent or less of the acceptable misalignment.
  5. Alignment and calculations to include measurement and allowance for thermal growth, spacer coupling length, indicator separation and axial spacing tolerances of the coupling.
  6. When alignment satisfies most stringent tolerance of system components, tighten anchor bolts and grout between base and foundation. Allow minimum 48 hours for grout to harden. After grout hardens, remove jacking screws, fully tighten anchor bolts, and recheck alignment. Correct alignment as required.
  7. After testing is complete, dowel motor or drivers and driven equipment. Comply with manufacturer's instructions.
  8. Final alignment report including final misalignment values (both linear and angular) shall be submitted for review. The report shall be dated and signed by the District witness, and the journeyman millwright that completed the alignment.
- G. Grouting Equipment Bases:
  1. Comply with manufacturer's installation instructions and API Recommended Practice 686 Latest Edition, for grouting spaces, and tolerances for level and alignments, both vertical and horizontal.
  2. Grout base when piping connections are complete and in alignment with no strain transmitted to equipment.
  3. Grout base when equipment is leveled and in alignment.
  4. Epoxy Grout: As specified in Section 03 60 00 – Grouting.
- H. Special Techniques: Use applicable special tools and equipment, including precision machinist levels, dial indicators, and gauges as required in equipment installations.
- I. When existing mechanical connections are dismantled to facilitate prosecution of the Work, Assignee shall remove and properly dispose of existing gaskets and replace in kind, except for gaskets that are in contact with drinking water. Gaskets in

contact with drinking water shall be in accordance with Article 2.1 – MATERIALS specified hereinbefore.

- 3.5 EBMUD FIELD CALIBRATION TAGS (NOT USED, TO BE PERFORMED BY ASSIGNEE)
- 3.6 FIELD QUALITY CONTROL (NOT USED, TO BE PERFORMED BY ASSIGNEE)

END OF SECTION

## SECTION 33 12 16.05

### MISCELLANEOUS VALVES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes: Furnish and install valves and appurtenances complete.
- B. Like items of equipment specified herein shall be the end product of one manufacturer in order to achieve standardization for operation, maintenance, spare parts, and manufacturer's services.
- C. Related sections:
  - 1. Section 01 33 00 – Submittal Procedures.

##### 1.2 SECTION 01 75 17 – FIELD TESTING AND STARTUP.

- 1. Section 01 91 13.10 – Asset Identification Tags.
- 2. Section 05 05 26 – Flange Bolting.
- 3. Section 09 96 56.05 – High-Build Epoxy Coatings.
- 4. Section 09 96 56.10 – Fusion-Bonded Epoxy Coatings.
- 5. Section 33 12 01 – Basic Mechanical Materials and Methods.
- 6. Section 40 20 20 – Mechanical Piping.

##### 1.3 SUBMITTALS

- A. Submit Prior to Fabrication:
  - 1. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
  - 2. Submit a completed asset tag list for all valves included in the submittal (ref Section 01 91 13.10 – Asset Identification Tags). This list should only show the valves represented in the submittal (excerpt of the total asset tag list).
- B. Submit Prior to Shipment:
  - 1. O&M Manuals:
    - a. Furnish in accordance with Section 01 33 00 requirements.

- b. Technical Content:
  - 1) Drawings and illustrations including exploded views.
  - 2) Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
  - 3) Installation, operation, maintenance, and special handling instructions.
- a. Format:
  - 4) In addition to the requirements of Section 01 33 00, the BFSS shall assemble the O&M manual content for all valves in this section into a single bound volume (multiple copies per Section 01 33 00).
  - 5) Each valve shall be separated in the manuals by tabs with corresponding references in a comprehensive table of contents at the front of the manual.
  - 6) Each tab section shall include the completed asset tag list for the valves in each tabbed section (See Section 01 91 13.10 – Asset Identification Tags).
  - 7) O&M manual submittals for this section that do not include all valves in this section, or do not comply with the required format will be return without review.

C. Assignee to submit Prior to Contract Completion:

- 1. Functional Test Report.
- 2. Manufacturer's Certificate of Proper Installation (when specified).

1.4 FUNCTIONAL TEST REPORT – TO BE COMPLETED BY ASSIGNEE

- A. Record all valve Functional Test data as the tests are performed.
- B. Functional Tests shall be as specified herein. The Assignee shall initial and date each Functional Test item as it is completed. The Engineer will initial each item as a witness.
- C. All Functional Test data shall be assembled into a single report. The Assignee shall sign and date the report certifying that all tests have been satisfactorily completed.



## 1.5 APPLICABLE STANDARDS

- A. ISO 5211 – Industrial Valves, Part-turn Actuator Attachments.
- B. NSF/ANSI 61 – Drinking Water System Components – Health Effects.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. All brass, bronze, iron and carbon steel valves and their seals and coatings that are in contact with potable water shall be certified by NSF/ANSI 61, unless otherwise approved by the Engineer.
- B. Valves shall include operator, actuator, handwheel, chain wheel, extension stem, operating nut, chain, wrench, and accessories for complete operation.
- C. Valves shall be suitable for intended service. Renewable parts shall not be of a lower quality than specified.
- D. Valves shall be the same size as adjoining pipe unless otherwise shown on drawings.
- E. Valve ends shall suit adjacent piping.
- F. Size valve operators to operate the valves for the full range of pressures and velocities.
- G. Factory-mount valve operators, actuators and accessories.
- H. All elastomers (e.g. EPDM) shall meet the requirements indicated in Section 33 12 01 – Basic Mechanical Materials and Methods.

### 2.2 MATERIALS

- A. Brass and bronze valve components and accessories that have surfaces in contact with water shall be alloys containing less than 16 percent zinc and less than 0.05 percent lead. Exception: Components made of UNS No. C87850 (Eco Brass), which contain more than 16 percent zinc, are acceptable:
  - 1. Stainless steel alloy 18-8, 304, or 316 may be substituted for bronze.
- B. Cast iron valve bodies: In accordance with ASTM A126, Class 30 minimum.
- C. Ductile iron valve bodies: In accordance with ASTM A536, Grade 65-45-12 minimum, unless specified otherwise.

## 2.3 FACTORY FINISHING

- A. Unless otherwise specified, all internal and external surfaces of the valve and exterior actuator shall be coated with two-part hi-build epoxy in accordance with AWWA C550 “Protective Epoxy Interior Coatings for Valves and Hydrants” or MSS-SP-98, “Protective Coatings for the Interior of Valves and Hydrants”.
- B. Surfaces and materials that do not require coating unless otherwise shown:
  - 1. Flange faces (coat with rust inhibitor in accordance with Section 33 12 01 – Basic Mechanical Materials and Methods).
  - 2. Bronze, PVC, or stainless steel.
- C. Use heat-activated (fusion) material in accordance with Section 09 96 56.10 when fusion-bonded epoxy coatings are specified.
- D. Use two-part liquid material approved by the coating manufacturer for field repairs of fusion-bonded epoxy coatings.
- E. Coatings for potable and raw water services shall be certified by the National Sanitation Foundation (NSF) in accordance with NSF Standard 61.
- F. Surface Preparation: Prepare surface for fusion-bonded epoxy coatings per Section 09 96 56.10 in all services; prepare surface for high-build epoxy coatings per Section 09 96 56.05.
- G. Number of Coats: Two.
- H. Minimum Dry Film Thickness per Coat: 6 mils.

## 2.4 GLOBE VALVES

- A. Bronze (or Brass) Globe Valves (2-inch and smaller):
  - 1. Valve shall be a globe design with a metallic plug (disc) and seat that is suitable for continuous close throttling. All bronze or brass, union bonnet, inside screw, and rising stem. Solid brass or stainless steel plug-type disc and brass seat. Flat resilient seated disc designs are not acceptable. Malleable iron handwheel; cast steel is not acceptable. Shall conform to MSS-SP-80 and be pressure rated as class 125 (200-psig CWP minimum), “Lead-free” certified materials, ASTM B584-C89833 or -C89836 or equal. Ends shall be FNPT unless otherwise shown on the drawings.
  - 2. Acceptable Products: Apollo 121T-LF series, Milwaukee UP502 series, or equal as approved by the Engineer.

## 2.5 BALL VALVES

### A. Bronze (or Brass) Ball Valves (1/4-inch to 2-inch):

1. Service: Water.
2. Bronze or brass body, two-piece full-port type. 316 stainless steel or brass ball and stem as called out on the drawings. Reinforced TFE seats and packing, blow-out-proof stem design. Shall conform to MSS-SP-110 and be pressure rated as class 150 (600-psig CWP). "Lead-free" certified materials, ASTM B584-C89836 or equal. Ends shall be FNPT unless otherwise shown on the drawings.
3. Provide stainless steel padlocking lever and nut.
4. Acceptable Products:
  - a. Threaded Ends: Apollo 70LF-140 series, Nibco T-585-80-LF, Stockham T-255 series, or equal as approved by the Engineer.
  - b. Soldered Ends: Apollo 70LF-240 series, Nibco S-585-80-LF, Stockham S-255 series, or equal as approved by the Engineer.

### B. Stainless Steel Ball Valves (1/4-inch to 2-inch):

1. Service: Water and chemical.
2. Stainless steel body, ASTM A351-CF8M, two-piece full-port type. Stainless steel ball and stem, ASTM A276-316. Reinforced TFE seats and packing, blow-out-proof stem design. Ends shall be FNPT unless otherwise shown on the drawings.
3. Shall conform to MSS-SP-110 and be pressure rated 1,000-psig CWP.
4. Provide stainless steel padlocking lever and nut.
5. Chemical Service: Ball valves shall have factory-drilled ball for venting. Valve shall be installed with vent on the upstream side of the system to prevent gas buildup from the liquid trapped in cavity of the ball.
6. Acceptable Products:
  - a. Apollo 76F-100-A series, Nibco T-585-S6-R-66-LL, or equal as approved by the Engineer.

### C. Stainless Steel Ball Valves, Flanged (2-1/2-inch and 6-inch):

1. Service: Water and chemical.

2. Stainless steel body, ASTM A351-CFM, full-port, two-piece type. Stainless steel ball and stem, ASTM A276-316. Reinforced TFE seats and packing, blow-out-proof stem design. Shall conform to ASME B16.34 and be pressure rated as class 150 (275-psig CWP). Ends shall be flanged unless otherwise shown on the drawings.
3. Provide stainless steel padlocking lever and nut.
4. Chemical Service: Ball valves shall have factory-drilled ball for venting. Valve shall be installed with vent on the upstream side of the system to prevent gas buildup from the liquid trapped in cavity to of the ball.
5. Acceptable Products:
  - a. Apollo 87A-200 series, Nibco F-515-S6-F-66-FS-LL series, or equal as approved by the Engineer.

## 2.6 NEEDLE VALVES

### A. Scaled Stainless Steel Needle Valve (1/2-inch or smaller):

1. Stainless body with FNPT ends, rated 5,000 psig at 70 degrees F. Stainless steel stem, Viton or TFE seals. Connection and orifice sizes as shown on the drawings.
2. Micrometer knob with scale, color bands, and set screw to lock the flow setting.
3. Acceptable Products: Parker “N” series N800SS, Deltrol “Easy Read” EN Series EN20SS, or equal as approved by the Engineer.

### B. Scaled Stainless Needle Valve with Check (1/2-Inch or smaller):

1. Stainless body with FNPT ends, rated 5,000 psig at 70 degree F. Flow control in one direction and free flow in opposite direction. Stainless steel stem, viton or TFE seals. Connection and orifice sizes as shown on the drawings.
2. Micrometer knob with scale, color bands, and set screw to lock the flow setting.
3. Acceptable Products:
  - a. Rego TRU Micro TMF series.
  - b. Parker “F” series.
  - c. Deltrol “Easy Read” EF Series.
  - d. Or equal as approved by the Engineer.

2.7 SELF-CONTAINED AUTOMATIC VALVES

A. Pressure Reducing Valve, Lead-Free, Direct Acting (2-inch and smaller):

1. Service: Seal Water (SLW).
2. Lead-free Bronze or lead-free brass body, cap, and tailpiece, stainless steel trim and strainer, NSF/FDA grade EPDM diaphragm and seat disc, FNPT threaded ends, rated for inlet pressures up to 400 psig. Balanced seat design.
3. Acceptable Products: Apollo 36ELF-1-1-(size)-0-(range)-T-B-Y series, Cla-Val CRD-L, or equal as approved by the Engineer. (size = 6, 7 or 8) (range = 1 or 3) Refer to the drawings for selection.

Equipment Tag No.	Size [inches]	Set Point [psig]	Inlet Pressure [psig]	Dwg No.
Refer to P&IDs				

B. Solenoid Control Valve, Water Service, Solenoid Pilot Operated:

1. Body and bonnet:
  - a. Globe pattern.
  - b. Material:
    - 1) 2-inch and smaller: Bronze.
    - 2) Larger than 2-inch: Ductile iron, epoxy lined and coated.
2. Trim: Stainless steel, or bronze.
3. Diaphragm: EPDM.
4. Accessories:
  - a. Needle valve: Stainless steel or brass.
  - b. Tubing: Stainless steel or copper.
  - c. Strainer: Bronze.
  - d. Ends – one of the following and as called out on the Drawings:
    - 1) 2-inch and smaller: threaded, rated at 400 psig minimum.

- 2) Larger than 2-inch:
  - a) ASME 150 flanged, rated at 250 psig minimum.
  - b) ASME 300 flanged, rated at 400 psig minimum.
5. Pilot Solenoid Valve: Stainless steel or brass, 24 VDC, NEMA 4X enclosure, energize to open the main valve.
6. Pilot system location:
  - a. Right side of main valve as viewed from the main valve inlet.
7. Acceptable Products:
  - a. Cla-Val Model 136-01.
  - b. Singer Model 106-SC.
  - c. Or equal as approved by the Engineer.

## 2.8 MANUAL OPERATORS

### A. General:

1. Operator force not to exceed 40 pounds under any operating condition, including initial breakaway and 200 psig differential pressure at 16-feet per second flow velocity. A gear reduction operator shall be used when force exceeds 40 pounds.
2. Operator shall be self-locking type or equipped with self-locking device.
3. Position Indicator on Quarter-Turn Valves: "OPEN" and "CLOSED" markings shall be painted in contrasting colors. If valve operators have no such markings, the markings shall be neatly hand painted on the operator.

### B. Exposed Operator:

1. Handwheels: Diameter 12 inches minimum, 18 inches maximum; coated in accordance with FACTORY FINISHING herein.
2. Lever operators designed to take a padlock are acceptable on quarter-turn valves 3-inch and smaller unless otherwise shown.
3. Valve Rotation (unless otherwise shown):
  - a. Exposed Valves: Open left (counterclockwise).

4. Handwheels shall be provided on gear type operators unless otherwise shown.
5. Valve handles shall be designed to take a padlock.

## 2.9 EQUIPMENT TAGS – TO BE COMPLETED BY ASSIGNEE

- A. Assignee to provide and install equipment tags per Section 01 91 13.10 – Asset Identification Tags.

## PART 3 - EXECUTION – TO BE PERFORMED BY ASSIGNEE

### 3.1 INSTALLATION

#### A. Flanged Ends:

1. Flanged valve bolt holes shall straddle vertical centerline of pipe.
2. Clean flanged faces, insert gasket and bolts, and tighten nuts progressively and uniformly.

#### B. Threaded Ends:

1. Clean threads by wire brushing or swabbing.
2. Apply joint compound.

#### C. Valve Orientation:

1. Install operating stem vertical when valve is installed in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above finished floor, unless otherwise shown.
2. Install operating stem horizontal in horizontal runs of pipe having centerline elevations above 4 feet 6 inches, unless otherwise shown or specified.
3. Install inline "duckbill" check valves so that clean out ports are accessible without removing the valve from the line.

- D. Backflow Preventers: mount a minimum of 12 inches to a maximum of 36 inches above grade measured from the bottom of the device, with a minimum of 12 inches side clearance in accordance with CCR Title 17, 7603.c.

- E. Locate valve to provide accessibility for control and maintenance.

- F. Field coat outdoor plastic valves with a urethane topcoat for UV protection in accordance with Section 09 96 56.05.

- G. Coating Inspection: The BFSS and Engineer shall inspect coatings upon delivery. All defects in film thickness or continuity shall be repaired at the expense of the BFSS. The Engineer will determine the extent of repair work necessary. Application

of the repair coatings shall be in accordance with the coating manufacturer's written instructions for field repair work.

- H. Field Finish: Coating of all non-buried ferrous valves and valve gear shall be the system and color as directed by the Engineer.

### 3.2 FIELD TESTING AND STARTUP

- A. Refer to section 01 75 17 for additional requirements.
- B. Calibration: all automatic valves capable of field adjustments to calibrations and setpoints shall be verified to conform to this specification and the P&IDs. The verified settings shall be recorded by the Assignee on the EBMUD Field Calibration Tag per Section 33 12 01. All relevant fields shall be completed:
  - 1. Equipment Tag ID.
  - 2. Relief valves and pilot valves: Setpoint with units, notated "INC" for increasing or "DEC" for decreasing, as applicable.
  - 3. Initials of the technician, the inspector, and the date.
- C. Leakage Test: Test with pipelines (See Section 40 20 20).
- D. Backflow Preventers: All backflow preventers must be inspected, tested and certified by EBMUD's Backflow Unit prior to placing into service. Provide a minimum of 10 working-days written notice to the Engineer prior to the intended in-service date.
- E. Functional Tests:
  - 1. Record all observations on the Functional Test Report.
  - 2. All tests shall be completed in the presence of the Engineer.
  - 3. Verify that all valves are properly tagged.
  - 4. Verify that valves open and close smoothly with operating pressure on one side and atmospheric pressure on the other.
  - 5. Operator Pull Test: Verify force required to operate valve does not exceed 40 pounds under any operating condition.



6. Inspect air valves as pipe is being filled to verify venting and seating is fully functional.
7. Count and record number of turns to open and close gear operated valves and Record on Functional Test Report. Account for any discrepancies with manufacturer's data.

END OF SECTION

## SECTION 40 20 20

### MECHANICAL PIPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes: Furnish and install all piping and piping appurtenances as shown on the drawings and as specified herein.
- B. Related sections:
  - 1. Section 01 35 44 – Environmental Requirements.
  - 2. Section 01 75 17 – Field Testing and Startup.
  - 3. Section 01 45 27 – Shop Inspection.
  - 4. Section 05 05 24 – Shop and Field Welding.
  - 5. Section 05 05 26 – Flange Bolting.
  - 6. Section 05 50 00 – Metal Fabrications.
  - 7. Section 09 96 56.05 – High-Build Epoxy Coatings.
  - 8. Section 09 96 56.10 – Fusion Bonded Epoxy Coatings.
  - 9. Section 33 12 01 – Basic Mechanical Materials and Methods.

##### 1.2 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: All materials that will not be installed the same day as delivered to the site shall be stored in the original manufacturer's packaging. Loose items with no original packaging shall be boxed to protect the products from scratches, abrasion, or breakage.
- B. Protection Prior to Installation:
  - 1. All products shall be transported, handled and stored in accordance with the manufacturer's recommendations.
  - 2. All products shall be protected from excessive heat, moisture, and other adverse environmental conditions during storage and handling.
  - 3. All plastic materials shall be stored out of direct sunlight.

## 1.3 SUBMITTALS

### A. Submit Prior to Shipment:

1. Submit a list of pipe, fittings, and appurtenances to be used for the work. The list shall include the following information, where applicable:
  - a. Materials (show conformance with listed ASTM specifications).
  - b. Size/Schedule (show conformance with listed ASTM and ANSI specifications).
  - c. Pressure/Temperature Ratings.
  - d. Manufacturer.
2. A signed "Manufacturer's Certificate of Compliance" stating that all material has been manufactured, passivated, sampled, tested and inspected in accordance with the specified standards. The applicable standards shall be listed on the certificate.
3. For steel and stainless steel pipe, flanges and fittings, chemical analysis certification report (mill test report and/or post-mill test report).
4. Manufacturers' published catalog information for all equipment and products.
5. Shop Fabrication Drawings:
  - a. Shop drawings for piping fabrication shall include the following details at a minimum:
    - 1) Drawings shall contain scale plan, section and detail views. Sufficient detail shall be provided to fabricate and install the design.
    - 2) Drawings shall contain complete piping dimensions for the fabrication of all piping sections.
    - 3) Piping components shall be called out with sequentially numbered item bubbles.
    - 4) All piping and fittings that are over 2" nominal size shall be drawn to scale in a two-line format. Piping that is 2" and smaller may be shown with a single line representation.
    - 5) All vents, drains, and chlorination taps not shown on the original drawings but required to properly vent, drain, and chlorinate the piping systems.

- 6) Drawings Material Lists: The “ITEM” column shall match the individual bubble call-outs. The “REQUIRED” column shall indicate exact quantities of components. Provide lengths rounded up. The “DESCRIPTION” column has the following required format: “Component, Size, Material with applicable material standard, Ratings with applicable construction standard, Configuration(s), End Type”. Refer to the example below.

EXAMPLE MATERIAL LIST		
ITEM	REQD	DESCRIPTION
1	20 FT	PIPE, 12", STL ASTM A53 GR B, ASME B36.10 STD WT
2	6	FLANGE, 8", STL ASTM A105, ASME B16.5 150 LB, SLIP-ON, FF
3	4	ELBOW, 6", STL ASTM A105, ASME B16.9 STD WT, 45 DEG, BWE
4	2	THREADED OUTLET, 1" NPT OUTLET X 12" RUN, STL, 3000 LB

6. Material traceability records including certified mill test reports and inspection certificates for the proposed pipe material.
  7. At the request of the Engineer, submit records of mathematical analyses or successful proof testing of the manufacturer’s wrought fitting design per ASME B16.9-2.2.
  8. Factory, Shop and Field Finishes.
  9. NSF/ANSI 61 certification for all materials in contact with drinking water.
  10. Manufacturer's instructions for installation of products and equipment.
  11. Pipe identification system.
- B. Submit 45 Calendar Days Prior to Cleaning and Testing:
1. Cleaning and disinfection plan.
  2. Piping Field Test Schedule: Each test shall be numbered and the boundaries shall be illustrated on the related P&ID. Refer to the “Mechanical Piping Schedule”.
  3. Piping field test equipment and instrument calibration sheets.
- C. Provide evidence of certification from the PVC and CPVC manufacturer(s) for personnel installing such materials, when requested by the Engineer.

D. Submit Prior to System Start-up:

1. All signed results and records of piping field testing, including “Piping Pressure Test Records”, to demonstrate that completion of all testing was successfully executed.

1.4 REFERENCES

A. American Water Works Association (AWWA):

1. C110 – Ductile Iron and Gray-Iron Fittings, 3" through 48".
2. C206 – Field Welding of Steel Water Pipe.
3. C220 – Stainless-Steel Pipe, 1/2 inch (13 mm) and Larger.
4. C653 – Disinfection of Water Treatment Plants.

B. American Society of Mechanical Engineers (ASME):

1. B1.20.1 – Pipe Threads, General Purpose, Inch.
2. B16.1 – Cast Iron Pipe Flanges and Flanged Fittings.
3. B16.3 – Malleable Iron Threaded Fittings.
4. B16.5 – Pipe Flanges and Flanged Fittings.
5. B16.9 – Factory-Made Wrought Steel Buttwelding Fittings.
6. B16.11 – Forged Fittings, Socket-Welding and Threaded.
7. B16.15 – Cast Bronze Threaded Fittings, Classes 125 and 250.
8. B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings.
9. B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
10. B16.24 – Cast Copper Alloy Pipe Flanges & Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 & 2500.
11. B16.26 – Cast Copper Alloy Fittings for Flared Copper Tubes.
12. B16.28 – Wrought Steel Buttwelding Short Radius Elbows and Returns.
13. B16.36 – Orifice Flanges.
14. B16.39 – Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300.

15. B16.42 – Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.
16. B16.47 – Large Diameter Steel Flanges.
17. B31.5 – Refrigeration Piping.
18. B31.9 – Building Services Piping.
19. B36.10 – Welded and Seamless Wrought Steel Pipe.
20. B36.19 – Stainless Steel Pipe.

C. ASTM International (ASTM):

1. A733 – Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples.
2. B43 – Standard Specification for Seamless Red Brass Pipe, Standard Sizes.
3. B88 – Standard Specification for Seamless Copper Water Tube.
4. B280 – Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
5. D1785 – Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
6. D2855 – Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
7. F441 – Standard Specification for Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe, Schedules 40 and 80.
8. Refer to Section 33 12 01 for additional ASTM references.

D. Manufacturers' Standardization Society (MSS):

1. SP-25 – Standard Marking System for Valves, Fittings, Flanges and Unions.
2. SP-58 – Pipe Hangers and Supports – Materials, Design and Manufacture.
3. SP-69 – Pipe Hangers and Supports – Selection and Application.
4. SP-83 – Class 3000 and 6000 Pipe Unions, Socket Welding and Threaded (Carbon Steel, Alloy Steel, Stainless Steels, and Nickel Alloys).
5. SP-89 – Pipe Hangers and Supports – Fabrication and Installation.

6. SP-123 – Non-Ferrous Threaded and Solder-Joint Unions for Use with Copper Water Tube.

E. Pipe Fabrication Institute (PFI):

1. ES-3 – Fabricating Tolerances.
2. ES-4 – Hydrostatic Testing of Fabricated Piping.
3. ES-24 – Pipe Bending Methods, Tolerances, Process and Material Requirements.

F. Title 24, Part 5 – California Plumbing Code, Latest Edition.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS, [DIP]

PIPE	Materials, Manufacture & Testing:	AWWA C150, AWWA C151. Cement mortar lining per AWWA C104.
	Construction/Dimensions:	Per AWWA C150 and AWWA C151.
FITTINGS & UNIONS	Materials, Manufacture & Testing:	Ductile Iron for Fittings: ASTM A536 (all Grades). In accordance with AWWA C110 or AWWA C153.
	Construction/Dimensions:	Flanged Ductile Iron and Gray Iron Fittings, 3" to 48": AWWA C110-08, ASME B16.42, class as shown Note: All pressure classes and schedules called out here are to be used unless otherwise shown on the drawings.
FLANGES	Materials:	Ductile iron.
	Construction/Dimensions:	Screw on flanges: Diameter, thickness, drilling, and other characteristics per ASME B16.1. Long hub, threaded, and specifically design for ductile iron pipe. After attaching to pipe, machine flange face to make pipe end and flange even and perpendicular to the axis of the pipe.
END OF [DIP]		

2.2 STAINLESS STEEL PIPE AND FITTINGS, [SST]

PIPE	Materials, Manufacture & Testing:	<p>ASTM A312 (-S1 for over 2-inch NPS).                  ASTM A358 Class 2(-S1-S2 for over 2-inch NPS).                  ASTM A376 (-S1 for over 2-inch NPS).                  Pipe shall be either seamless or have a single longitudinal (straight) seam weld.                  All pipes shall be cleaned, de-scaled and passivated per ASTM A380 and A967.                  Welded Joints: Grades TP304L or TP316L.</p>
	Construction/Dimensions:	<p>Stainless Steel Pipe per ASME B36.19, SCH 40S, unless otherwise shown.                  Pipe Nipples: ASTM A733.</p>
FITTINGS & UNIONS	Materials, Manufacture & Testing:	<p>ASTM A182:                  Forged Welded Ends: Grades F304L or F316L as shown.                  ASTM A403:                  Wrought Welded Ends: Grades WP304L or WP316L as shown.                  ASTM A774:                  As-Welded Wrought Ends: Grades 304L or 316L as shown.                  All fittings shall be cleaned, de-scaled and passivated per ASTM A380 and A967.</p>
	Construction/Dimensions:	<p>Wrought Buttweld Fittings: ASME B16.9, STD WT, long radius.                  Forged Fittings: ASME B16.11, Class 3000.                  Cast Fittings: MSS SP-114, Class 150.                  Unions: MSS-SP-83, Class 3000.                  Note: All pressure classes and schedules called out here are to be used unless otherwise shown on the drawings.</p>
FLANGES	Materials:	<p>Forged or Rolled: ASTM A182 Grade F304L or F316L.                  Plate: ASTM A240.</p>
	Construction/Dimensions:	<p>Service pressures 175 psig &amp; under: All flanges shall be flat faced and as specified herein unless otherwise shown.                  Steel Plate Flanges, 12" &amp; smaller: AWWA C228, Class SD unless otherwise shown.                  Refer to Standard Drawing 323-EA.</p>



		<p>Service pressures 275 psig and under: All flanges shall be flat faced and as specified herein unless otherwise shown. If grade 304L or 316L is used, the flange shall be dual-rated 304/304L or 316/316L or AWWA SE.</p> <p>Slip-On or Welding Neck Type, NPS 24" &amp; smaller: ASME B16.5, Class 150 unless otherwise shown.</p> <p>Welding Neck Type, NPS 26" thru 60": ASME B16.47, Series A Class 150 unless otherwise shown.</p> <p>Plate Flanges, 72" &amp; smaller: AWWA C228, Class SE unless otherwise shown.</p> <p>Refer to Standard Drawing 324-EA.</p>
		<p>Marking Requirements: Refer to "Fittings, Flange and Union Markings" hereinafter.</p>
<p>END OF [SST]</p>		

### 2.3 COPPER TUBING AND FITTINGS, [CU]

PIPE	Materials and Construction/Dimensions:	<p>Exposed service: Seamless Copper Water Tube per ASTM B88, Type K, hard temper (no coils).</p> <p>Buried service: ASTM B88, Type K, hard temper or coils, blue polyethylene coating of 0.025-inch min thickness. Acceptable products: Mueller PlumbShield, Kamco Aqua-shield, or equal as approved by the Engineer.</p>
FITTINGS & UNIONS	Materials:	<p>Cast copper or bronze: ASTM B584, Alloy C84400 (Lead-free)</p> <p>Wrought copper or bronze: ASTM B75, Alloy C12200 (Lead-free)</p> <p>Compression: Brass.</p> <p>Flared: Brass.</p>
	Construction/Dimensions:	<p>Fittings:</p> <p>Cast: ASME B16.18.</p> <p>Wrought: ASME B16.22.</p> <p>Wrought Radius Elbows: MSS-SP-104</p> <p>Compression: See Manufactured Fittings below.</p> <p>45-degree Flared: See Manufactured Fittings below.</p> <p>Unions: MSS-SP-123.</p>
FLANGES	Materials:	<p>ASTM B806 alloy C87850 or B371 alloy C69300.</p>
	Construction/Dimensions:	<p>Cast flat-faced, ASME B16.24, Class 150 (unless otherwise shown).</p>

JOINTS	Construction:	Soldered: per ASTM B828.
SOLDER	Materials:	“Silver Bearing Solder” for copper plumbing: Tin with a minimum of 1.0% silver (Ag), per ASTM B32, grade Sn95 a patented solder with a minimum of 1.0% Ag and 1.0% Cu. Solid core only. 0.10% maximum lead content. Shall not contain Selenium. Approved Products: Oatey Silver Lead Free and Safe-Flo Solder, or equal as approved by the Engineer.
FLUX	Materials:	External lead-free NSF61 paste flux for copper piping.
END OF [CU]		

## 2.4 FITTING, FLANGE AND UNION MARKINGS

- A. All fittings, flanges and unions used in piping connections which include (but are not limited to) flanged, soldered, brazed, threaded, or welded joints, shall be marked to identify the manufacturer, the rating description, materials of construction, and service limitations per MSS SP-25. Components not stamped with the markings per this requirement will be rejected.

## 2.5 MANUFACTURED FITTINGS

## 2.6 FACTORY FINISHING

- A. Holdbacks at field joints:
1. Cement-Mortar: As necessary for field weld.
  2. Fusion-Bonded Epoxy: 6-inch from field weld joints.

## 2.7 MISCELLANEOUS COMPONENTS

- A. Bolt Thread Anti-Seize Compound: See Section 05 05 26.
- B. Thread Sealants:
1. For Stainless Steel Piping:
    - a. Suitable for operating pressures up to 10,000 psig.
    - b. NSF/ANSI 61 approved.
    - c. Acceptable products: Loctite® 565, Real-Tuff by Hercules, or equal as approved by the Engineer.
  2. For Thermoplastic Piping: Polytetrafluoroethylene (PTFE) thread tape.

- C. Flange Gaskets: See Section 05 05 26.
- D. Flange Insulation Sets: See Section 05 05 26.
  - 1. Thread sealing compound:
    - a. NSF approved.
    - b. Polytetrafluoroethylene (PTFE).
    - c. Acceptable products:
      - 1) Whitlam Co. "Talon PTFE".
      - 2) Or equal as approved by the Engineer.

## PART 3 - EXECUTION

### 3.1 SHOP FABRICATION

- A. Dimensions given on drawings are nominal. Allowances for gaskets and welds are not shown and shall be provided.
- B. Existing piping and pipe support locations and alignments might deviate from what is shown on the drawings. The locations, elevations, and alignment including plumbness, flatness, or any other specified angularity of connection points to existing pipes shall be verified prior to preparation of the piping submittals, with any differing as-found conditions accounted for and clearly noted as exceptions in said submittals. All adjustments shall be included in the piping submittal.
- C. Tolerances:
  - 1. Tolerances shall be per PFI Standard ES-3 and as follows:
    - a. Linear Dimensions (intermediate or overall), including: face-to-face, face-to-end, and end-to-end of straight piping; center-to-end or center-to-face of nozzles and other attachments; or center-to-face of bends. Tolerances are not accumulative:
      - 1) Refer to Figure 1 in PFI ES-3 for illustration.
      - 2) 10-inch and smaller:  $\pm 1/8$ -inch maximum.
      - 3) 12-inch thru 24-inch:  $\pm 3/16$ -inch maximum.
      - 4) 24-inch thru 36-inch:  $\pm 1/4$ -inch maximum.

5) Larger than 36-inch:  $\pm 1/4$ -inch plus  $\pm 1/16$ -inch for each 12-inches over 36-inch.

b. Angularity:

1) Refer to Figure 1 in PFI ES-3 for illustration.

2) Alignment of flange facings or pipe ends shall not deviate by more than  $3/64$ -inch per foot or  $1/32$ -inch total, whichever is greater.

3) End preparation for field butt welds shall not deviate by more than  $1/32$ -inch per foot across the land for inert gas weld or  $3/32$ -inch for other welds.

4) Rotation of flanges shall be  $1/16$ -inch maximum.

D. Post-fabrication Treatment of Stainless Steel Piping Welded Joints:

1. See Section 05 05 24 for cleaning and passivating stainless steel weldments.

### 3.2 INSPECTION

A. Expense of re-witnessing failed hydrostatic tests or re-inspection of any phase of pipe manufacture shall be paid by the Assignee.

B. Expense of re-witnessing or re-inspection by the District's authorized agent shall be the total charge billed to the District by the agent.

### 3.3 SHIPPING

A. Encapsulate all flanges and pipe ends in dense foam.

B. Securely strap all elements to pallets with straps. Only nylon straps shall be used with stainless steel pipes; metallic straps are prohibited.

C. Cap ends of tubing, pipe & fittings with non-metallic caps.

D. Load pallets so that no pipe material bears the weight of the pallets above.

E. Material shall be inspected upon delivery and material rejected due to improper shipping methods or damage during shipment.

### 3.4 PROTECTION OF STAINLESS-STEEL MATERIALS

A. Do not allow bare cables, chains, hooks, metal bars, or skids to come in contact with stainless steel.

B. Store stainless steel materials away from other metals.

- C. Do not store stainless steel materials in contact with the ground.
- D. Do not store stainless steel outside without protection, such as plastic wrap.
- E. Do not use wrapping or protection that might absorb water and stain the surface of the stainless steel, such as cardboard.

3.5 INSTALLATION (NOT USED, TO BE PERFORMED BY ASSIGNEE)

3.6 INSTALLATION – EXPOSED PIPING (NOT USED, TO BE PERFORMED BY ASSIGNEE)

3.7 PIPE SUPPORT SYSTEMS

- A. No attempt has been made to show all required pipe supports in all locations on the drawings. The absence of pipe supports and details on any drawing shall not relieve the BFSS of the responsibility for providing them in accordance with the pipe manufacturer's written recommendations and these specifications.
- B. Provide special pipe supports where shown.
- C. General support spacing shall be at maximum distances as listed below (unless otherwise shown):

TYPE OF PIPE	1" SIZE AND SMALLER	1-1/4" SIZE AND LARGER
Steel, Stainless Steel, Brass	6' - 0"	10' - 0"
Copper Tubing	5' - 0"	8' - 0"
PVC, CPVC	3' - 0"	5' - 0"

- D. Provide at least one pipe support at each change of direction of the pipe.
- E. Provide additional pipe supports directly adjacent to valves and other operating devices so that piping does not move when the valve or device is operated.
- F. Decrease spacing as necessary to prevent sagging and vibration.
- G. Provide a minimum of two anchor bolts on each channel support attached to concrete.

3.8 BOLTING APPLICATION SCHEDULE

A. Unless otherwise noted or shown, all bolting shall be in accordance with Section 05 05 26 and shall be applied according to the following:

BOLT TYPE	APPLICATION
Stainless Steel	All chemical services All piping inside vaults, basins, tanks and vessels All submerged* services All stainless steel piping All stainless steel pipe supports All concrete anchorage
Galvanized steel	All other applications
* Submerged is defined herein to mean any portion of the bolted system that can periodically become wetted during operation by the process fluid or ground water.	

- 3.9 CLEANING (NOT USED, TO BE PERFORMED BY ASSIGNEE)
- 3.10 DISINFECTION (NOT USED, TO BE PERFORMED BY ASSIGNEE)
- 3.11 FIELD FINISHING (NOT USED, TO BE PERFORMED BY ASSIGNEE)
- 3.12 TESTING – GENERAL (NOT USED, TO BE PERFORMED BY ASSIGNEE)
- 3.13 HYDROSTATIC TEST FOR PRESSURE PIPING (NOT USED, TO BE PERFORMED BY ASSIGNEE)
- 3.14 HYDROSTATIC TEST FOR GRAVITY PIPING (NOT USED, TO BE PERFORMED BY ASSIGNEE)
- 3.15 NON-DESTRUCTIVE EXAMINATIONS (NOT USED, TO BE PERFORMED BY ASSIGNEE)

END OF SECTION

## SECTION 46\_05\_94

### MECHANICAL EQUIPMENT TESTING

#### PART 1 GENERAL

##### 1.01 SUMMARY

A. Section includes:

1. Testing of mechanical equipment and systems.

##### 1.02 REFERENCES

A. American Gear Manufacturers Association:

1. AGMA 6000-B96 - Specification for Measurement of Linear Vibration on Gear Units.

B. American National Standards Institute (ANSI):

1. S1.4 - Specification for Sound Level Meters.

C. Hydraulic Institute (HI).

D. National Institute of Standards and Technology (NIST).

##### 1.03 SUBMITTALS

A. Provide Source Test Plans as specified in Section 01 75 17 – Field Testing and Startup.

B. Provide Installation and Functional Testing Plans as specified in Section 01 75 17 – Field Testing and Startup.

C. Operation and maintenance manuals:

1. As specified in Section 01 33 00 – Submittal Procedures.
2. Include motor rotor bar pass frequencies for motors larger than 500 horsepower.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Commissioning of equipment as specified in:
  - 1. This Section.
  - 2. Section 01 75 17 – Field Testing and Startup.
  - 3. Equipment sections:
    - a. If testing requirements are not specified, provide Level 1 tests.
- B. Operation of related existing equipment:
  - 1. District will operate related existing equipment or facilities necessary to accomplish the testing.
  - 2. Schedule and coordinate testing as specified in Section 01 75 17 – Field Testing and Startup.
- C. Provide necessary test instrumentation that has been calibrated within 1 year from date of test to recognized test standards traceable to the NIST or approved source:
  - 1. Properly calibrated field instrumentation permanently installed as a part of the Work may be utilized for tests.
  - 2. Prior to testing, provide signed and dated certificates of calibration for test instrumentation and equipment.
- D. Test measurement and result accuracy:
  - 1. Use test instruments with accuracies as recommended in the appropriate referenced standards. When no accuracy is recommended in the referenced standard, use 1 percent or better accuracy test instruments:
    - a. Improved (lower error tolerance) accuracies specified elsewhere prevail over this general requirement.
  - 2. Do not adjust results of tests for instrumentation accuracy:
    - a. Measured values and values directly calculated from measured values shall be the basis for comparing actual equipment performance to specified requirements.



### 3.02 VARIABLE SPEED EQUIPMENT TESTS

- A. Establish performance over the entire speed range and at the average operating condition.
- B. Establish performance curves for the following speeds:
  - 1. Speed corresponding to the rated maximum capacity.
  - 2. Speed corresponding to the minimum capacity.
  - 3. Speed corresponding to the average operating conditions.

### 3.03 PUMP TESTS - ALL LEVELS OF TESTING

- A. Test in accordance with the following:
  - 1. Applicable HI standards.
  - 2. This Section.
  - 3. Equipment sections.
- B. Test tolerances: In accordance with appropriate HI standards, except the following modified tolerances apply:
  - 1. From 0 to plus 5 percent of head at the rated design point flow.
  - 2. From 0 to plus 5 percent of flow at the rated design point head.
  - 3. No tolerance for head and flow when ranges are specified.
  - 4. No negative tolerance for the efficiency at the rated design point, and other specified conditions.
  - 5. Use of specified test tolerances shall not result in motor overload while operating at any point on the supplied pump operating head-flow curve, including runout.
  - 6. No positive tolerance for vibration limits. Vibration limits and test methods in HI standards do not apply. Use limits and methods specified in this or other sections of the Specifications.

### 3.04 DRIVERS TESTS

- A. Test motors as specified in Section 26 05 83 - Low Voltage Motors.
- B. Test other drivers as specified in the equipment section.

### 3.05 NOISE REQUIREMENTS AND CONTROL

- A. Perform noise tests in conjunction with vibration test analysis.
- B. Make measurements in relation to reference pressure of 0.0002 microbar.
- C. Make measurements of emitted noise levels on sound level meter meeting or exceeding ANSI S1.4, Type II.
- D. Set sound level meter to slow response.
- E. Unless otherwise specified, maximum free field noise level not to exceed 85 dBA measured as sound pressure level at 3 feet from the equipment.

### 3.06 PRESSURE TESTING

- A. Hydrostatically pressure test pressure containing parts at the appropriate standard or code required level above the equipment component specified design pressure or operating pressure, whichever is higher.

### 3.07 INSPECTION AND BALANCING

- A. Statically and dynamically balance each of the individual rotating parts as required to achieve the required field vibration limits.
- B. Statically and dynamically balance the completed equipment rotating assembly and drive shaft components.
- C. Furnish copies of material and component inspection reports, including balancing reports for equipment system components and for the completed rotating assembly.
- D. Critical speed of rotating equipment:
  - 1. Satisfy the following:
    - a. The first lateral and torsional critical speed of all constant, variable, and 2-speed driven equipment that is considered rigid such as horizontal pumps, non-clog pumps, blowers, air compressors, and engines shall be at least 25 percent above the equipment's maximum operating speed.
    - b. The first lateral and torsional critical speed of all constant, variable, and 2-speed driven equipment that is considered flexible or flexibly mounted such as vertical pumps (vertical in-line and vertical non-clog pumps excluded) and fans shall at least 25 percent below the equipment's lowest operating speed.

- c. The second lateral and torsional critical speed of all constant, variable, and 2-speed equipment that is considered flexible or flexibly mounted shall be at least 25 percent above the maximum operating speed.

E. Vibration tests:

1. Definitions:

- a. Root mean square: For pumps operating at speeds greater than 600 revolutions per minute (rpm), the vibration measurement shall be measured as the overall velocity in inches per second root mean square (RMS).
- b. Peak-to-peak displacement: The root means squared average of the peak-to-peak displacement multiplied by the square root of 2.
- c. Peak velocity: The root mean squared average of the peak velocity multiplied by the square root of 2.
- d. Peak acceleration: The root mean squared average of the peak acceleration multiplied by the square root of 2.
- e. High-frequency enveloping: A process to extract very low amplitude time domain signals associated with impact or impulse events such as bearing or gear tooth defects and display them in a frequency spectrum of acceleration versus frequency.
  - 1) Manufacturers: One of the following or equal, as approved by the Engineer:
    - a) CSI, PeakVue.
    - b) Rockwell Automation, Entek Group, Spike Energy analysis.
- f. Rotor bar pass frequency (RBF): For detecting loose rotor bars.
- g. Low speed equipment: Equipment or components of equipment rotating at less than 600 rpm.
- h. High speed equipment: Equipment and equipment components operating at or above 600 rpm.
- i. Preferred operating range: Manufacturer's defined preferred operating range (POR) for the equipment.
- j. Allowable operating range: Manufacturer's defined allowable operating range (AOR) for the equipment.

2. Vibration instrumentation requirements:
  - a. Analyzers: Use digital type analyzers or data collectors with anti-aliasing filter, 12-bit A/D converter, fast Fourier transform circuitry, phase measurement capability, time wave form data storage, high-frequency enveloping capabilities, 35 frequency ranges from 21 to 1,500,000 cycles per minute, adjustable fast Fourier transform resolution from 400 to 6,400 lines, storage for up to one hundred 3,200 line frequency spectra, data output port, circuitry for integration of acceleration data to velocity or double integration to displacement:
    - 1) Manufacturers: One of the following or equal:
      - a) Computational Systems Inc., (CSI) Division of Emerson Process Management, Model 2120A, Data Collector/analyzer with applicable analysis software.
      - b) Pruftechnik, VIBXPERT II.
  - b. Analyzer settings:
    - 1) Units: English, inches/second, mils, and gravitational forces.
    - 2) Fast Fourier transform lines: Most equipment 1,600 minimum; for motors, enough lines as required to distinguish motor current frequencies from rotational frequencies, use 3,200 lines for motors with a nominal speed of 3,600 rpm; 3,200 lines minimum for high-frequency enveloping; 1,600 lines minimum for low speed equipment.
    - 3) Sample averages: 4 minimum.
    - 4) Maximum frequency (Fmax): 40 times rotational frequency for rolling element bearings, 10 times rotational frequency for sleeve bearings.
    - 5) Amplitude range: Auto select but full scale not more than twice the acceptance criteria or the highest peak, whichever is lower.
    - 6) Fast Fourier transform windowing: Hanning window.
    - 7) High pass filter: Minus 3 dB at 120 cycles per minute for high-speed equipment. Minus 3 dB at 21 cycles per minute for low-speed equipment.
  - c. Accelerometers:

- 1) For low-speed equipment: Low frequency, shear mode accelerometer, 500 millivolts per gravitational force sensitivity, 10 gravitational force range, plus/minus 5 percent frequency response from 0.5 hertz to 850 hertz, magnetic mount:
  - a) Manufacturers: One of the following or equal:
    - (1) PCB, Model 393C.
    - (2) Wilcoxon Research, Model 797L.
  
- 2) For high-speed equipment: General purpose accelerometer, 100 millivolts per gravitational force sensitivity, 50 gravitational force range, plus/minus 3 dB frequency response range from 2 hertz to 12,000 hertz when stud mounted, with magnetic mount holder:
  - a) Manufacturers: One of the following or equal:
    - (1) Entek-IRD, Model 943.
    - (2) Wilcoxon Research, Model 793.
  
3. Accelerometer mounting:
  - a. Use magnetic mounting or stud mounting.
  - b. Mount on bearing housing in location with best available direct path to bearing and shaft vibration.
  - c. Remove paint and mount transducer on flat metal surface or epoxy mount for high-frequency enveloping measurements.
  
4. Vibration acceptance criteria:
  - a. Testing of rotating mechanical equipment: Tests are to be performed by an experienced, factory trained, and independent authorized vibration analysis expert.
  - b. Vibration displacement limits: Unless otherwise specified, equipment operating at speeds 600 rpm or less is not to exhibit unfiltered readings in excess of the following:

Operating Conditions and Application Data	Overall Peak-to-Peak Displacement	
	Field (mils)	Factory (mils)
Operation within the POR	3.0	4.0
Operation within the AOR	4.0	5.0

<b>Operating Conditions and Application Data</b>	<b>Overall Peak-to-Peak Displacement</b>	
	<b>Field (mils)</b>	<b>Factory (mils)</b>
Additive value when measurement location is greater than 5 feet above foundation.	2.0	2.0
Additive value for solids-handling pumps	2.0	N/A
Additive value for slurry pumps	2.0	N/A

- c. Vibration velocity limits: Unless otherwise specified, equipment operating at speeds greater than 600 rpm is not to exceed the following RMS limits:

<b>HI Pump Type</b>	<b>Horsepower</b>	<b>Field Test</b>	<b>Factory Test</b>
		<b>Overall RMS</b>	<b>Overall RMS</b>
Horizontal Solids Handling Centrifugal Pumps	Below 33 hp	0.25	0.28
Horizontal and Vertical In-Line Centrifugal Pumps (other than Non-Clog type)	Between 33 and 100 hp	0.28	0.31
	100 hp and above	0.31	0.34
Vertical Solids Handling Centrifugal Pumps	Below 33 hp	0.30	0.33
	Between 33 and 100 hp	0.32	0.35
Vertical Turbine, Mixed Flow, and Propeller Pumps (solids-handling type pumps)	100 hp and above	0.34	0.35
	Below 268 hp	0.15	0.19
Non-Solids Handling Centrifugal Pumps HI Types BB1, BB2, BB3, BB4, BB5, OH1, OH2, OH3, OH4, OH5, and OH7	268 hp and above	0.19	0.22
	Below 268 hp	0.13	
Vertical Turbine, Mixed Flow, and Propeller Pumps HI Types VS1, VS2, VS3, VS4, VS5, VS6, VS7, and VS8	268 hp and above	0.17	
	Slurry Pumps	0.25	0.30
Motors		See applicable motor Specification	See applicable motor Specification
Gear Reducers, Radial		Not to exceed AGMA 6000-B96 limits	Not to exceed AGMA 6000-B96 limits
Other Reducers, Axial		0.1	N/A

- d. Equipment operation: Measurements are to be obtained with equipment installed and operating within capacity ranges specified and without duplicate equipment running.
  - e. Additional criteria:
    - 1) No narrow band spectral vibration amplitude components, whether sub-rotational, higher harmonic, or synchronous multiple of running speed, are to exceed 40 percent of synchronous vibration amplitude component without the manufacturer's detailed verification of origin and ultimate effect of such excitation.
    - 2) The presence of discernable vibration amplitude peaks in test Level 2 or 3 vibration spectra at bearing inner or outer race frequencies shall be cause for rejection of the equipment.
    - 3) For motors, the following shall be cause for rejection:
      - a) Stator eccentricity evidenced by a spectral peak at 2 times electrical line frequency that is more than 40 percent of the peak at rotational frequency.
      - b) Rotor eccentricity evidenced by a spectral peak at 2 times electrical line frequency with spectra side bands at the pole pass frequency around the 2 times line frequency peak.
      - c) Other rotor problems evidenced by pole pass frequency side bands around operating speed harmonic peaks or 2 times line frequency side bands around rotor bar pass frequency or around 2 times the rotor bar pass frequency.
      - d) Phasing problems evidenced by 1/3 line frequency side band spectral peaks around the 2 times electrical line frequency peak.
    - 4) The presence of peaks in a high-frequency enveloping spectra plot corresponding to bearing, gear or motor rotor bar frequencies or harmonics of these frequencies shall be cause for rejection of the equipment; since inadequate lubrication of some equipment may be a cause of these peaks, lubrication shall be checked, corrected as necessary and the high-frequency envelope analysis repeated.
5. Vibration testing results presentation:
- a. Provide equipment drawing with location and orientation of measurement points indicated.
  - b. For each vibration measurement take and include appropriate data on equipment operating conditions at the time vibration data is taken; for

pumps, compressors, and blowers record suction pressure, discharge pressure, and flow.

- c. When vibration spectra data required:
  - 1) Plot peak vibration velocity versus frequency in cycles per minute.
  - 2) Label plots showing actual shaft or part rotation frequency, bearing inner and outer race ball pass frequencies, gear mesh frequencies and relevant equipment excitation frequencies on the plot; label probable cause of vibration peaks whether in excess of specification limits or not.
  - 3) Label plots with equipment identification and operating conditions such as tag number, capacity, pressure, driver horsepower, and point of vibration measurement.
  - 4) Plot motor spectra on a log amplitude scale versus frequency.
- d. For low-speed equipment, plot peak vibration displacement versus frequency as well as velocity versus frequency.
- e. Provide name of the manufacturer and model number of the vibration instrumentation used, including analyzer and accelerometer used together with mounting type.

### 3.08 TESTING LEVELS

#### A. Level 1 tests:

##### 1. Level 1 Performance Test:

##### a. General:

- 1) For equipment, operate, rotate, or otherwise functionally test for 15 minutes minimum after components reach normal operating temperatures.
- 2) Operate at rated design load conditions.
- 3) Confirm that equipment is properly assembled.
- 4) Confirm the equipment moves or rotates in the proper direction.
- 5) Confirm shafting, drive elements, and bearings are installed and lubricated in accordance with proper tolerances.



- 6) Confirm that no unusual power consumption, lubrication temperatures, bearing temperatures, or other conditions are observed.

b. Pumps:

- 1) In accordance with general performance test requirements as specified in this Section.
- 2) Measure flow and head while operating at or near the rated condition; for factory testing, testing may be at reduced speeds with flow and head corresponding to the rated condition when adjusted for speed using the appropriate affinity laws:
  - a) Use of a test driver is permitted for factory tests when actual driver is given a separate test at its point of manufacture as specified in Section 26\_05\_09 - Low Voltage Motors up to 500 Horsepower, or the applicable equipment section.
  - b) Use actual driver for field tests.
- 3) Record measured flow, suction pressure, discharge pressure, and make observations on bearing temperatures and noise levels.

2. Level 1 Vibration Test:

a. Test requirement:

- 1) Measure filtered vibration spectra versus frequency in 3 perpendicular planes at each normally accessible bearing housing on the driven equipment, any gears and on the driver; 1 plane of measurement to be parallel to the axis of rotation of the component.
- 2) Vibration spectra versus frequency shall be in accordance with vibration acceptance criteria.

b. Equipment operating condition: Test at specified maximum speed.

3. Level 1 Noise Test:

- a. Measure unfiltered overall A-weighted sound pressure level in dBA at 3 feet horizontally from the surface of the equipment and at a mid-point of the equipment height.

B. Level 2 tests:

1. Level 2 Performance Test:

a. General:

- 1) For equipment, operate, rotate, or otherwise functionally test for at least 2 hours after components reach normal operating temperatures.
- 2) Operate at rated design load conditions.
- 3) Confirm that equipment is properly assembled.
- 4) Confirm the equipment moves or rotates in the proper direction.
- 5) Confirm shafting, drive elements, and bearings are installed and lubricated in accordance with proper tolerances.
- 6) Confirm that no unusual power consumption, lubrication temperatures, bearing temperatures, or other conditions are observed.

b. Pumps:

- 1) In accordance with general performance test requirements as specified in this Section.
- 2) Test 2 hours minimum for flow and head at the rated condition; for factory testing, testing may be at a reduced speeds with flow and head corresponding to the rated condition when adjusted for speed using the appropriate affinity laws.
  - a) Use of a test driver is permitted for factory tests when actual driver is given a separate test at its point of manufacture as specified in Section 26\_05\_09 - Low Voltage Motors up to 500 Horsepower.
  - b) Use actual driver for field tests.
- 3) Test for flow and head at 2 additional conditions; one at 25 percent below the rated flow and one at 10 percent above the rated flow.
- 4) Record measured flow, suction pressure, discharge pressure, and observations on bearing temperatures and noise levels at each condition.

2. Level 2 Vibration Test:

a. Test requirement:

- 1) Measure filtered vibration spectra versus frequency and measure vibration phase in 3 perpendicular planes at each normally accessible bearing housing on the driven equipment, any gears and on the driver; 1 plane of measurement to be parallel to the axis of rotation of the component; measure actual rotational speeds for each vibration

spectra measured using photometric or other tachometer input connected directly to the vibration data collector.

2) Vibration spectra versus frequency shall be in accordance with vibration acceptance criteria.

b. Equipment operating condition: Repeat test requirements at design specified maximum speed and at minimum speed for variable speed equipment.

c. Natural frequency test of field installed equipment:

1) Excite the installed equipment and support system in 3 perpendicular planes, use same planes as operating vibration measurement planes, and determine the as-installed natural resonant frequency of the driven equipment, the driver, gears, and supports.

2) Perform test at each bearing housing, at each support pedestal, and for pumps on the suction and discharge piping.

3) Perform with equipment and attached piping full of intended service or process fluid.

3. Level 2 Noise Test:

a. Measure filtered A-weighted overall sound pressure level in dBA for each of 8 octave band mid-points beginning at 63 hertz, measured at 3 feet horizontally from the surface of the equipment at mid-point height of the noise source.

C. Level 3 tests:

1. Level 3 Performance Tests:

a. General:

1) For equipment, operate, rotate, or otherwise functionally test for at least 4 hours after components reach normal operating temperatures.

2) Operate at rated design load conditions for 1/2 the specified time; operate at each of any other specified conditions for a proportionate share of the remaining test time.

3) Confirm that equipment is properly assembled.

4) Confirm the equipment moves or rotates in the proper direction.

- 5) Confirm shafting, drive elements, and bearings are installed and lubricated in accordance with proper tolerances.
- 6) Confirm that no unusual power consumption, lubrication temperatures, bearing temperatures, or other conditions are observed.
- 7) Take appropriate capacity, power or fuel consumption, torque, revolutions per minute, pressure, and temperature readings using appropriate test instrumentation to confirm equipment meets specified performance requirements at the design rated condition.
- 8) Bearing temperatures: During maximum speed or capacity performance testing, measure and record the exterior surface temperature of each bearing versus time.

b. Pumps:

- 1) In accordance with general performance test requirements as specified in this Section.
- 2) Test 4 hours minimum for flow and head; begin tests at or near the rated condition; for factory and field-testing, test at full speed:
  - a) Use of a test driver is permitted for factory tests when actual driver is given a separate test at its point of manufacture as specified in Section 26\_05\_09 - Low Voltage Motors up to 500 Horsepower.
  - b) Use actual driver for field tests.
- 3) Test each specified flow and head condition at the rated speed and test at minimum as well as maximum specified speeds; operate at each test condition for a minimum of 15 minutes or longer as necessary to measure required performance, vibration, and noise data at each test condition.
- 4) Record measured shaft revolutions per minute, flow, suction pressure, discharge pressure; record measured bearing temperatures (bearing housing exterior surface temperatures may be recorded when bearing temperature devices are not required by the equipment section) and record observations on noise levels.
- 5) Perform efficiency and/or net positive suction head required (NPSHr) and/or priming time tests when specified in the equipment section in accordance with the appropriate HI standard and as follows:
  - a) Perform NPSHr testing at maximum rated design speed, head and flow with test fluids at ambient conditions; at maximum

rated speed, test at 15 percent above rated design flow, and 25 percent below rated design flow.

- b) Perform efficiency testing with test fluids at maximum rated speed.
- c) Perform priming time testing with test fluids at maximum rated speed.

2. Level 3 Vibration Test:

- a. Requirements: Same as Level 2 vibration test, except data taken at each operating condition tested and with additional requirements below.
- b. Perform high-frequency enveloping analysis for gears and bearings:
  - 1) Measure bearing element vibration directly on each bearing cap in a location close as possible to the bearing load zone that provides a smooth surface and direct path to the bearing to detect bearing defects.
  - 2) Report results in units of acceleration versus frequency in cycles per minute.
- c. Perform time wave form analysis for gears, low speed equipment and reciprocating equipment; plot true peak amplitude velocity and displacement versus time and label the period between peaks with the likely cause of the periodic peaks (relate the period to a cause).
- d. Plot vibration spectra on 3 different plots; peak displacement versus frequency, peak acceleration versus frequency and peak velocity versus frequency.

3. Level 3 Noise Test:

- a. Measure filtered, un-weighted overall sound pressure level in dB at 3 feet horizontally from the surface of the equipment at mid-point height and at 4 locations approximately 90 degrees apart in plain view; report results for each of 8 octave band mid-points beginning at 63 hertz.

D. Level 4 tests:

1. Level 4 Performance Test:

- a. General:
  - 1) For equipment, operate, rotate, or otherwise functionally test for at least 8 hours after components reach normal operating temperatures.

- 2) Operate at rated design load conditions for 1/2 the specified time; operate at each of any other specified conditions for a proportionate share of the remaining test time.
- 3) Confirm that equipment is properly assembled.
- 4) Confirm the equipment moves or rotates in the proper direction.
- 5) Confirm shafting, drive elements, and bearings are installed and lubricated in accordance with proper tolerances.
- 6) Confirm that no unusual power consumption, lubrication temperatures, bearing temperatures, or other conditions are observed.
- 7) Take appropriate capacity, power or fuel consumption, torque, revolutions per minute, pressure and temperature readings, using appropriate test instrumentation to confirm equipment meets specified performance requirements at the design rated condition.
- 8) Bearing temperatures: During maximum speed or capacity testing, measure and record the exterior surface temperature of each bearing versus time.

b. Pumps:

- 1) In accordance with general performance test requirements as specified in this Section.
- 2) Test 8 hours minimum for flow and head; begin tests at or near the rated condition; for factory and field-testing, test with furnished motor at full speed.
- 3) Test each specified flow and head condition at the rated speed and test at minimum as well as maximum specified speeds; operate at each test condition for a minimum of 20 minutes or longer as necessary to measure required performance, vibration, and noise data at each test condition.
- 4) Record measured shaft revolutions per minute, flow, suction pressure, discharge pressure; record measured bearing temperatures (bearing housing exterior surface temperatures may be recorded when bearing temperature devices not required by the equipment section) and record observations on noise levels.
- 5) Bearing temperatures: During maximum speed or capacity testing, measure and record the exterior surface temperature of each bearing versus time.

- 6) Perform efficiency and/or NPSHr and/or priming time tests when specified in the equipment section in accordance with the appropriate HI standard and as follows:
  - a) Perform NPSHr testing at maximum rated design speed, head and flow with test fluids at ambient conditions; at maximum rated speed, test at 15 percent above rated design flow, and 25 percent below rated design flow.
  - b) Perform efficiency testing with test fluids at maximum rated speed.
  - c) Perform priming time testing with test fluids at maximum rated speed.
2. Level 4 Vibration Test: Same as Level 3 Vibration Test.
3. Level 4 Noise Test: Same as Level 3 Noise Test, except with data taken at each operating condition tested.

END OF SECTION

## SECTION 46\_41\_34.01

### VERTICAL SHAFT FLOCCULATOR UNITS

#### PART 1 GENERAL

##### 1.01 SUMMARY

A. Section includes:

1. Vertical shaft flocculators.

B. The BFSS shall provide mixers, flocculators and appurtenances, complete and operable, in accordance with the Contract Documents.

C. This Section applies to all mixers and flocculators associated with the BFSS unless indicated otherwise.

##### 1.02 REFERENCES

A. American Bearing Manufacturers Association (ABMA):

1. 9 - Load Ratings and Fatigue Life for Ball Bearings.

2. 11 - Load Ratings and Fatigue Life for Roller Bearings.

B. American Gear Manufacturers Association (AGMA):

1. 6113-A06 - Standard for Industrial Enclosed Gear Drives.

C. American Institute of Steel Construction (AISC).

D. American National Standards Institute (ANSI).

E. Institute of Electrical and Electronics Engineers (IEEE).

F. National Electrical Manufacturers Association (NEMA).

G. National Fire Protection Association (NFPA):

1. 70 - National Electrical Code (NEC).

H. NSF International (NSF):

1. 61 - Drinking Water System Components - Health Effects.



### 1.03 DELEGATED DESIGN

- A. As specified in Section 01 35 73 - Delegated Design Procedures.
- B. Anchoring and bracing.

### 1.04 SUBMITTALS

- A. As specified in Section 01 33 00 - Submittal Procedures and Section 01 61 00 – Common Product Requirements.
- B. Shop Drawings and product data:
  - 1. Include fabrication, assembly, and mounting drawings showing materials and dimensions as listed below:
    - a. Impellers:
      - 1) Diameter.
      - 2) Maximum shaft speed.
      - 3) Tip speed at maximum shaft speed.
      - 4) Materials.
      - 5) Stress at maximum load.
      - 6) Setting elevation.
      - 7) Velocity gradient G at design conditions.
      - 8) Water horsepower at maximum speed.
      - 9) Power number.
      - 10) Flow number.
    - b. Impeller shaft:
      - 1) Diameter.
      - 2) Materials.
      - 3) Critical speed of rotating assembly.
      - 4) Torsional and bending stresses at maximum load.

- 5) Coupling details:
    - a) Showing that the drive unit may be removed while the impeller shaft and impeller remain in service.
  - 6) Impeller connection details.
  - 7) Revolutions per minute at maximum motor speed.
- c. Gear reducers:
- 1) Manufacturer's literature and drawings.
  - 2) Model number.
  - 3) AGMA horsepower rating.
  - 4) Materials.
  - 5) Efficiency.
  - 6) Bearing ratings.
  - 7) Lubrication details.
  - 8) Bearing life under maximum loading conditions.
- d. Motor data as specified in Section 26 05 83 - Low Voltage Motors.
- e. Support design information:
- 1) Weight of complete assembly.
  - 2) Impeller shaft and impeller weight.
  - 3) Torque load.
  - 4) Setting drawings and instructions for installation of anchor bolts and gear reducer, including tolerances.
- C. Calculations:
1. Substantiate that the proposed flocculator will transmit the required energy to the process water.
- D. Documentation showing all lubricants are food grade or NSF 61 approved.

E. Delegated Design Submittals:

1. Provide project-specific calculations based on support conditions and requirements to resist loads specified in Section 01 81 02 - Seismic Design Criteria.
  - a. To structures for equipment installed in structures designated as seismic design category C, D, E, or F.
  - b. For equipment installed outdoors.

F. Installation instructions:

1. Detail the complete installation of the equipment including rigging, moving, and setting into place.
2. Provide manufacturer's installation instructions.

G. Commissioning Submittals:

1. As specified in Section 01 75 17 – Field Testing and Startup, including the following:
  - a. Manufacturer's representative qualifications.
  - b. Certificates:
    - 1) Requirements as specified in this Section.
  - c. Test Plans:
    - 1) Test requirements as specified in this Section.
  - d. Test Reports.
  - e. Manufacturer's representatives field notes and data.
  - f. Owner Training.

H. Operation and maintenance manuals:

1. As specified in Section 01 33 00 – Submittal Procedures.

## 1.05 QUALITY ASSURANCE

- A. Mixing equipment manufacturer's qualifications:
  - 1. Manufactured in the United States with minimum 5 years of experience of producing substantially similar equipment.
  - 2. Member of AGMA.
- B. Component supply and compatibility:
  - 1. Gear reducers shall be manufactured by mixing equipment manufacturer.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. As specified in Section 01 61 00 – Common Product Requirements, Section 33 12 01 - Basic Mechanical Materials and Methods, and the manufacturer's instructions.
- B. Packing:
  - 1. Inspect prior to packing. Verify that assemblies and components are complete and undamaged.
  - 2. Protect machined surfaces and mating connections.
  - 3. Protect bearings and gearing with a shop applied corrosion prevention coating.
  - 4. Cover openings into gearboxes with vapor inhibiting and water repellent material.
  - 5. Crate in a manner that will prevent damage during shipment, delivery, and onsite storage.
  - 6. Identify crate contents by a packing slip fastened to outside of crate.
- C. Store materials to permit easy access for inspection and identification.
- D. Keep steel members off ground, using pallets, platforms, or other supports.
- E. Protect steel members and packaged materials from corrosion and deterioration.
- F. Store in loose covered breathable storage area off the ground to prevent condensation:
  - 1. Use of plastic sheeting will not be allowed.

## 1.07 PROJECT OR SITE CONDITIONS

- A. As specified in Section 01 81 02 – Seismic Design Criteria and Section 33 12 01 – Basic Mechanical Materials and Methods.

## 1.08 WARRANTY

- A. As specified in Div 00 and 01.

## 1.09 MAINTENANCE

- A. Provide 1 set of any special tools required for maintenance or operation.
- B. Spare parts for each size or type of mixing unit:
  - 1. Include 1 repair kit, including bearings, shims, gaskets, seals, retaining rings, packing rings, and adaptor sleeves.
  - 2. 1 spare impeller assembly with fasteners for each different type of mixer.
- C. Provide 1-year supply of bearing grease or oil for all units furnished, including the lubricant changes after the initial run-in period.
- D. Package and deliver spare parts as specified in Section 01 61 00 - Common Product Requirements.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. Flocculators shall provide complete and uniform dispersion of chemicals.
- B. Each mixer and flocculator shall consist of a motor driven gear reducer directly connected to a vertical shaft equipped with an impeller.

### 2.02 MANUFACTURERS

- A. One of the following, or equal:
  - 1. Lightnin, Series LFD.
  - 2. Philadelphia Mixer, Series 440.

### 2.03 DESIGN AND PERFORMANCE CRITERIA

- A. As required per Section 46 44 10 – Ballasted Flocculation.

## 2.04 DRIVE ASSEMBLY

### A. Drive units:

1. Designed for the specific requirements of mixer service and suitable for 24 hour a day operation.
2. Gear drive efficiency: Not less than 90 percent.

### B. Pinion mounted directly on motor shaft:

1. Prohibited.

### C. Lifting lugs:

1. Provided lifting lugs on each motor and each speed reducer.
2. Lifting lugs shall be designed and located to permit lifting complete mixer and drive unit, or each component separately.

### D. Electric motor and speed reducer:

1. With flexible coupling provided between motor and speed reducer.
2. Electric motor shall be readily separated from speed reducers.

### E. Speed reducer:

1. Furnished with independent bearing support construction.
2. Designed and rated and nameplated in accordance with AGMA Standard 6113-A06 with minimum service factor of 2.0 based on motor nameplate horsepower.
3. Housing constructed of close grain cast iron or steel weldments.
4. Unit capable of supporting overhung loads.
5. Provided unit with a suitable lubrication system for all weather starting and operation.

### F. Speed reducer output shaft:

1. Constructed and supported such that shaft deflections caused by operating loads do not affect alignment of antifriction bearings or cause misalignment of gearing during mixer operation.

G. Gearing systems:

1. Utilize precision ground, alloy steel, spiral bevel, and helical gear combinations.
2. Reducers employing worm gearing will not be acceptable.

H. Lubrication:

1. Provide splash type or immersion type oil lubrication from a common sump for gearing.
2. NSF 61 approved, or food grade lubricants.
3. Oil changes shall not be required at an interval of less than 2,500 hours following initial run in period.
4. Oil leakage down the low-speed shaft shall be prevented by means of a dry well.
5. Lubrication fill and drain lines shall be sized for efficient functioning and located for easy accessibility.
6. Speed reducer breather shall be located above possible oil foam level.
7. Provide an oil level gauge or dipstick and drain.
8. Oil drain shall be extended from drive with a valve to prevent leakage and spillage during oil changes.

I. External cooling:

1. External cooling to dissipate heat is prohibited.
2. Reducers requiring internal or external oil pumps are prohibited.

J. Flanged pedestal:

1. Provided for mounting speed reducer to base plate.

K. Bearings:

1. Antifriction type with minimum L10 life of following hours as defined by ABMA 9 and ABMA 11:
  - a. Typical: 50,000 hours.

- b. Output shaft bearings: 300,000 hours.
  - c. Bearing life: Based on rated motor nameplate horsepower.
- L. Allowance for vacuum processed metals or special processing techniques:
  - 1. None.
- M. General maintenance, specifically including motor changes, gear changes, replacement of antifriction bearings (except bearings supporting output shaft), and oil system maintenance:
  - 1. Not require removal of speed reducer housing from speed reducer housing foundation.
- N. Sound level:
  - 1. Maximum 85 dBA at 3 feet from drive assembly at operating speeds.

## 2.05 MOTORS

- A. As specified in Section 26 05 83 - Low Voltage Motors:
  - 1. Horsepower: Per BFSS' Ballasted Flocculation system requirements and Section 46 44 10 – Ballasted Flocculation.
  - 2. Speed: Per BFSS' Ballasted Flocculation system requirements and Section 46 44 10 – Ballasted Flocculation.
  - 3. Inverter duty rated.
  - 4. Winding temperature sensors: Thermostat type for motor shutdown protection.
  - 5. Direct connected to input shaft of speed reducer with a torsionally resilient flexible coupling, Falk Steelflex or equal.
  - 6. Provide an approved guard for each coupling.
  - 7. Provide a weather hood for vertical mounting as recommended by motor manufacturer.

## 2.06 IMPELLER

- A. Type: Per BFSS' Ballasted Flocculation system requirements and Section 46 44 10 – Ballasted Flocculation.
- B. Material:
  - 1. Fabricate from Type 316 stainless steel.



- 2. Use Type 316L stainless steel grade for assemblies fabricated by welding.
- C. Stress at maximum load: Not greater than 11,000 pounds per square inch.
- D. Unit: With high pumping characteristics, dynamically and hydraulically stable.
- E. Use of shaft stabilizers is not acceptable.
- F. Impeller shall be keyed to shaft and field removable.
- G. Setting:
  - 1. Per BFSS' Ballasted Flocculation system requirements and Section 46 44 10 – Ballasted Flocculation.

## 2.07 IMPELLER SHAFT

- A. Diameter:
  - 1. As determined by analysis of torque, bending moment and the critical speed.
  - 2. Combined bending and torsional stress at maximum load not to exceed 6,000 pounds per square inch.
  - 3. First lateral critical speed of shaft, impeller, and bearing system not less than 170 percent of maximum operating speed.
- B. Strength of shaft, impellers, and couplings: As determined by the manufacturer's detailed structural calculations in accordance with AISC, including effects of specified flows through mixing chambers.
- C. Vertical shafting for impeller assembly: Of ample size and design for service intended and supported and steadied so that unit operates without shaft whip or vibration.
- D. Shaft:
  - 1. Supported on antifriction bearings, carrying only impeller shaft loads, and including thrust bearing capable of supporting entire weight of vertical impeller shaft and impeller.
  - 2. Shafts shall be of solid type made from Type 316 stainless steel.
  - 3. Output shaft shall be totally overhung.
    - a. Bearings external to the speed reducer are not acceptable.
    - b. When turned by hand, impeller shaft run out or deflection shall not exceed 1/8 inch per 10 feet of length.

E. Rigid type couplings:

1. Designed to transmit 200 percent of full torque and 150 percent of axial load on coupling.
2. Mounting:
  - a. Mount coupling above the deck.
  - b. Design for maintenance access to flange bolts from deck level to remove (drop) shaft without disturbing the gear reducer or internal components.
  - c. Fabricate upper coupling half of steel and lower coupling half of Type 316L stainless steel.
3. Below mounting deck level:
  - a. Required when shaft length exceeds 20 feet. Space couplings to limit shaft sections to 20 feet maximum.
  - b. Fabricate from Type 316L stainless steel.
4. Coupling flanges: Turned and faced after being welded in place and provided with a rabbeted or registered fit.
5. Coupling halves: Bolted together through flanges with Type 316 stainless steel bolts.
6. Removal of drive unit:
  - a. Design and submit a blocking plate that allows the entire drive unit to be removed while the impeller shaft and impeller remain suspended from the concrete deck, allowing the installation of a standby drive unit.
  - b. Provide 1 blocking plate per 10 flocculation units provided.

2.08 COATING

- A. Shop prime and field finish coat steel and cast/ductile iron as specified in Section 09 96 57 – Mechanical and Electrical Coating Systems.
- B. Motors, speed reducers, and other components that could be damaged by blast cleaning may be furnished with manufacturer's standard coating system, when approved by the Engineer.

- C. Coat gears, bearing surface and similar ferrous metal surfaces that are to remain unpainted with a heavy application of rust resistant coating:
  - 1. Maintain coating during storage and until equipment is placed in operation.

### PART 3 EXECUTION

#### 3.01 PREPARATION (TO BE COMPLETED BY ASSIGNEE)

- A. Anchoring and bracing to structures:
  - 1. Prepare equipment anchor setting template(s) and use to position anchors during construction of supporting structure(s).
  - 2. Install anchors of type and material indicated on approved anchoring designs.
  - 3. Install anchors with embedment indicated on approved anchoring designs.

#### 3.02 INSTALLATION (TO BE COMPLETED BY ASSIGNEE)

- A. Install equipment in accordance with the accepted installation instructions and anchorage details.
- B. Install speed reducers on carbon steel mounting plates.
  - 1. Set level and plumb and grout plates with non-shrink epoxy grout.
- C. Install initial supply of break in and final lubricants as recommended by the manufacturer.

#### 3.03 COMMISSIONING

- A. Source Testing (Factory Acceptance Tests):
  - 1. As specified in Section 01 75 17 - Field Testing and Startup.
  - 2. Witnessed.
  - 3. As specified in Section 46 05 94 - Mechanical Equipment Testing:
    - a. Running test: Operate gear reducer at maximum speed using a rust inhibiting break in oil prior to shipment to check for proper operation and excessive noise and vibration.
    - b. Visual inspection. Verify that equipment complies with Specifications and approved Shop Drawings.
  - 4. Furnish test reports and the Manufacturer's Certificate of Source Testing.

B. Installation Verification:

1. As specified in Section 01 75 17 – Field Testing and Startup.
2. Manufacturer shall verify proper installation of flocculator system.
3. Furnish Manufacturer’s Certificate of Installation Verification.

C. Functional Testing:

1. As specified in Section 01 75 17 – Field Testing and Startup.
2. Witnessed by District and Engineer.
3. Equipment testing level 2 per Section 46 05 94 – Mechanical Equipment Testing:
  - a. Demonstrate that power demand of each drive motor does not exceed nameplate horsepower or nameplate full load ampere rating.
  - b. Demonstrate each mixer to be capable of operation without undue noise, vibration, or shaft whip over complete range of operating speeds:
    - 1) Adjust, repair, or replace defective equipment.
  - c. Furnish necessary equipment required for testing, properly calibrated.
4. Furnish test reports and the Manufacturer’s Certificate of Functional Compliance.

D. Owner Training:

1. Perform District Training as specified in Section 01 79 00 – Demonstration and Training and Section 46 44 10 – Ballasted Flocculation.

END OF SECTION



## SECTION 46\_44\_10

### BALLASTED FLOCCULATION

#### PART 1 GENERAL

##### 1.1 SUMMARY

A. Section includes:

1. Ballasted flocculation system.

##### 1.2 REFERENCES

A. American Gear Manufacturers' Association (AGMA):

1. C95 - Fundamental Rating Factors and Calculation Methods for. Involute Spur and Helical Gear Teeth.

B. American National Standards Institute (ANSI).

C. American Society of Mechanical Engineers (ASME):

1. B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Inch Standard.

D. American Welding Society (AWS).

E. ASTM International (ASTM):

1. A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
2. A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
3. A194 - Standard Specification for Carbon Steel Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
4. A536 - Standard Specification for Ductile Iron Castings.

F. Food and Drug Administration (FDA).

G. Institute of Electrical and Electronics Engineers (IEEE):

1. IEEE Standard Test Procedure for Polyphase Induction Motors and Generators.

- H. International Electrotechnical Commission (IEC).
- I. International Standards Organization (ISO):
  - 1. 1328-1 - Definitions and allowable values of deviations relevant to flanks of gear teeth.
  - 2. 1328-2 - Definitions and allowable values of deviations relevant to radial composite.
- J. National Electrical Manufacturers Association (NEMA):
  - 1. 250 - Enclosures for Electrical Equipment (1,000 V Maximum).
  - 2. MG1 - Motors and Generators.
- K. Occupational Safety and Health Administration (OSHA).
- L. Society for Protective Coatings (SSPC):
  - 1. SP10 - Near-White Metal Blast Cleaning.
- M. Underwriters Laboratories, Inc. (UL):
  - 1. 508 - Standard for Industrial Control Equipment.
  - 2. 508A - Standard for Industrial Control Panels.
  - 3. 698A - Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations.
  - 4. 1449 - Surge Protective Devices.

### 1.3 BALLASTED FLOCCULATION SYSTEM SUPPLIER SCOPE OF WORK

- A. BFSS is responsible for process design and equipment sizing, selection and procurement required for the Ballasted Flocculation system:
  - 1. System will be designed and supplied as specified in this Section.
  - 2. BFSS's scope of work does not include any engineering, selection, procurement, installation, or operation of any equipment, materials or other services not specifically defined in the Contract Documents.
  - 3. BFSS's scope of supply is included in Attachment A, at the end of this Section.

- B. Engineering will be in accordance with the Project Drawings and Specifications and those applicable state and national codes, standards and/or regulations in effect at the time of this Project, except as otherwise noted:
  - 1. BFSS shall provide necessary design, installation, and operating information for equipment within its stated scope of supply.
  - 2. BFSS is not responsible for the design, selection, installation, operation, or maintenance of any materials, equipment or services supplied by others.
- C. BFSS shall provide process engineering and design support for the system and Submittals as required in the Contract Documents.

#### 1.4 ASSIGNEE SCOPE OF WORK

- A. The assignee remains the sole source of responsibility for providing and installing a complete and operable ballasted flocculation system, per the Contract Requirements.
- B. Specifically, the Assignee is responsible for all Work, as described in the Contract Documents not specifically defined as part of the BFSS's scope as per Attachment A and herein.

#### 1.5 DELEGATED DESIGN

- A. As specified in Section 01 35 73 - Delegated Design Procedures.
- B. Anchoring and bracing.
- C. Plate settler system, including, but not limited to:
  - 1. Structural design.
  - 2. Equipment framing.
  - 3. Fastening of system components to one another.
  - 4. Support beams and support columns, including anchorage to new concrete or other structures.
  - 5. Dead loads, live loads, seismic loads, wind loads, and snow loads must be taken into account for all basin conditions:
    - a. Seismic design according to project seismic category.

#### 1.6 SUBMITTALS

- A. Furnish Submittals as specified in Section 01 33 00 - Submittal Procedures and Section 01 61 00 - Common Product Requirements.



B. Materials required establishing compliance with the specifications shall be submitted in accordance with the provisions of the Contract Documents. Submittals shall include at least the following:

1. Descriptive literature, bulletins, and/or catalogs of the equipment.
2. Data on the characteristics, features, and performance of the equipment.
3. Electrical schematics, panel layouts, field wiring diagrams (including BFSS provided wiring and denoted to show wiring by others to interface with the BFSS equipment), process and instrumentation drawings, instrumentation sheets, and product data sheets for electrical equipment being supplied by the BFSS.
4. Power and control wiring diagrams with electrical interconnection requirements including terminal numbers.
5. Power requirements for the local control panel.
6. Weight of equipment including the weight of the single largest item.
7. A complete bill of materials for equipment.
8. Motor data as specified in Section 26 05 83 - Low Voltage Motors.
9. EBMUD Equipment IDs of all provided equipment.
10. Control Strategy.

C. Delegated Design Submittals:

1. Anchorage and Bracing: Provide project-specific calculations based on support conditions and requirements to resist loads specified in Section 01 81 02 – Seismic Design Criteria:
  - a. To structures for equipment installed in structures designated as seismic design category C, D, E, or F.
  - b. For equipment installed outdoors.
  - c. For wall mounted equipment weighing 125 pounds or more.
2. Plate Settler System:
  - a. Provide a full structural analysis report with detailed calculations. Report shall demonstrate conformance with applicable ACI, AISC, ASCE, AWS,

other necessary standards, and the Drawing and Specification requirements:

- 1) Include loads and load combinations, unity checks, member sizes/materials, bolted connections, anchor connections, deflection, stability, reactions, and other necessary information for a complete structural report.
- 2) Provide project-specific calculations based on support conditions and requirements to resist loads specified in Section 01 81 02 – Seismic Design Criteria and 01 81 04 – Wind Design Criteria:
  - a) Including sloshing loads due to seismic forces acting on plate packs, supports and effluent troughs.
  - b) Dead loads, live loads, seismic loads, wind loads, and snow loads must be calculated for all basin conditions.

D. Installation instructions:

1. Detail the complete installation of the equipment including rigging, moving, and setting into place.
2. Provide manufacturer's installation instructions.

## 1.7 OPERATION AND MAINTENANCE

A. Operation and maintenance manuals shall be furnished as specified in Section 01 33 00 Submittal Procedures:

1. Manuals shall be prepared specifically for this installation and shall include required cuts, drawings, equipment lists, descriptions, and other information that is required to instruct operation and maintenance personnel unfamiliar with such equipment.

B. A factory trained representative with complete knowledge of the proper system operation and maintenance shall be provided to instruct representatives of the District on proper operation and maintenance of the system and equipment:

1. Instruction shall be conducted in conjunction with the inspection of installation and start-up assistance as specified in this Section.
2. If there are difficulties in operation of equipment due to Assignee's work, additional services shall be provided by BFSS at standard BFSS rates.
3. BFSS shall be provided with a minimum of 3-weeks' notice prior to the date personnel are requested to be on site.

## 1.8 QUALITY ASSURANCE

- A. BFSS shall have completed projects of similar type, complexity and water quality to the proposed project.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. As specified in Section 01 61 00 - Common Product Requirements and Section 33 12 01 – Basic Mechanical Materials and Methods.
- B. Equipment will be shipped by the BFSS or the BFSS's vendor when the equipment is ready and available for shipment:
  - 1. Assignee will be responsible for receiving, unloading, and properly storing the equipment in accordance with BFSS's instructions.
  - 2. Promptly upon the arrival of any equipment components at the job site or first shipping destination, the Assignee will prepare a BFSS's receiving report and submit a copy thereof to the BFSS.
  - 3. Receiving report is to note equipment receipt and evidence of damage in transit, if any. Confirmation of inspection will be no later than 10 days after receipt of delivery.
- C. Finished iron or steel surfaces not required to be painted, such as flange faces, shall be properly protected to prevent rust, corrosion, and damage.
- D. Each box or package shall be properly marked to show its net weight in addition to its contents.

## 1.10 PROJECT OR SITE CONDITIONS

- A. As specified in Section 01 81 02 – Seismic Design Criteria.

## 1.11 WARRANTY

- A. As specified in Divisions 00 and 01.
- B. BFSS shall guarantee equipment specified in this Section, including buy-out items not manufactured by the primary equipment supplier, for a period of 24 months commencing from the date of substantial Project completion.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. The following or equal:
  - 1. Krüger Inc., Actiflo®.
  - 2. WestTech, RapiSand™.

### 2.2 GENERAL

- A. Equipment covered by these Specifications is intended to be standard process equipment of proven ability as manufactured by reputable companies having long experience in the production of such equipment. Equipment furnished shall be designed, constructed and installed by the Assignee in accordance with the best practices and methods and shall operate satisfactorily when installed as indicated on the Drawings.
- B. Parts shall be so designed and proportioned as to have liberal strength and stiffness and to be especially adapted for the work to be done. Ample room and facilities shall be provided for inspection, repairs, and adjustment.
- C. Nameplate ratings for the motors shall not be exceeded, nor shall the design service factor be reduced when its piece of equipment is operating at any point on its characteristic curve.
- D. Location, size, and type of piping shall be as indicated on the Drawings, or as required by the equipment or manufacturers recommendations, if size not shown.
- E. Submerged anchors and bolting shall be Type 316 stainless steel - No exception.
- F. Materials exposed to potable water shall be listed as FDA approved.
- G. Where VFD's are to be provided by the Assignee in the motor control center to drive motors provided by the BFSS strict coordination shall occur for features and settings required:
  - 1. BFSS shall provide the information required within their Shop Drawings and shall review the VFD Shop Drawings for compliance.
  - 2. Incompatibility between VFD's and motors will not be allowed as cause for BFSS warranty disapproval for BFSS provided equipment.
  - 3. VFD adjustments, and settings shall be performed by the Assignee with on-site assistance from the VFD manufacturer's representative and shall be witnessed by the BFSS.

4. BFSS in conjunction with the Assignee shall certify the drive has been selected to match each motor and driven load through its entire range of operation, that potential circulating bearing currents have been mitigated, that dV/dT reflective wave devices are provided as required and recommended by the manufacturer, and that the motor will be protected from overheating by use of temperature switches.
5. Assignee shall provide a copy of the VFD settings to the District.
6. Coordination noted above is in addition to Engineer requirements that will be provided in the Contract Documents.

## 2.3 DESIGN AND PERFORMANCE CRITERIA

### A. Design Basis:

1. Ballasted Flocculation system will be designed to treat raw or ozonated water from the Pardee Reservoir, Briones Reservoir, and/or Folsom South Canal Connection:
  - a. The Ballasted Flocculation process is a high performance compact clarification system using microsand enhanced flocculation and settling. The following paragraphs narratively describe the basic flow progression and function of the specified Ballasted Flocculation System:
    - 1) A coagulant is added to the raw water in the influent pipe and flash mixed using a pumped diffusion type flash mix system.
    - 2) The coagulated water then enters the concrete water tanks of the ballasted flocculation system. In the first stage, the “coagulation” stage, coagulated water is further mixed to begin forming small floc.
    - 3) Coagulated water then enters the next stage, called the “flocculation” or “injection” stage, where the microsand and flocculant aid polymer is added.
    - 4) Flocculant aid polymer binds the destabilized suspended solids to the microsand particles by forming polymer bridges.
    - 5) Floc is allowed to build in a “maturation” or “flocculation 2” stage. During this stage the mixing zone allows the microsand/solids floc to agglomerate and grow into high-density floc known as microsand ballasted floc.
    - 6) In the final stage, the “sedimentation” stage, the microsand ballasted flocs settle quickly to the bottom of the tank.

- 7) Efficiency of settling is further increased by the use of the lamella plates.
  - 8) Microsand/solids mixture is collected at the bottom of the sedimentation stage, below the lamella plates.
  - 9) Sludge/microsand mixture is then continuously pumped to hydrocyclones via dedicated sand return pumps, where the solids are separated from the microsand by the centrifugal forces generated in the hydrocyclone.
  - 10) Recovered microsand is continuously recycled to the flocculation stage, and the separated sludge is continuously discharged.
2. The BFSS may propose value-added adjustments to this design basis, provided the proposed system meets the design requirements described in the next section.

B. Design requirements:

1. Ballasted Flocculation process shall be capable of thorough coagulant mixing, microsand and polymer injection and mixing, flocculation, sand ballasted flocculation, sedimentation, sludge removal, and sand recycle. Final water clarification will take place via plate settlers.
  - a. Microsand shall be separated from the sludge/microsand mixture via continuous recirculation through the hydrocyclones.
  - b. Microsand shall be continuously re-injected into the Ballasted Flocculation process.
  - c. Sludge shall be discharged continuously to the downstream solids handling systems.
2. System shall be capable of continuously operating at surface loading rates of 25 gallons per minute per square foot at design flow rate. Microsand recycle pumps shall operate in a minimum of 3 duty + 1 standby configuration per train.
3. System shall be capable of operating at a surface loading rate up to 33.3 gallons per minute per square foot for short periods of time during emergencies when 1 train is out of service:
  - a. An emergency period is expected to last no longer than 5 days.
  - b. During emergency operations, microsand pumps are anticipated to operate in a 4 duty + 0 standby configuration per train.

4. System shall be capable of being operated intermittently with regular, daily start-up and shutdown sequences as well as being operated continuously without shutdown for several months.
5. Only those processes making use of microsand ballasted flocculation, operating in a similar manner to that described above, will be considered.
6. After initial startup (2 hydraulic retention times) the Ballasted flocculation system shall meet the performance parameters as specified in this Section at all times while operating at surface loading rates up to but not exceeding 25 gallons per minute per square foot.

C. Design Criteria:

<b>Design Criteria</b>	
<b>Parameter</b>	<b>Criteria</b>
Number of Ballasted Flocculation Trains	2
Total Effluent Design Capacity, mgd	88.0
Effluent Design Capacity Per Train, mgd	44.0
Hydraulic Capacity Per Train, mgd	58.7
<u>Minimum</u> Number of Sand Recirculation Pumps and Hydrocyclones Per Train (Duty + Standby)	3 + 1 @ 306 gpm
Peak loading	
Typical Operations, gallons per minute per square foot	16.6
Maximum Flow Operations, gallons per minute per square foot	25
Special Circumstances Operation, gallons per minute per square foot	33.3

D. Operations and Water Quality Parameters

1. The BFSS shall guarantee the following performance parameters when the WTP is within the operations and water quality parameters listed below:

Parameter	Units	Low Winter	Typical	High Turbidity	Peak Turbidity	Maximum Flow	FSCC Take	High Winter
Maximum Ballasted Flocculation Flow	mgd	16.5	58.3	58.3	58.3	88	88	38.5
Maximum Raw Water Turbidity	NTU	1.0	0.9	15	80	1.5	2.3	3.0
Maximum Raw Water TOC	mg/L	1.9	1.5	3.0	3.0	2.0	2.5	3.0
Minimum Raw Water Temperature	degrees Celsius	12	18	12	12	18	21	12
Raw Water pH Range	-	7.0-8.4	7.0-8.4	7.0-8.4	7.0-8.4	7.0-8.4	7.0-8.4	7.0-8.4
Minimum Raw Water Alkalinity	mg/L as CaCO <sub>3</sub>	46	46	46	46	39	58	46
Maximum Raw Water Algae	No. per mL	<10,000	<10,000	10,000	10,000	100,000	100,000	10,000
Maximum Raw Water MIB	µg/L	Minimal	Minimal	20	20	40	60	Minimal
Maximum Raw Water Geosmin	µg/L	Minimal	Minimal	20	20	40	40	Minimal
BF Trains Online	No.	1	2	2	2	2	2	1 or 2



E. Performance parameters:

Parameter	Criteria
Settled water turbidity 95 percent of the time when the raw water turbidity is less than or equal to 10 NTU	Less than 1.0 NTU
Settled water turbidity 95 percent of the time when the raw water turbidity is greater than to 10 NTU	less than 2.0 NTU
Maximum Settled Water Turbidity, NTU	5
Maximum sand loss per train, lbs per million gallons treated	15

2.4 PROJECT/SITE CONDITIONS

A. Equipment location:

1. Equipment will be located outdoors.
2. Equipment supports and foundations:
  - a. Unless otherwise indicated, skid mounted and non-skid mounted equipment supports, anchors, and restrainers shall be adequately designed for static, dynamic, and seismic loads by the BFSS. Equipment support and anchor designs by BFSS shall meet the following criteria:
    - 1) Anchorage designs for skids, non-skid mounted equipment including electrical panels, and pipe systems shall be designed to meet requirements of Seismic forces in accordance with Section 01 81 02, Seismic Design Criteria.

B. Electrical enclosure supports:

1. Local control panels shall be designed by the BFSS with proper horizontal anchoring supports within 18 inches of the top of the enclosure for securing the cabinets to the adjacent reinforced concrete or concrete masonry unit wall.
2. There shall be no fewer than 2 horizontal anchoring supports per enclosure.

C. Type 316 stainless steel anchors:

1. Anchor bolts, nuts, and associated hardware for anchoring skid-mounted or non-skid mounted equipment and electrical enclosures shall be furnished by the BFSS anchor bolts for skid systems and non-skid mounted equipment shall be Type 316 stainless steel, Class 2, as specified in ASTM A193 for bolts and to ASTM A194 for nuts.

- a. Threads on stainless steel bolts shall be protected with an antiseize lubricant suitable for submerged stainless steel bolts, to meet government specification MIL-A-907E.
- b. BFSS shall provide calculations and design of anchoring systems to the Assignee.

D. Equipment foundations:

1. Mechanical skid-mounted equipment, tanks, control cabinets, enclosures, and related equipment shall be mounted on minimum 4-inch high concrete bases as required for anchorage design, unless otherwise indicated, and shall be furnished by the Assignee. Equipment foundation sizes shall be verified with the selected BFSS and finalized with the Engineer prior to development of final Contract Documents.

## 2.5 BALLASTED FLOCCULATION BASIN CONFIGURATION

- A. Each ballasted flocculation train shall consist of several separate stages or basins as described in Paragraph 2.3.A.
- B. Each stage shall be separated by concrete or stainless steel (type 316) baffles:
  1. Any wall that spans the full width of the ballasted flocculation train shall be constructed from concrete.
  2. Assignee shall provide and install all concrete infrastructure.
  3. Any non-concrete baffles required for BFSS's proposed Ballasted Flocculation System shall be provided by BFSS.

## 2.6 MIXERS

- A. Principal items specified in this article are the mixers used in each of the ballasted flocculation system mixing stages. These shall be vertical shaft mixer assemblies, provided as part of the Ballasted Flocculation system. These mixing assemblies and appurtenant equipment shall be provided, complete and operable, in accordance with the Contract Documents:
  1. Mixers to be provided as part of the Ballasted Flocculation system shall have purpose and duties as specified in this Section, and shall comply with the following Specifications:
    - a. Section 33 12 01 – Basic Mechanical Materials and Methods  
Section 46 41 43.01 - Vertical Shaft Flocculators.

2. The following items shall also be submitted:
  - a. Literature and Drawings describing the equipment in sufficient detail including materials of construction to indicate full accordance with the Specifications.
  - b. Calculations confirming that equipment furnished meets design criteria and the intent of the Contract Documents.
  - c. Calculations showing shaft and impeller design information (stresses, critical speed, deflections, shear, impeller power draw at specified speed, and pumping capacity at specified speed of the impeller) shall be submitted.
  - d. Calculations for bearing life.
  - e. Provisions of weight loads and torques exerted by mixer on the structural concrete deck when operating at high speed.
  - f. Calculations and/or literature confirming that components within the gear reducer will receive adequate lubrication.
3. Duties of the manufacturer's qualified factory representative:
  - a. BFSS shall furnish the services of a qualified factory representative of the vertical-shaft mixer manufacturer to provide assistance for the installation, preliminary operational testing, and final operational testing of the mixers.
  - b. In addition, operator training services for the District's personnel shall be provided.
  - c. Qualified factory representative of the mixer Manufacturer shall be on-site for a minimum of two 8-hour working days spread over a minimum of 2 trips.
4. Assignee shall arrange at least 2 site visits by the BFSS's or specific equipment Manufacturer's specialist during start-up testing of the equipment to measure the amount of vibration and prepare written recommendations for keeping the vibration within acceptable limits. If vibration readings exceed the specified or the applicable referenced standard vibration limits for the mixers, the Assignee shall make necessary corrections for the equipment to meet the acceptance criteria.

- B. Mixing units: Each mixer assembly shall consist of a heavy-duty speed reducer, electric motor, baseplate, solid agitator shaft, and mixing impellers. Mechanical details of each component shall be as follows:
1. Mixer gear drive must be built in accordance with the current AGMA Standards:
    - a. AGMA calculated drive horsepower rating shall be stamped on the drive nameplate.
    - b. Drive housings shall be of high quality close grained cast iron, or fabricated steel, stress relieved and reinforced, and shall be provided with lifting lugs.
    - c. Each unit shall be provided with an integral or separate baseplate and shall have a minimum 12-inch pedestal base for ease of assembly of the agitator shaft and to facilitate draining of the oil from the gear drive.
  2. Gearing must be vertical parallel shaft all helical or helical/spiral bevel type to ensure the highest efficiency coupled with the convenience of mounting and maintenance (worm gearing is not acceptable):
    - a. Worm gear and planetary gear arrangements shall not be acceptable.
    - b. Helical gears shall be a minimum Quality 10 in accordance with ISO standard 1328-1 and 1328-2.
    - c. Spiral/bevel sets shall be a minimum AGMA Quality 8, matched and lapped.
    - d. Each drive assembly shall be of ample capacity to supply the required power and torque output at the maximum speed setting.
    - e. Reducer shall be designed and manufactured in accordance with the AGMA Standard and shall have a service factor of 1.5 based upon the full motor nameplate horsepower at maximum operating speed.
    - f. Service factors based on uniform load and motor brake horsepower will not be accepted.
    - g. Agitator gear drive coupled to impeller shaft must be designed, manufactured, and tested by the mixer supplier.
    - h. Gear reducers shall incorporate double or triple reduction gearing in a single housing lubricated by a common oil bath.

- i. Coupling of lower shaft to gear reducer shaft shall occur inside the gear reducer box.
  - j. Full load operating noise levels of the mixer drives shall not exceed 85 dBA at 3 feet from any part of the drive assembly.
3. Drive bearings shall be of the antifriction type, ball or roller bearings:
- a. Bearings shall be grease- or oil-lubricated.
  - b. Bearings within the drive, including output shaft bearings, shall have a 50,000-hour rating for L-10 life when operating at full motor nameplate horsepower at design speed and sufficiently sized to stabilize the impeller assembly under operating conditions.
4. Each drive must have an effective lubrication of rotating elements without leakage down the output shaft:
- a. Output shaft bearings may be grease lubricated.
  - b. Output shaft bearing seals shall be dry-well type.
5. Electric motor drivers shall be suitable for operating in a humid outdoor environment with class F insulation, a 1.15 service factor, NEMA Premium efficiency, and TEFC enclosure:
- a. Motors shall be squirrel cage induction motors for operation on 3 phase, 60 hertz, 460 volt current with synchronous speed of 1,800 revolutions per minute or less.
  - b. Where variable speed mixers are required, mixer motors are to be used with AC inverters that shall meet NEMA MG1, part 31 for variable torque, 10:1 turndown operation:
    - 1) AC inverter shall be supplied by the Assignee to meet the specifications that will be provided in the Project bid documents.
  - c. Motor shall be connected to the input shaft with a flexible coupling and shall be pilot mounted with a NEMA C face flange:
    - 1) Integral mounted motors without flexible coupling attachments shall not be accepted.
    - 2) IEC or other non-NEMA motor flanges will not be accepted.
  - d. Motors shall be designed constructed and tested in accordance with applicable IEEE and NEMA standards.

6. Lower mixer shaft shall be connected to the upper, or drive output shaft, by means of a rigid flanged or integral coupling.
7. Agitator shaft shall be of solid or hollow shaft design, as recommended by the mixer manufacturer, constructed of Type 316 stainless steel not less than 4 1/2-inch diameter:
  - a. Shaft shall be designed such that the combined (Mohrs circle) maximum shear stress shall not exceed 9,000 pounds per square inch under maximum operating loads for stainless steel.
  - b. It shall be of overhung design for use in complete coverage (liquid levels at least 1 impeller diameter above the impeller height).
  - c. Use of underwater steady bearings is not permitted.
  - d. Mixer shaft shall have a maximum operating speed of 0.75 times the natural frequency of the shaft and impeller assembly without the use of stabilizing ring and lower shaft bearing.
  - e. Mixer shafts shall have extended keyways to allow the impeller to be placed at the optimal depth from the tank bottom. This depth shall be as recommended by the BFSS.
8. Mixer impellers shall be a low shear axial-flow hydrofoil type impellers:
  - a. Mixing impellers shall be constructed of Type 316 stainless steel or other approved material as recommended by the mixer manufacturer and shall be of bolted construction and shall be connected to the agitator shaft with a hook key for maximum security.
  - b. Maximum stress in any impeller component shall not exceed 12,000 pounds per square inch under maximum operating loads.
9. Mixer gear drive and motor shall arrive on site with the Manufacturer's prime coat, for type of primer.
10. Each mixer shall be supported by a concrete slab, designed by the Engineer and installed by the Assignee:
  - a. Mixers will be mounted to a concrete housekeeping pad a minimum of 4-inch thick.
  - b. Mixer anchorage calculations to the concrete substructure shall be provided by the BFSS.
11. Upon installation each unit shall be run to demonstrate its ability to operate without overloading, jamming, or excessive vibration during normal operation.

12. Mixers:
    - a. Manufacturers: One of the following, or equal:
      - 1) Philadelphia Mixers.
  13. If any problems are observed during testing and start-up of the mixers, the mixer manufacturer shall conduct a field visit to the site at the expense of the BFSS.
- C. Design criteria: Mixers design criteria shall be per the BFSS and based on the BFSS's specific basin dimensions and mixing requirements.

## 2.7 MICROSAND PUMPS

### A. General:

1. Principal items specified in this Section are Microsand Recirculation pumps, provided as part of the Ballasted Flocculation system.
2. These horizontal split-case pump systems shall be provided, complete and operable, in accordance with the Contract Documents:
  - a. Pumps to be provided as part of the Ballasted Flocculation system shall have purpose and duties as specified in this Section.
  - b. Pump Manufacturer shall work with BFSS in examining the Site conditions, intended application, and operation of the pump system and recommending the pump which will best satisfy the indicated requirements.
  - c. Duties of the Manufacturer's qualified factory representative:
    - 1) BFSS shall furnish the services of a qualified factory representative of the pump manufacturer to provide assistance for the installation, preliminary operational testing, and final operational testing of the Microsand Recirculation Pumps.
    - 2) In addition, operator training services for the District's personnel shall be provided.
    - 3) Qualified factory representative shall be on-site for a minimum of two 8-hour working days spread over a minimum of 2 trips.

B. Microsand recirculation pumps:

1. General description:

- a. Pump Name: Microsand Pump.
- b. Minimum Quantity: 8.
- c. Location: Ballasted Flocc Sand Recycle Pump Gallery.
- d. Design Capacity (at Design Pumping Head):
  - 1) Pump shall be sized as recommended by BFSS.
- e. Minimum Design Pumping Head: 80 feet.

2. Operating conditions:

- a. Microsand Pumps shall operate at the best possible efficiency over the operating range based on the application and pump model selection and shall cause no overloading of motors under operating conditions.
- b. Microsand Pumps shall be capable of continuous operation at all times.
- c. Microsand Pumps shall have a continuously falling head/capacity characteristic curve from no flow to maximum flow conditions to ensure satisfactory parallel operation.

C. Pump arrangement/construction:

- 1. Casings shall be close-grained cast iron radially split type, computer machined and tested to 150 percent of maximum head, with integral bearing supports:
  - a. Casings shall be fitted with field replaceable abrasion resistant rubber liners pressure molded to the backing plate and secured to the casing externally by heavy-duty studs and nuts.
  - b. Rubber liners shall extend through casing nozzles to form natural gaskets between flanges and piping.
  - c. Flanges to be slotted for easy assembly and disassembly.
- 2. Microsand pumps shall include a sub-base, complete with integral drip rim or pan and drain, to provide for ease of pump installation/removal in the field.



3. Pump impellers shall be statically balanced to ensure freedom from vibration:
  - a. Impeller shall be abrasion resistant rubber, pressure molded to a ductile iron/steel support skeleton or shall be a recessed type consisting of hard metal construction, depending on the application:
    - 1) Determination of impeller type shall be made by the BFSSBFSS.
    - 2) Impeller to be screwed to the shaft with heavy duty threads running in opposite direction to the shaft rotation for maximum security.
4. Wetted pump shaft sleeve shall be of Type 316 stainless steel; non-wetted pump shaft shall be constructed of EN9 carbon steel, machined and ground, and designed for minimum deflection:
  - a. Shafts and other rotating components shall be statically balanced or machined, depending on pump model.
5. Bearings to be heavy-duty anti-friction type completely enclosed in an oil-lubricated cast iron cartridge assembly or lubricated by grease depending on pump model:
  - a. Minimum L-10 bearing life shall be 100,000 hours at any point within the operating range.
  - b. Bearing housing shall be of the cylindrical or cartridge type.
6. Pumps shall be driven by V-belts and sheaves to obtain the required pump speed:
  - a. Provision shall be made for adjusting belt tension.
  - b. A fully enclosed, steel belt guard shall be provided in compliance with OSHA requirements.
7. Pumps and motors shall be provided with necessary lugs, eyebolts, or other suitable attachments for lifting.
8. Electric motor shall be sized to be non-overloading at all points on the pump performance curve with a minimum service factor of 1.15:
  - a. Motor enclosure shall be TEFC, and suitable for operation in a humid, outdoor environment, with class F insulation.
  - b. Motors shall be heavy-duty, high efficiency, TEFC, NEMA Premium efficient, 3 phase, 60 hertz, 460 volt rated as specified.

9. Microsand recirculation pumps shall arrive on site with the Manufacturer's prime coat; for type of primer.
10. Pumps and motors shall be provided with necessary lugs, eyebolts, or other suitable attachments for lifting.

D. Manufacturers: The following or equal:

1. McLanahan.

## 2.8 SLUDGE/SAND GEAR DRIVE AND SCRAPER ASSEMBLY

A. General: Sludge/sand Gear Drive, Scraper Assembly, and Support Structure to be provided under this Contract shall comply with the following general specifications unless stated otherwise:

1. Sludge scraper mechanism shall be suitable for installation in the settling tank with a floor slope of 8 degrees. Total load of the scraper mechanism shall be supported from the walkway spanning the top of the settler tank.
2. Each scraper shall comprise a complete assembly including center drive assembly, overload alarm, torque tube, sludge collector arms and necessary anchorage parts.
3. Overall mechanism shall be designed for a torque capacity determined when the full volume of sand in the system is collected at the bottom of the settler.
4. Vertical shaft shall be fabricated of schedule 40 Type 316 stainless steel pipe flanged at its upper end for mounting to the drive unit and attachments at its lower end for the rake arms:
  - a. Center scraper shall be attached to the center shaft and shall extend into the sludge discharge cone.
  - b. No submerged steady bearing shall be permitted.
5. Rake arms shall be fabricated of Type 316 stainless steel and designed to move the solids to the discharge cone.
6. Discharge cone scraper shall be fabricated of Type 316 stainless steel attached directly to the center shaft.
7. Sludge/sand gear drive and scraper assembly shall be supported by a concrete slab, designed by the Engineer and installed by the Assignee:
  - a. Anchorage calculations to the concrete substructure shall be provided by the BFSS.

B. Center drive mechanism:

1. Drive mechanism shall consist of an electric motor, a primary hydraulic reduction unit, an intermediate reduction unit (for torque ratings greater than 14,000 feet-pounds), and a final reduction unit.
2. Final reduction unit (for torque ratings greater than 14,000 feet-pounds):
  - a. External gear shall be an integral gear bearing:
    - 1) Manufacturers: One of the following, or equal:
      - a) Kaydon, Inc.
      - b) Rotek, Inc.
    - 2) Gear teeth shall be made to AGMA grade 6 or higher.
    - 3) Gear teeth shall have a core hardness of 250 to 300 BHN and shall be induction hardened to a surface hardness of 54 to 60 HRc.
    - 4) Gear shall be rated in accordance with AGMA C95 for 20 years at the specified operating torque.
    - 5) Bearing raceway shall be hardened to 58 to 60 HRc and precision ground.
    - 6) Bearing shall have a seal to prevent contamination of the bearing raceway.
    - 7) Bearing shall have a B-10 life in excess of 100 years and a minimum overturning moment capacity of 375,000 feet-pounds.
    - 8) A ball and strip liner type bearing will not be considered equal.
  - b. Final reduction pinion shall be made of heat-treated carbon steel and shall be mounted on the output shaft of the intermediate reduction gearbox. Gear teeth shall be made to AGMA grade 6 or higher.
  - c. Gear teeth shall have a core hardness of 300 to 350 BHN and shall be induction hardened to a surface hardness of 54 to 60 HRc.
  - d. Final reduction housing shall have a seal to prevent contamination of the oil bath in which the gear/bearing unit and pinion run. An oil fill pipe, dip stick, inspection cover, and drain valve shall be furnished.

## SECTION 46\_44\_10

### BALLASTED FLOCCULATION

#### PART 1 GENERAL

##### 1.1 SUMMARY

A. Section includes:

1. Ballasted flocculation system.

##### 1.2 REFERENCES

A. American Gear Manufacturers' Association (AGMA):

1. C95 - Fundamental Rating Factors and Calculation Methods for. Involute Spur and Helical Gear Teeth.

B. American National Standards Institute (ANSI).

C. American Society of Mechanical Engineers (ASME):

1. B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Inch Standard.

D. American Welding Society (AWS).

E. ASTM International (ASTM):

1. A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
2. A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
3. A194 - Standard Specification for Carbon Steel Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
4. A536 - Standard Specification for Ductile Iron Castings.

F. Food and Drug Administration (FDA).

G. Institute of Electrical and Electronics Engineers (IEEE):

1. IEEE Standard Test Procedure for Polyphase Induction Motors and Generators.

- H. International Electrotechnical Commission (IEC).
- I. International Standards Organization (ISO):
  - 1. 1328-1 - Definitions and allowable values of deviations relevant to flanks of gear teeth.
  - 2. 1328-2 - Definitions and allowable values of deviations relevant to radial composite.
- J. National Electrical Manufacturers Association (NEMA):
  - 1. 250 - Enclosures for Electrical Equipment (1,000 V Maximum).
  - 2. MG1 - Motors and Generators.
- K. Occupational Safety and Health Administration (OSHA).
- L. Society for Protective Coatings (SSPC):
  - 1. SP10 - Near-White Metal Blast Cleaning.
- M. Underwriters Laboratories, Inc. (UL):
  - 1. 508 - Standard for Industrial Control Equipment.
  - 2. 508A - Standard for Industrial Control Panels.
  - 3. 698A - Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations.
  - 4. 1449 - Surge Protective Devices.

### 1.3 BALLASTED FLOCCULATION SYSTEM SUPPLIER SCOPE OF WORK

- A. BFSS is responsible for process design and equipment sizing, selection and procurement required for the Ballasted Flocculation system:
  - 1. System will be designed and supplied as specified in this Section.
  - 2. BFSS's scope of work does not include any engineering, selection, procurement, installation, or operation of any equipment, materials or other services not specifically defined in the Contract Documents.
  - 3. BFSS's scope of supply is included in Attachment A, at the end of this Section.

- B. Engineering will be in accordance with the Project Drawings and Specifications and those applicable state and national codes, standards and/or regulations in effect at the time of this Project, except as otherwise noted:
  - 1. BFSS shall provide necessary design, installation, and operating information for equipment within its stated scope of supply.
  - 2. BFSS is not responsible for the design, selection, installation, operation, or maintenance of any materials, equipment or services supplied by others.
- C. BFSS shall provide process engineering and design support for the system and Submittals as required in the Contract Documents.

#### 1.4 ASSIGNEE SCOPE OF WORK

- A. The assignee remains the sole source of responsibility for providing and installing a complete and operable ballasted flocculation system, per the Contract Requirements.
- B. Specifically, the Assignee is responsible for all Work, as described in the Contract Documents not specifically defined as part of the BFSS's scope as per Attachment A and herein.

#### 1.5 DELEGATED DESIGN

- A. As specified in Section 01 35 73 - Delegated Design Procedures.
- B. Anchoring and bracing.
- C. Plate settler system, including, but not limited to:
  - 1. Structural design.
  - 2. Equipment framing.
  - 3. Fastening of system components to one another.
  - 4. Support beams and support columns, including anchorage to new concrete or other structures.
  - 5. Dead loads, live loads, seismic loads, wind loads, and snow loads must be taken into account for all basin conditions:
    - a. Seismic design according to project seismic category.

#### 1.6 SUBMITTALS

- A. Furnish Submittals as specified in Section 01 33 00 - Submittal Procedures and Section 01 61 00 - Common Product Requirements.

B. Materials required establishing compliance with the specifications shall be submitted in accordance with the provisions of the Contract Documents. Submittals shall include at least the following:

1. Descriptive literature, bulletins, and/or catalogs of the equipment.
2. Data on the characteristics, features, and performance of the equipment.
3. Electrical schematics, panel layouts, field wiring diagrams (including BFSS provided wiring and denoted to show wiring by others to interface with the BFSS equipment), process and instrumentation drawings, instrumentation sheets, and product data sheets for electrical equipment being supplied by the BFSS.
4. Power and control wiring diagrams with electrical interconnection requirements including terminal numbers.
5. Power requirements for the local control panel.
6. Weight of equipment including the weight of the single largest item.
7. A complete bill of materials for equipment.
8. Motor data as specified in Section 26 05 83 - Low Voltage Motors.
9. EBMUD Equipment IDs of all provided equipment.
10. Control Strategy.

C. Delegated Design Submittals:

1. Anchorage and Bracing: Provide project-specific calculations based on support conditions and requirements to resist loads specified in Section 01 81 02 – Seismic Design Criteria:
  - a. To structures for equipment installed in structures designated as seismic design category C, D, E, or F.
  - b. For equipment installed outdoors.
  - c. For wall mounted equipment weighing 125 pounds or more.
2. Plate Settler System:
  - a. Provide a full structural analysis report with detailed calculations. Report shall demonstrate conformance with applicable ACI, AISC, ASCE, AWS,

other necessary standards, and the Drawing and Specification requirements:

- 1) Include loads and load combinations, unity checks, member sizes/materials, bolted connections, anchor connections, deflection, stability, reactions, and other necessary information for a complete structural report.
- 2) Provide project-specific calculations based on support conditions and requirements to resist loads specified in Section 01 81 02 – Seismic Design Criteria and 01 81 04 – Wind Design Criteria:
  - a) Including sloshing loads due to seismic forces acting on plate packs, supports and effluent troughs.
  - b) Dead loads, live loads, seismic loads, wind loads, and snow loads must be calculated for all basin conditions.

D. Installation instructions:

1. Detail the complete installation of the equipment including rigging, moving, and setting into place.
2. Provide manufacturer's installation instructions.

1.7 OPERATION AND MAINTENANCE

A. Operation and maintenance manuals shall be furnished as specified in Section 01 33 00 Submittal Procedures:

1. Manuals shall be prepared specifically for this installation and shall include required cuts, drawings, equipment lists, descriptions, and other information that is required to instruct operation and maintenance personnel unfamiliar with such equipment.

B. A factory trained representative with complete knowledge of the proper system operation and maintenance shall be provided to instruct representatives of the District on proper operation and maintenance of the system and equipment:

1. Instruction shall be conducted in conjunction with the inspection of installation and start-up assistance as specified in this Section.
2. If there are difficulties in operation of equipment due to Assignee's work, additional services shall be provided by BFSS at standard BFSS rates.
3. BFSS shall be provided with a minimum of 3-weeks' notice prior to the date personnel are requested to be on site.



## 1.8 QUALITY ASSURANCE

- A. BFSS shall have completed projects of similar type, complexity and water quality to the proposed project.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. As specified in Section 01 61 00 - Common Product Requirements and Section 33 12 01 – Basic Mechanical Materials and Methods.
- B. Equipment will be shipped by the BFSS or the BFSS's vendor when the equipment is ready and available for shipment:
  - 1. Assignee will be responsible for receiving, unloading, and properly storing the equipment in accordance with BFSS's instructions.
  - 2. Promptly upon the arrival of any equipment components at the job site or first shipping destination, the Assignee will prepare a BFSS's receiving report and submit a copy thereof to the BFSS.
  - 3. Receiving report is to note equipment receipt and evidence of damage in transit, if any. Confirmation of inspection will be no later than 10 days after receipt of delivery.
- C. Finished iron or steel surfaces not required to be painted, such as flange faces, shall be properly protected to prevent rust, corrosion, and damage.
- D. Each box or package shall be properly marked to show its net weight in addition to its contents.

## 1.10 PROJECT OR SITE CONDITIONS

- A. As specified in Section 01 81 02 – Seismic Design Criteria.

## 1.11 WARRANTY

- A. As specified in Divisions 00 and 01.
- B. BFSS shall guarantee equipment specified in this Section, including buy-out items not manufactured by the primary equipment supplier, for a period of 24 months commencing from the date of substantial Project completion.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. The following or equal:
  - 1. Krüger Inc., Actiflo®.
  - 2. WestTech, RapiSand™.

### 2.2 GENERAL

- A. Equipment covered by these Specifications is intended to be standard process equipment of proven ability as manufactured by reputable companies having long experience in the production of such equipment. Equipment furnished shall be designed, constructed and installed by the Assignee in accordance with the best practices and methods and shall operate satisfactorily when installed as indicated on the Drawings.
- B. Parts shall be so designed and proportioned as to have liberal strength and stiffness and to be especially adapted for the work to be done. Ample room and facilities shall be provided for inspection, repairs, and adjustment.
- C. Nameplate ratings for the motors shall not be exceeded, nor shall the design service factor be reduced when its piece of equipment is operating at any point on its characteristic curve.
- D. Location, size, and type of piping shall be as indicated on the Drawings, or as required by the equipment or manufacturers recommendations, if size not shown.
- E. Submerged anchors and bolting shall be Type 316 stainless steel - No exception.
- F. Materials exposed to potable water shall be listed as FDA approved.
- G. Where VFD's are to be provided by the Assignee in the motor control center to drive motors provided by the BFSS strict coordination shall occur for features and settings required:
  - 1. BFSS shall provide the information required within their Shop Drawings and shall review the VFD Shop Drawings for compliance.
  - 2. Incompatibility between VFD's and motors will not be allowed as cause for BFSS warranty disapproval for BFSS provided equipment.
  - 3. VFD adjustments, and settings shall be performed by the Assignee with on-site assistance from the VFD manufacturer's representative and shall be witnessed by the BFSS.

4. BFSS in conjunction with the Assignee shall certify the drive has been selected to match each motor and driven load through its entire range of operation, that potential circulating bearing currents have been mitigated, that dV/dT reflective wave devices are provided as required and recommended by the manufacturer, and that the motor will be protected from overheating by use of temperature switches.
5. Assignee shall provide a copy of the VFD settings to the District.
6. Coordination noted above is in addition to Engineer requirements that will be provided in the Contract Documents.

## 2.3 DESIGN AND PERFORMANCE CRITERIA

### A. Design Basis:

1. Ballasted Flocculation system will be designed to treat raw or ozonated water from the Pardee Reservoir, Briones Reservoir, and/or Folsom South Canal Connection:
  - a. The Ballasted Flocculation process is a high-performance compact clarification system using microsand enhanced flocculation and settling. The following paragraphs narratively describe the basic flow progression and function of the specified Ballasted Flocculation System:
    - 1) A coagulant is added to the raw water in the influent pipe and flash mixed using a pumped diffusion type flash mix system.
    - 2) The coagulated water then enters the concrete water tanks of the ballasted flocculation system. In the first stage, the “coagulation” stage, coagulated water is further mixed to begin forming small floc.
    - 3) Coagulated water then enters the next stage, called the “flocculation” or “injection” stage, where the microsand and flocculant aid polymer is added.
    - 4) Flocculant aid polymer binds the destabilized suspended solids to the microsand particles by forming polymer bridges.
    - 5) Floc is allowed to build in a “maturation” or “flocculation 2” stage. During this stage the mixing zone allows the microsand/solids floc to agglomerate and grow into high-density floc known as microsand ballasted floc.
    - 6) In the final stage, the “sedimentation” stage, the microsand ballasted flocs settle quickly to the bottom of the tank.

- 7) Efficiency of settling is further increased by the use of the lamella plates.
  - 8) Microsand/solids mixture is collected at the bottom of the sedimentation stage, below the lamella plates.
  - 9) Sludge/microsand mixture is then continuously pumped to hydrocyclones via dedicated sand return pumps, where the solids are separated from the microsand by the centrifugal forces generated in the hydrocyclone.
  - 10) Recovered microsand is continuously recycled to the flocculation stage, and the separated sludge is continuously discharged.
2. The BFSS may propose value-added adjustments to this design basis, provided the proposed system meets the design requirements described in the next section.

B. Design requirements:

1. Ballasted Flocculation process shall be capable of thorough coagulant mixing, microsand and polymer injection and mixing, flocculation, sand ballasted flocculation, sedimentation, sludge removal, and sand recycle. Final water clarification will take place via plate settlers:
  - a. Microsand shall be separated from the sludge/microsand mixture via continuous recirculation through the hydrocyclones.
  - b. Microsand shall be continuously re-injected into the Ballasted Flocculation process.
  - c. Sludge shall be discharged continuously to the downstream solids handling systems.
2. System shall be capable of continuously operating at surface loading rates of 25 gallons per minute per square foot at design flow rate. Microsand recycle pumps shall operate in a minimum of 3 duty + 1 standby configuration per train.
3. System shall be capable of operating at a surface loading rate up to 33.3 gallons per minute per square foot for short periods of time during emergencies when 1 train is out of service:
  - a. An emergency period is expected to last no longer than 5 days.
  - b. During emergency operations, microsand pumps are anticipated to operate in a 4 duty + 0 standby configuration per train.

4. System shall be capable of being operated intermittently with regular, daily start-up and shutdown sequences as well as being operated continuously without shutdown for several months.
5. Only those processes making use of microsand ballasted flocculation, operating in a similar manner to that described above, will be considered.
6. After initial startup (2 hydraulic retention times) the Ballasted flocculation system shall meet the performance parameters as specified in this Section at all times while operating at surface loading rates up to but not exceeding 25 gallons per minute per square foot.

C. Design Criteria:

<b>Design Criteria</b>	
<b>Parameter</b>	<b>Criteria</b>
Number of Ballasted Flocculation Trains	2
Total Effluent Design Capacity, mgd	88.0
Effluent Design Capacity Per Train, mgd	44.0
Hydraulic Capacity Per Train, mgd	58.7
<u>Minimum</u> Number of Sand Recirculation Pumps and Hydrocyclones Per Train (Duty + Standby)	3 + 1 @ 306 gpm
Peak loading	
Typical Operations, gallons per minute per square foot	16.6
Maximum Flow Operations, gallons per minute per square foot	25
Special Circumstances Operation, gallons per minute per square foot	33.3

D. Operations and Water Quality Parameters:

1. The BFSS shall guarantee the following performance parameters when the WTP is within the operations and water quality parameters listed below:

Parameter	Units	Low Winter	Typical	High Turbidity	Peak Turbidity	Maximum Flow	FSCC Take	High Winter
Maximum Ballasted Flocculation Flow	mgd	16.5	58.3	58.3	58.3	88	88	38.5
Maximum Raw Water Turbidity	NTU	1.0	0.9	15	80	1.5	2.3	3.0
Maximum Raw Water TOC	mg/L	1.9	1.5	3.0	3.0	2.0	2.5	3.0
Minimum Raw Water Temperature	degrees Celsius	12	18	12	12	18	21	12
Raw Water pH Range	-	7.0-8.4	7.0-8.4	7.0-8.4	7.0-8.4	7.0-8.4	7.0-8.4	7.0-8.4
Minimum Raw Water Alkalinity	mg/L as CaCO <sub>3</sub>	46	46	46	46	39	58	46
Maximum Raw Water Algae	No. per mL	<10,000	<10,000	10,000	10,000	100,000	100,000	10,000
Maximum Raw Water MIB	µg/L	Minimal	Minimal	20	20	40	60	Minimal
Maximum Raw Water Geosmin	µg/L	Minimal	Minimal	20	20	40	40	Minimal
BF Trains Online	No.	1	2	2	2	2	2	1 or 2

E. Performance parameters:

Parameter	Criteria
Settled water turbidity 95 percent of the time when the raw water turbidity is less than or equal to 10 NTU	Less than 1.0 NTU
Settled water turbidity 95 percent of the time when the raw water turbidity is greater than to 10 NTU	less than 2.0 NTU
Maximum Settled Water Turbidity, NTU	5
Maximum sand loss per train, lbs per million gallons treated	15

2.4 PROJECT/SITE CONDITIONS

A. Equipment location:

1. Equipment will be located outdoors.
2. Equipment supports and foundations:
  - a. Unless otherwise indicated, skid mounted and non-skid mounted equipment supports, anchors, and restrainers shall be adequately designed for static, dynamic, and seismic loads by the BFSS. Equipment support and anchor designs by BFSS shall meet the following criteria:
    - 1) Anchorage designs for skids, non-skid mounted equipment including electrical panels, and pipe systems shall be designed to meet requirements of Seismic forces in accordance with Section 01 81 02, Seismic Design Criteria.

B. Electrical enclosure supports:

1. Local control panels shall be designed by the BFSS with proper horizontal anchoring supports within 18 inches of the top of the enclosure for securing the cabinets to the adjacent reinforced concrete or concrete masonry unit wall.
2. There shall be no fewer than 2 horizontal anchoring supports per enclosure.

C. Type 316 stainless steel anchors:

1. Anchor bolts, nuts, and associated hardware for anchoring skid-mounted or non-skid mounted equipment and electrical enclosures shall be furnished by the BFSS anchor bolts for skid systems and non-skid mounted equipment shall be Type 316 stainless steel, Class 2, as specified in ASTM A193 for bolts and to ASTM A194 for nuts:
  - a. Threads on stainless steel bolts shall be protected with an antiseize lubricant suitable for submerged stainless steel bolts, to meet government specification MIL-A-907E.

- b. BFSS shall provide calculations and design of anchoring systems to the Assignee.

D. Equipment foundations:

- 1. Mechanical skid-mounted equipment, tanks, control cabinets, enclosures, and related equipment shall be mounted on minimum 4-inch high concrete bases as required for anchorage design, unless otherwise indicated, and shall be furnished by the Assignee. Equipment foundation sizes shall be verified with the selected BFSS and finalized with the Engineer prior to development of final Contract Documents.

## 2.5 BALLASTED FLOCCULATION BASIN CONFIGURATION

- A. Each ballasted flocculation train shall consist of several separate stages or basins as described in Paragraph 2.3.A.
- B. Each stage shall be separated by concrete or stainless steel (type 316) baffles:
  - 1. Any wall that spans the full width of the ballasted flocculation train shall be constructed from concrete.
  - 2. Assignee shall provide and install all concrete infrastructure.
  - 3. Any non-concrete baffles required for BFSS's proposed Ballasted Flocculation System shall be provided by BFSS.

## 2.6 MIXERS

- A. Principal items specified in this article are the mixers used in each of the ballasted flocculation system mixing stages. These shall be vertical shaft mixer assemblies, provided as part of the Ballasted Flocculation system. These mixing assemblies and appurtenant equipment shall be provided, complete and operable, in accordance with the Contract Documents:
  - 1. Mixers to be provided as part of the Ballasted Flocculation system shall have purpose and duties as specified in this Section, and shall comply with the following Specifications:
    - a. Section 33 12 01 – Basic Mechanical Materials and Methods  
Section 46 41 43.01 - Vertical Shaft Flocculators.
  - 2. The following items shall also be submitted:
    - a. Literature and Drawings describing the equipment in sufficient detail including materials of construction to indicate full accordance with the Specifications.



- b. Calculations confirming that equipment furnished meets design criteria and the intent of the Contract Documents.
  - c. Calculations showing shaft and impeller design information (stresses, critical speed, deflections, shear, impeller power draw at specified speed, and pumping capacity at specified speed of the impeller) shall be submitted.
  - d. Calculations for bearing life.
  - e. Provisions of weight loads and torques exerted by mixer on the structural concrete deck when operating at high speed.
  - f. Calculations and/or literature confirming that components within the gear reducer will receive adequate lubrication.
3. Duties of the manufacturer's qualified factory representative:
- a. BFSS shall furnish the services of a qualified factory representative of the vertical-shaft mixer manufacturer to provide assistance for the installation, preliminary operational testing, and final operational testing of the mixers.
  - b. In addition, operator training services for the District's personnel shall be provided.
  - c. Qualified factory representative of the mixer Manufacturer shall be on-site for a minimum of two 8-hour working days spread over a minimum of 2 trips.
4. Assignee shall arrange at least 2 site visits by the BFSS's or specific equipment Manufacturer's specialist during start-up testing of the equipment to measure the amount of vibration and prepare written recommendations for keeping the vibration within acceptable limits. If vibration readings exceed the specified or the applicable referenced standard vibration limits for the mixers, the Assignee shall make necessary corrections for the equipment to meet the acceptance criteria.
- B. Mixing units: Each mixer assembly shall consist of a heavy-duty speed reducer, electric motor, baseplate, solid agitator shaft, and mixing impellers. Mechanical details of each component shall be as follows:
- 1. Mixer gear drive must be built in accordance with the current AGMA Standards:
    - a. AGMA calculated drive horsepower rating shall be stamped on the drive nameplate.

- b. Drive housings shall be of high quality close grained cast iron, or fabricated steel, stress relieved and reinforced, and shall be provided with lifting lugs.
  - c. Each unit shall be provided with an integral or separate baseplate and shall have a minimum 12-inch pedestal base for ease of assembly of the agitator shaft and to facilitate draining of the oil from the gear drive.
2. Gearing must be vertical parallel shaft all helical or helical/spiral bevel type to ensure the highest efficiency coupled with the convenience of mounting and maintenance (worm gearing is not acceptable):
- a. Worm gear and planetary gear arrangements shall not be acceptable.
  - b. Helical gears shall be a minimum Quality 10 in accordance with ISO standard 1328-1 and 1328-2.
  - c. Spiral/bevel sets shall be a minimum AGMA Quality 8, matched and lapped.
  - d. Each drive assembly shall be of ample capacity to supply the required power and torque output at the maximum speed setting.
  - e. Reducer shall be designed and manufactured in accordance with the AGMA Standard and shall have a service factor of 1.5 based upon the full motor nameplate horsepower at maximum operating speed.
  - f. Service factors based on uniform load and motor brake horsepower will not be accepted.
  - g. Agitator gear drive coupled to impeller shaft must be designed, manufactured, and tested by the mixer supplier.
  - h. Gear reducers shall incorporate double or triple reduction gearing in a single housing lubricated by a common oil bath.
  - i. Coupling of lower shaft to gear reducer shaft shall occur inside the gear reducer box.
  - j. Full load operating noise levels of the mixer drives shall not exceed 85 dBA at 3 feet from any part of the drive assembly.
3. Drive bearings shall be of the antifriction type, ball or roller bearings:
- a. Bearings shall be grease- or oil-lubricated.
  - b. Bearings within the drive, including output shaft bearings, shall have a 50,000-hour rating for L-10 life when operating at full motor nameplate

horsepower at design speed and sufficiently sized to stabilize the impeller assembly under operating conditions.

4. Each drive must have an effective lubrication of rotating elements without leakage down the output shaft:
  - a. Output shaft bearings may be grease lubricated.
  - b. Output shaft bearing seals shall be dry-well type.
5. Electric motor drivers shall be suitable for operating in a humid outdoor environment with class F insulation, a 1.15 service factor, NEMA Premium efficiency, and TEFC enclosure:
  - a. Motors shall be squirrel cage induction motors for operation on 3 phase, 60 hertz, 460 volt current with synchronous speed of 1,800 revolutions per minute or less.
  - b. Where variable speed mixers are required, mixer motors are to be used with AC inverters that shall meet NEMA MG1, part 31 for variable torque, 10:1 turndown operation:
    - 1) AC inverter shall be supplied by the Assignee to meet the specifications that will be provided in the Project bid documents.
  - c. Motor shall be connected to the input shaft with a flexible coupling and shall be pilot mounted with a NEMA C face flange:
    - 1) Integral mounted motors without flexible coupling attachments shall not be accepted.
    - 2) IEC or other non-NEMA motor flanges will not be accepted.
  - d. Motors shall be designed constructed and tested in accordance with applicable IEEE and NEMA standards.
6. Lower mixer shaft shall be connected to the upper, or drive output shaft, by means of a rigid flanged or integral coupling.
7. Agitator shaft shall be of solid or hollow shaft design, as recommended by the mixer manufacturer, constructed of Type 316 stainless steel not less than 4 1/2-inch diameter:
  - a. Shaft shall be designed such that the combined (Mohrs circle) maximum shear stress shall not exceed 9,000 pounds per square inch under maximum operating loads for stainless steel.

- b. It shall be of overhung design for use in complete coverage (liquid levels at least 1 impeller diameter above the impeller height).
  - c. Use of underwater steady bearings is not permitted.
  - d. Mixer shaft shall have a maximum operating speed of 0.75 times the natural frequency of the shaft and impeller assembly without the use of stabilizing ring and lower shaft bearing.
  - e. Mixer shafts shall have extended keyways to allow the impeller to be placed at the optimal depth from the tank bottom. This depth shall be as recommended by the BFSS.
8. Mixer impellers shall be a low shear axial-flow hydrofoil type impellers:
- a. Mixing impellers shall be constructed of Type 316 stainless steel or other approved material as recommended by the mixer manufacturer and shall be of bolted construction and shall be connected to the agitator shaft with a hook key for maximum security.
  - b. Maximum stress in any impeller component shall not exceed 12,000 pounds per square inch under maximum operating loads.
9. Mixer gear drive and motor shall arrive on site with the Manufacturer's prime coat, for type of primer.
10. Each mixer shall be supported by a concrete slab, designed by the Engineer and installed by the Assignee:
- a. Mixers will be mounted to a concrete housekeeping pad a minimum of 4-inch thick.
  - b. Mixer anchorage calculations to the concrete substructure shall be provided by the BFSS.
11. Upon installation each unit shall be run to demonstrate its ability to operate without overloading, jamming, or excessive vibration during normal operation.
12. Mixers:
- a. Manufacturers: One of the following, or equal:
    - 1) Philadelphia Mixers.
13. If any problems are observed during testing and start-up of the mixers, the mixer manufacturer shall conduct a field visit to the site at the expense of the BFSS.

- C. Design criteria: Mixers design criteria shall be per the BFSS and based on the BFSS's specific basin dimensions and mixing requirements.

## 2.7 MICROSAND PUMPS

### A. General:

1. Principal items specified in this Section are Microsand Recirculation pumps, provided as part of the Ballasted Flocculation system.
2. These horizontal split-case pump systems shall be provided, complete and operable, in accordance with the Contract Documents:
  - a. Pumps to be provided as part of the Ballasted Flocculation system shall have purpose and duties as specified in this Section.
  - b. Pump Manufacturer shall work with BFSS in examining the Site conditions, intended application, and operation of the pump system and recommending the pump which will best satisfy the indicated requirements.
  - c. Duties of the Manufacturer's qualified factory representative:
    - 1) BFSS shall furnish the services of a qualified factory representative of the pump manufacturer to provide assistance for the installation, preliminary operational testing, and final operational testing of the Microsand Recirculation Pumps.
    - 2) In addition, operator training services for the District's personnel shall be provided.
    - 3) Qualified factory representative shall be on-site for a minimum of two 8-hour working days spread over a minimum of 2 trips.

### B. Microsand recirculation pumps:

1. General description:
  - a. Pump Name: Microsand Pump.
  - b. Minimum Quantity: 8.
  - c. Location: Ballasted Floc Sand Recycle Pump Gallery.
  - d. Design Capacity (at Design Pumping Head):
    - 1) Pump shall be sized as recommended by BFSS.

- e. Minimum Design Pumping Head: 80 feet.
2. Operating conditions:
- a. Microsand Pumps shall operate at the best possible efficiency over the operating range based on the application and pump model selection and shall cause no overloading of motors under operating conditions.
  - b. Microsand Pumps shall be capable of continuous operation at all times.
  - c. Microsand Pumps shall have a continuously falling head/capacity characteristic curve from no flow to maximum flow conditions to ensure satisfactory parallel operation.
- C. Pump arrangement/construction:
- 1. Casings shall be close-grained cast iron radially split type, computer machined and tested to 150 percent of maximum head, with integral bearing supports:
    - a. Casings shall be fitted with field replaceable abrasion resistant rubber liners pressure molded to the backing plate and secured to the casing externally by heavy-duty studs and nuts.
    - b. Rubber liners shall extend through casing nozzles to form natural gaskets between flanges and piping.
    - c. Flanges to be slotted for easy assembly and disassembly.
  - 2. Microsand pumps shall include a sub-base, complete with integral drip rim or pan and drain, to provide for ease of pump installation/removal in the field.
  - 3. Pump impellers shall be statically balanced to ensure freedom from vibration:
    - a. Impeller shall be abrasion resistant rubber, pressure molded to a ductile iron/steel support skeleton or shall be a recessed type consisting of hard metal construction, depending on the application:
      - 1) Determination of impeller type shall be made by the BFSSBFSS.
      - 2) Impeller to be screwed to the shaft with heavy duty threads running in opposite direction to the shaft rotation for maximum security.
  - 4. Wetted pump shaft sleeve shall be of Type 316 stainless steel; non-wetted pump shaft shall be constructed of EN9 carbon steel, machined and ground, and designed for minimum deflection:
    - a. Shafts and other rotating components shall be statically balanced or machined, depending on pump model.

5. Bearings to be heavy-duty anti-friction type completely enclosed in an oil-lubricated cast iron cartridge assembly or lubricated by grease depending on pump model:
  - a. Minimum L-10 bearing life shall be 100,000 hours at any point within the operating range.
  - b. Bearing housing shall be of the cylindrical or cartridge type.
6. Pumps shall be driven by V-belts and sheaves to obtain the required pump speed:
  - a. Provision shall be made for adjusting belt tension.
  - b. A fully enclosed, steel belt guard shall be provided in compliance with OSHA requirements.
7. Pumps and motors shall be provided with necessary lugs, eyebolts, or other suitable attachments for lifting.
8. Electric motor shall be sized to be non-overloading at all points on the pump performance curve with a minimum service factor of 1.15:
  - a. Motor enclosure shall be TEFC, and suitable for operation in a humid, outdoor environment, with class F insulation.
  - b. Motors shall be heavy-duty, high efficiency, TEFC, NEMA Premium efficient, 3 phase, 60 hertz, 460 volt rated as specified.
9. Microsand recirculation pumps shall arrive on site with the Manufacturer's prime coat; for type of primer.
10. Pumps and motors shall be provided with necessary lugs, eyebolts, or other suitable attachments for lifting.

D. Manufacturers: The following or equal:

1. McLanahan.

## 2.8 SLUDGE/SAND GEAR DRIVE AND SCRAPER ASSEMBLY

- A. General: Sludge/sand Gear Drive, Scraper Assembly, and Support Structure to be provided under this Contract shall comply with the following general specifications unless stated otherwise:
  1. Sludge scraper mechanism shall be suitable for installation in the settling tank with a floor slope of 8 degrees. Total load of the scraper mechanism shall be supported from the walkway spanning the top of the settler tank.

2. Each scraper shall comprise a complete assembly including center drive assembly, overload alarm, torque tube, sludge collector arms and necessary anchorage parts.
3. Overall mechanism shall be designed for a torque capacity determined when the full volume of sand in the system is collected at the bottom of the settler.
4. Vertical shaft shall be fabricated of schedule 40 Type 316 stainless steel pipe flanged at its upper end for mounting to the drive unit and attachments at its lower end for the rake arms:
  - a. Center scraper shall be attached to the center shaft and shall extend into the sludge discharge cone.
  - b. No submerged steady bearing shall be permitted.
5. Rake arms shall be fabricated of Type 316 stainless steel and designed to move the solids to the discharge cone.
6. Discharge cone scraper shall be fabricated of Type 316 stainless steel attached directly to the center shaft.
7. Sludge/sand gear drive and scraper assembly shall be supported by a concrete slab, designed by the Engineer and installed by the Assignee:
  - a. Anchorage calculations to the concrete substructure shall be provided by the BFSS.

B. Center drive mechanism:

1. Drive mechanism shall consist of an electric motor, a primary hydraulic reduction unit, an intermediate reduction unit (for torque ratings greater than 14,000 feet-pounds), and a final reduction unit.
2. Final reduction unit (for torque ratings greater than 14,000 feet-pounds):
  - a. External gear shall be an integral gear bearing:
    - 1) Manufacturers: One of the following, or equal:
      - a) Kaydon, Inc.
      - b) Rotek, Inc.
    - 2) Gear teeth shall be made to AGMA grade 6 or higher.
    - 3) Gear teeth shall have a core hardness of 250 to 300 BHN and shall be induction hardened to a surface hardness of 54 to 60 HRc.



- 4) Gear shall be rated in accordance with AGMA C95 for 20 years at the specified operating torque.
  - 5) Bearing raceway shall be hardened to 58 to 60 HRc and precision ground.
  - 6) Bearing shall have a seal to prevent contamination of the bearing raceway.
  - 7) Bearing shall have a B-10 life in excess of 100 years and a minimum overturning moment capacity of 375,000 feet-pounds.
  - 8) A ball and strip liner type bearing will not be considered equal.
- b. Final reduction pinion shall be made of heat-treated carbon steel and shall be mounted on the output shaft of the intermediate reduction gearbox. Gear teeth shall be made to AGMA grade 6 or higher.
  - c. Gear teeth shall have a core hardness of 300 to 350 BHN and shall be induction hardened to a surface hardness of 54 to 60 HRc.
  - d. Final reduction housing shall have a seal to prevent contamination of the oil bath in which the gear/bearing unit and pinion run. An oil fill pipe, dip stick, inspection cover, and drain valve shall be furnished.
  - e. Final reduction housing shall be fabricated from ASTM A36 steel plate:
    - 1) Welds shall be in accordance with applicable specifications of the AWS.
    - 2) After welding, mounting and mating surfaces shall be machined to insure proper fit and alignment of the drive pinion and mating gear.
    - 3) Base plate on which the gear/bearing is mounted shall have a minimum thickness of 1.0 inches.
    - 4) Surface on which the gear/bearing is mounted shall be machined flat within 0.008 inches.
    - 5) Steel plate to which the intermediate pinion drive gear box is mounted shall have a minimum thickness of 1.25 inches.
    - 6) Top of the final reduction housing shall provide a center platform to allow adequate access to the drive unit.

3. Final reduction unit (for torque ratings less than 14,000 feet-pounds):
  - a. Final gear reduction unit shall have bearings with a B-10 life in excess of 100,000 hours and be AGMA rated for 10,000,000 cycles when operating at the continuous operating torque. Final gear reduction unit shall be of the planetary/spur gear type and shall be permanently grease lubricated.
4. Intermediate reduction unit (for torque ratings greater than 14,000 feet-pounds only):
  - a. Intermediate reduction unit shall be mounted on top of the final reduction unit and properly registered to maintain accurate centers for the final reduction gearing:
    - 1) Intermediate reduction unit shall have sufficient bearing capacity to fully support the pinion gear without a lower support bearing.
    - 2) Intermediate reduction unit shall have bearings with a B-10 life in excess of 100,000 hours and be AGMA rated for 10,000,000 cycles when operating at the continuous output torque.
    - 3) Intermediate reduction gearbox shall be of the planetary type with a minimum efficiency of 85 percent, grease lubricated at the factory so lubrication or maintenance shall not be required for 10 years.
    - 4) Oil lubricated drives or drives require lubrication or maintenance more than once every 5 years shall not be acceptable.
5. Primary hydraulic reduction unit:
  - a. Primary hydraulic reduction unit shall drive the intermediate/final reduction unit:
    - 1) Manufacturers: The following or equal:
      - a) Parker Hannifin.
  - b. Hydraulic gear pump (positive displacement type), hydraulic motor:
    - 1) Manufacturers: The following or equal:
      - a) Parker Hannifin:
        - (1) A 3.0 service factor shall be applied to the catalog rating of commercial hydraulic components.

- c. Hydraulic motor shall be designed for low speed - high torque operation:
  - 1) A pressure relief valve shall be incorporated to provide additional protection against overload.
  - 2) Hydraulic components shall be enclosed in a steel enclosure that shall serve as the reservoir for the hydraulic fluid.
  - 3) Enclosure shall be capable of holding 5 gallons of hydraulic fluid.
  - 4) To ensure soft start capabilities drives incorporated chains and or belts shall not be acceptable.
  
- 6. Electric motor:
  - a. Electric motor shall be an inverter duty motor in accordance with NEMA MG1 Part 31 for use with a variable frequency drive.
  - b. Motor enclosure shall be TEFC, and suitable for operation in a humid, outdoor environment.
  - c. Motors shall be 3 phase, 60 hertz, 460 volt rated.
  - d. Motors shall comply with manufacturers' standard design, construction and testing procedures as define by applicable IEEE and NEMA standards.
  - e. Motors shall be NEMA Premium efficiency type and rated for severe duty. Efficiency shall be determined in accordance with IEEE 112, Test Method B.
  
- 7. Overload device:
  - a. An overload device shall be attached to the primary hydraulic reduction unit and shall be activated by the hydraulic pressure in the primary reduction unit:
    - 1) Device shall have 2 adjustable pressure switches so that an alarm circuit may be energized when the load on the mechanism approaches overload and open the motor circuit when an overload occurs.
    - 2) Overload device shall also have a minimum 6-inch diameter gauge that will indicate the output torque of the drive in feet-pounds.
    - 3) To ensure accurate torque readings drives utilizing the movement a gear shall not be acceptable.

C. Painting:

1. Center drive mechanism assembly shall be provided with standard factory prime coating. Fabricated steel parts will be abrasive blast cleaned to SSPC SP10, near white finish.
  2. External surfaces of fabricated parts shall be coated with 1 layer of Tnemec Omnithane Series 1 modified aromatic polyurethane primer, 2.5 to 3.5 mils dry film thickness and 1 layer of Tnemec Endura-Shield Series 73 semi-gloss aliphatic acrylic polyurethane, 2 to 5 mils dry film thickness.
- D. Manufacturers: The following or equal:
1. Sludge drive gearbox: DBS.
  2. Sludge rake assembly: ClearStream Environmental.

## 2.9 HYDROCYCLONES

- A. Hydrocyclones shall be sized by the BFSS:
1. Underflow of the hydrocyclones shall be gravity fed back into the Ballasted Flocculation process train for reuse of the clean microsand.
  2. Overflow of the hydrocyclone shall be sent by gravity flow to the sludge handling facility.
- B. Hydrocyclones shall be supported from the concrete deck by a BFSS designed and BFSS provided frame. Type 304 stainless steel frame, anchored to a concrete pad below:
1. BFSS shall provide protective devices of a suitable material to prevent corrosion of the concrete from sand discharge out of the hydrocyclone.
  2. Hydrocyclone support frame shall be constructed so as to allow the necessary access for maintenance and removal of the hydrocyclones.
- C. Hydrocyclone will be equipped with a flush port and utilizes an external water supply to aid in the efficient separation of sand and sludge. Source water supply shall be provided by others and regulated to provide a consistent, steady flow.

## 2.10 LAMELLA SETTLING EQUIPMENT

- A. Equipment shall have an incline at 60 degrees from the horizontal. Equipment shall be sufficiently supported underneath by Type 316 stainless steel supports anchored to the settler walls. Supports shall allow for operators to walk on top of the plates for maintenance.
- B. Total required surface area of lamella equipment in each sedimentation basin shall be equal to the square footage required to produce the design surface loading rate.

- C. BFSS shall provide solids settling parallel plate packs suitable for use with the Ballasted Flocculation System process:
  - 1. Materials:
    - a. Structural steel components shall be of Type 316 stainless steel; plate modules shall be made of Type 316 stainless steel.
    - b. Submerged nuts, washers, anchors and bolting shall be Type 316 stainless steel.
- D. Equipment shall be sufficiently supported underneath by Type 316 stainless steel support angles anchored to the Sedimentation Basin walls.
- E. Modules shall be sized to facilitate removal from Sedimentation Basin if/when necessary.
- F. BFSS shall be responsible for designing and supplying support systems associated with the stainless steel plates.

#### 2.11 EFFLUENT COLLECTION SYSTEM

- A. Clarified water shall be collected by means of square notched collection troughs. Each trough shall discharge to a common effluent launder:
  - 1. Collection troughs shall be rectangular shaped and fabricated from Type 316 stainless steel. Troughs shall be sized by the BFSS.
  - 2. Collection troughs shall be designed to provide “free-fall” over trough weir at 34 gallons per minute per square foot (maximum design rate).

#### 2.12 ANTI-VORTEX BAFFLES

- A. Anti-vortex baffles shall be provided in each mixing basin to optimize the mixing effectiveness:
  - 1. Baffles shall be constructed of Type 316 stainless steel:
    - a. Stainless steel baffles:
      - 1) Sized and designed by the BFSS.
    - b. Include adequate support system and bracing to connect the baffles to the basin concrete walls.

## 2.13 VALVES

### A. Miscellaneous valves:

1. As specified in Section 33 12 16.05 - Miscellaneous Valves

## 2.14 VENDOR CONTROL PANELS

### A. General:

1. Provide components and equipment with UL 508 listing.
2. Provide control panels with a UL 508A label.
3. VCP shall contain the hardwired controls, relays, hardwired interlocks, and wiring required for the Ballasted Flocculation system to interface with the VFDs/Starters in the MCC and the EBMUD Plant control system. The Plant control system (PCS) Remote I/O panels only have the I/O points for PCS control:
  - a. Provide field wiring terminal strips for external connections.
4. Provide surge protection on the incoming power feed:
  - a. Provide UL 1449 rated SPD.
5. Provide necessary control hardware, and components as required for a fully functional and operational installation. Control System I/O will be located in a separate PCS Remote I/O panel.
6. Provide heating, cooling, and dehumidifying devices to maintain devices within their rated temperature range.
7. Provide GFCI duplex 120 VAC convenience receptacle.
8. Provide internal cabinet LED light for every 36 inches of enclosure width.
9. Power supply:
  - a. 120 VAC, 1-phase 60 Hz.

### B. Enclosures and panel components:

1. Enclosure:
  - a. Acceptable products: For wall mounted enclosures, Hoffman Concept wall-mount enclosure, with Hoffman Concept back panel, or equal as approved by the Engineer.
  - b. Rating: NEMA Type 4X stainless steel.

2. Wiring:

a. Single conductor wiring inside Control Panel shall be No. 14 AWG stranded copper with 600 volt Type MTW insulation unless otherwise specified.

b. Color Coding:

1)	Function	Gauge	Color
a)	Instrument DC Power (+)	14	Light Blue
b)	Instrument DC Power (-)	14	White w/ Blue Stripe
c)	HVAC DC Power (+)	12	Dark Blue
d)	HVAC DC Power (-)	12	Gray
e)	DC Control	18	Violet
f)	AC Control	16	Red
g)	AC Common	14	White
h)	AC Power	14	Black
i)	AC Ground	14	Green

3. All wiring shall be neatly routed in wiring ducts and labeled with their assigned wire numbers. Provide wire labels for all wiring inside the control panel. Wire labels shall be machine printed, permanent type heat shrinkable polyolefin labels, Brady Permasleeve printable wire markers, or equal as approved by the Engineer.

4. Instruments with grounding terminals shall be grounded to the panel steel. Provide grounding lug for grounding the console to earth ground.

5. Wire termination:

a. Screw type terminals: wires terminated on screw type terminal blocks shall be made of 105 degrees C nylon insulated, crimp-on terminals with locking fork-type tongue for screw-type terminals, AMP, Inc., or Thomas & Betts Co. Sta-Kon, or equal as approved by the Engineer.

b. Screw clamp terminals: wires terminated on screw clamp terminal blocks such as relays, switches, control units and devices, and power supplies shall be made with plastic insulating color coded collar ferrules. Use twin plastic insulated ferrules for connecting two wires to a single terminal

block. Acceptable products: Phoenix Contact Type AI and AI-TWIN, or equal as approved by the Engineer.

c. Ferrule Color Coding:

- 1) Provide plastic insulating color-coded collar ferrules for all wires terminated on screw or spring clamp terminal blocks such as relays, switches, control units and devices, and power supplies shall be made with plastic insulating color coded collar ferrules.
- 2) Ferrules shall be color-coded based on cross-sectional area per UL 486F, Form E. Use only manufacturer approved crimping tool designed specifically for the type of ferrule provided.
- 3) Use twin plastic insulated ferrules for when connecting two wires to a single terminal block.
- 4) Acceptable products:
  - a) Phoenix Contact Type AI and AI-TWIN.
  - b) Or equal as approved by the Engineer.

6. Open-slot-wiring duct sized for the application shall be provided to hold the wires neatly in place. Wiring duct covers shall be hinged. Provide one-inch minimum wire bending radius to prevent wires from being kinked or stressed at the wiring duct junctions.

C. Control units and devices:

1. Terminal blocks:

- a. Terminal blocks shall be finger-safe rated 600 VAC/VDC @ 20A minimum and of the IEC standard feed-through type. Terminal blocks shall accept a wire size range of #22 to #12 AWG and be the DIN rail mountable type.
- b. Fused terminal blocks shall be finger-safe rated 300 VAC/VDC @ 15A minimum with LED blown fuse indicator. Fused terminal blocks shall be equipped with built-in fuse puller and with fuse size as shown on drawings.
- c. Terminal blocks for analog 4-20mA circuits shall be knife-style isolation (circuit disconnect) type.
- d. All terminal blocks shall be clearly and permanently labeled with snap-in marker numbers.



- e. Terminal block jumpers shall be pre-made specifically designed for the application.
- f. Terminal blocks for power and control signals shall be gray in color.
- g. Provide all necessary accessories, partition plates, separating plates, end cover, group markers, etc., as required for proper installation of the terminal blocks.
- h. Provide 20 percent spare terminal blocks for every terminal strip, space permitting.
- i. Acceptable products (Allen-Bradley part numbers are listed; or equal as approved by the Engineer is acceptable):
  - 1) End Anchor: Allen Bradley 1492-EA35.
  - 2) End Barrier (Single Circuit Terminal Blocks): Allen-Bradley 1492-EB3.
  - 3) End Barrier (Two Circuit Terminal Blocks): Allen-Bradley 1492-EBD3.
  - 4) End Barrier (Grounding Terminal Blocks): Allen-Bradley 1492-EB3-Y.
  - 5) Group Marker: Allen-Bradley 1492-GM35.
  - 6) Fuse Block: Allen-Bradley 1492-H5.
  - 7) Single Circuit Terminal Block: Allen-Bradley 1492-W4.
  - 8) Two Circuit Terminal Block (For digital I/O field wiring interface applications only): Allen-Bradley 1492-WD4.
  - 9) Knife-Style Isolating Terminal Block (For analog 4-20mA or 1-5VDC applications only): Allen-Bradley 1492-WKD3.
  - 10) Grounding Terminal Block: Allen-Bradley 1492-WG4.
  - 11) Side Jumpers: Allen-Bradley 1492-N49.
  - 12) Center Jumpers: Allen-Bradley 1492-CJ6-XX (where XX is the number of poles).
  - 13) Marking Systems (1492-W4 and 1492-WG4 terminal blocks): Allen-Bradley 1492-SM6X12 (snap-in marker cards) or Allen-Bradley

1492-MP-X (individual marker tabs where X is the number, letter, or symbol required).

14) Marking Systems (1492-WD4 terminal blocks): Allen-Bradley 1492-SM6X9 (snap-in marker cards) or Allen-Bradley 1492-MP-X (individual marker tabs where X is the number, letter, or symbol required).

15) Marking Systems (1492-WKD3 terminal blocks): Allen-Bradley 1492-SM5X9 (snap-in marker cards) or Allen-Bradley 1492-MP5-X (individual marker tabs where X is the number, letter, or symbol required).

16) Marking Systems (1492-H5 fuse blocks): Allen-Bradley 1492-SM8X12 (snap-in marker cards).

2. Din rail mounted circuit breakers shall be the high density, energy limiting type rated 250VAC or 120VDC, with current ratings as shown on the drawings. Acceptable products: Allen Bradley 1492-GH (250VAC) and 1492-CB Series B (120VDC), or equal as approved by the Engineer.

3. Pilot Devices:

a. Pushbuttons:

1) 30.5 mm diameter, NEMA 4X, momentary contact, extended head, number of contact blocks as specified or as indicated on the drawings, with finger guard terminals:

a) Allen-Bradley 800HC-BR2 (“Start” pushbutton, “Stop” pushbutton, “Trouble” pushbutton, no contact block, black cap).

b) Or equal as approved by the Engineer.

b. Selector switches:

1) 30.5 mm diameter, NEMA 4X, maintained contact, standard knob with white insert, finger guard terminals, number of positions and contact development as shown on the drawings:

a) Allen-Bradley 800HC-HR2A (2 position, 1-NO – 1-NC contact configuration).

b) Or equal as approved by the Engineer.

- c. Indicator lights:
  - 1) 30.5 mm diameter, NEMA 4X, 24VDC, LED push-to-test lamp, with finger guard terminals, color as specified or as indicated on the drawings.
  - 2) Acceptable products:
    - a) Allen-Bradley 800HC-QRTH24A (amber), 800HC-QRTH24R (red), 800HC-QRTH24W (white).
    - b) Or equal as approved by the Engineer.
- d. Push-pull operators:
  - 1) 2-position push-pull/twist to release, NEMA 4X, maintained contact, with two contact blocks unless otherwise specified or as indicated on the drawings, finger guard terminals.
  - 2) Provide a protective guard to avoid unintentional tripping of E-stop push-pull operators:
    - a) Allen-Bradley 800HC-FRXT6A5 (“E-Stop”, red cap, 2-NC contacts with operator in the “out” position) and Allen-Bradley 800T-XA2 additional contact block with 2-NC contacts.
    - b) Allen-Bradley 800T-N310 (protective guard for push-pull operator with stainless steel finish).
    - c) Or equal as approved by the Engineer.
- e. Legend plates:
  - 1) Provide matching legend plates for the pilot devices specified in this Section. Legend plates shall be white with black letters except for the E-stop legend plate which shall be yellow with black letters.
  - 2) Acceptable products:
    - a) Allen-Bradley 800H-W500 (white/black normal legend plates).
    - b) Allen-Bradley 800H-W500J (white/black jumbo legend plates).
    - c) Allen-Bradley 800H-W797A (yellow E-stop legend plates).
    - d) Or equal as approved by the Engineer.

4. Control Relays:

- a. Control relays contacts shall be rated 10A at 250V with a DPDT contact arrangement and 24VDC coil unless otherwise noted on drawings. The relay shall have a built-in free-wheeling diode for DC coils and an indicator light. The relay shall be the socket mount type. The relay socket shall be the DIN rail mount, finger-safe type:

- 1) Acceptable products:

- a) IDEC RH series.

- b) Phoenix Contact:

- (1) Control Relay: Phoenix Contact No. 2967620.

- (2) Plug-In Jumper: Phoenix Contact No. 2966838 (length as required).

- (3) Separation Plate: Phoenix Contact No. 2966841.

- c) Or equal as approved by the Engineer.

5. Time Delay Relays:

- a. DIN rail mounted discrete output on time delay relay with 120VAC coil, DPDT contact rating of 10 amperes at 250VAC, and on and timing out LED indicator light.

- b. Adjustable time delay from 1 sec to 10 hours.

- c. Acceptable products:

- 1) Time Delay Relay: IDEC RTE analog timer Part no. RTE-B12-AC120V, or equal as approved by the Engineer.

6. Fuses:

- a. Time delay glass tube construction with nickel plated brass endcaps, 1/4 inch x 1-1/4 inch size, for use in Allen-Bradley 1492-H5 fuse blocks.

- b. Provide fuse sizes as shown on the drawings.

- c. Acceptable products: Bussman MDL or equal as approved by the Engineer.

7. Ground Bar:

- a. Ground bars shall be UL listed and have suitable number and size of terminals necessary for terminating stranded copper ground wires.
- b. Acceptable products:
  - 1) Phoenix Contact.
  - 2) Bus bar base: Phoenix Contact Model No. 0404428.
  - 3) Bus bar terminal blocks: green/yellow color, rated for 76A, Phoenix Contact Model No. 0423027.
  - 4) Copper bus bar: 1/8" x 3/8" tin-plated, Phoenix Contact Model No. 0402174.
  - 5) Or equal as approved by the Engineer.

D. Plant control system (PCS) monitoring and control:

1. Hardwired I/O monitoring and control:

- a. Discrete input and output rating: 24 VDC.
- b. Analog signal type: 4 to 20 mA.
- c. VCP Inputs:
  - 1) As shown on the Contract Drawings.
- d. VCP Outputs:
  - 1) As shown on the Contract Drawings.
  - 2) VCP Alarms:
    - a) Cabinet over-temperatures from high temperature switch.
    - b) Intrusion status on enclosures equipped with intrusion switches.
    - c) DC power supply failure.

## 2.15 CONTROL STRATEGY

### A. General:

1. Coordinate the following with the District PCS programmer:
  - a. BF Supplier shall provide District with the BF system standard control strategy and provide the District programmer with technical support for programming services during construction, startup and commissioning testing.
  - b. BF Supplier shall schedule and conduct a minimum of two 4-hour workshops with the District and the Engineer to discuss the control strategies, graphics, controls, and information content for the PCS control system. The workshops shall be held at the District's facility, during normal business hours, at agreed upon dates/times.
  - c. BF supplier shall propose in writing the workshop dates a minimum of 2 weeks before the proposed dates.

## 2.16 MICROSAND

### A. General:

1. Microsand for the Ballasted Flocculation system shall have an effective size of 110 to 120 microns, a uniformity coefficient of less than 1.7 and shall contain 95 to 99 percent pure silica sand.
2. BFSS to provide required microsand for system start-up.

## 2.17 BULK BAG SAND FEED SYSTEM

- A. The bulk bag sand feed system will be provided by the Assignee under a separate contract. BFSS shall provide guidance on sand feed system design criteria as part of their Phase 1 services.

## 2.18 SPARE PARTS

- A. BFSS shall provide a list of recommended spare parts as part of the Ballasted Flocculation System Operations and Maintenance Manual as specified.
- B. The following spare parts shall be provided by the BFSS at a minimum:
  1. Mixer bearings and seals set; 1 set for each type/model of mixer provided.
  2. Microsand Pump V-belt sets; 6 sets.
  3. Hydrocyclone Apex Tip; 6 assemblies.

## 2.19 PROCESS INSTRUMENTATION

A. Instrumentation not specifically indicated as provided by the BFSS (PBV) on the P&IDs or in Attachment A shall be provided by the Assignee.

B. Seal Water Instruments:

1. Thermal Dispersion Flow Switch:

- a. Service: Seal Water.
- b. Equipment Tag Numbers: 239-SLW-FSL-021, 239-SLW-FSL-022, 239-SLW-FSL-023, 239-SLW-FSL-024, 239-SLW-FSL-025, 239-SLW-FSL-026, 239-SLW-FSL-027, 239-SLW-FSL-028.
- c. Thermal dispersion sensing method insertion type switch.
- d. Powder coated aluminum NEMA 4X enclosure.
- e. 316 stainless steel probe with single 1-1/4" MNPT process connection with 500 psig pressure rating, or 316 stainless steel inline tee configuration with 3/4" FNPT process connections, as indicated on the Drawings.
- f. Process orientation and insertion length per the Drawings.
- g. 24 VDC powered.
- h. Dual SPDT hermetically sealed relays rated for 115/230 VAC @ 6 amps. Selectable NO or NC states.
- i. Field adjustable setpoint range of 0.05 to 5 feet/sec.
- j. Potentiometer setpoint adjustment with LED indication of flow and calibration status.
- k. Operating temperature: -40 deg F to 140 deg F.
- l. Stainless steel identification tag.
- m. Performance:
  - 1) Repeatability: +/- 1 percent of range or better.
  - 2) Response Time: 5 seconds or better.

- n. Acceptable Products:
  - 1) FCI FLT93 series.
  - 2) Or equal as approved by the Engineer.
- 2. Rotameter: See ISA specification form.
- 3. Pressure Gauge – Water or chemical service, process mount: See ISA specification form.

### PART 3 EXECUTION

#### 3.1 BFSS' SERVICES DURING DESIGN (PHASE 1)

##### A. BFSS shall provide the following work during the design phase:

- 1. Part A (Collaboration with District and Engineer) – The BFSS shall provide the following design support services not including preparation and submittal of Shop Drawings which are described in Part B below:
  - a. Attend initial Kickoff Meeting with District and Engineer within 2 weeks of receiving Notice to Proceed (to be attended by BFSS Project Manager in person in or near the jobsite and other BFSS staff available via phone or videoconference).
  - b. Participate in bi-weekly design coordination meetings and conference calls with the District and Engineer.
  - c. Assist Engineer with the configuration and layout of selected equipment and associated piping, valves, gates, panels, instruments, and associated appurtenances including preparation of associated drawings.
  - d. Provide preliminary drawings (AutoCAD or Revit format) of equipment to be supplied to assist the Engineer with completing the Contract Documents for construction.
  - e. Provide review of the Engineer's 30 percent, 60 percent, 90 percent and 100 percent design drawings and specifications of support systems for the Work.
- 2. Part B (Preparation of Shop Drawings and Submittals for the Ballasted Flocculation System) – After receiving written "Notice to Begin Preparing Shop Drawings and Submittals" from the Engineer, the BFSS shall provide the



following services, equipment, materials, and systems for the Ballasted Flocculation System:

- a. Provide the following elements of the required submittals, as specified in the Contract Documents, including the following items.
- b. Shop Drawings as defined in 01 33 00 and herein.
- c. Recommended list of Spare parts as defined in 2.18 above.
- d. These submittals will be reviewed and approved by Engineer and will be made available to prospective bidders for the Walnut Creek Pretreatment Project as part of the District's procurement efforts to select an ASSIGNEE.

### 3.2 CONSTRUCTION PREPARATION (BY ASSIGNEE)

- A. Anchoring and bracing to structures:
  1. Prepare equipment anchor setting template(s) and use to position anchors during construction of supporting structure(s).
  2. Install anchors of type and material indicated on approved anchoring designs.
  3. Install anchors with embedment indicated on approved anchoring designs.

### 3.3 INSTALLATION

- A. Assignee shall install the equipment in accordance with the BFSS provided and accepted installation instructions and anchorage details.
- B. Assignee shall furnish the required oil and grease for initial operation, as specified:
  1. Grades of oil and grease shall be in accordance with the BFSS' recommendations.
- C. Equipment, components, piping and appurtenances shall be installed true to alignment rigidly supported. Any damage caused by the negligence of the Assignee to the above items shall be repaired or replaced by the Assignee to its original condition.
- D. Interconnecting piping supplied by the BFSS or the Assignee shall be hydrostatically tested by the Assignee.
- E. During the construction period, the Assignee shall authorize direct, informal discussions between the BFSS's software configuration engineer and the District and/or the District's Programmer for purposes of coordinating the required data

transfer between the BFSS provided LCP and the rest of the treatment plant SCADA system, along with other programming coordination and technical issues:

1. As a result of these discussions, certain minor refinements or revisions to the project control strategies may be agreed upon, but these changes shall not alter the overall scope of work or cause an increase or decrease to the Contract price.
2. During these discussions, no oral statement by the District or the District's Programmer shall be construed to give formal approval to an alternate product or method, nor shall any statement be construed to grant formal exception to, or variation from, the requirements of the Contract Documents.

### 3.4 COMMISSIONING

- A. Test mechanical equipment per Section 46 05 94 – Mechanical Equipment Testing:
  1. Unless otherwise indicated, provide Level 1 Performance Test, Level 1 Vibration Test, and Level 1 Noise Test for all specified mechanical equipment.
- B. The district shall inspect shop and field activities as described in Sections 01 45 27 Shop Inspections, 01 75 17 Field Testing and Startup, and Section 46 05 94 Mechanical Equipment Testing.
- C. Witness Testing and Shop Inspections:
  1. At a minimum, the BFSS shall accommodate the Engineer, as indicated, for witnessed Factory Acceptance Testing (FAT) for the following equipment:
    - a. Sludge scraper assemblies.
    - b. Microsand pumps.
    - c. Mixers.
  2. Furnish test reports and the Manufacturer's Certificate of FAT.
  3. At a minimum, the BFSS shall accommodate the Engineer, as indicated, for shop inspection during manufacturing of the following equipment:
    - a. Lamella plate module sets.
    - b. Lamella plate supports.
    - c. Effluent collection troughs.
    - d. Supports for collection troughs.
    - e. Anti-vortex, mixing, and basin separation baffles.

- f. Sludge scraper assembly, including rake arms and blades.
  - g. Other provided fabricated steel assemblies, as identified by District.
4. Testing shall be per Section 01 45 27, 01 75 17, and 46 05 94.

D. Installation Verification:

- 1. Following installation completion and prior to starting commissioning, the BFSS shall meet all requirements listed in Section 1 75 17 under Installation Completion.
- E. Provide the services of equipment vendors / representatives as described in the individual equipment sections.

3.5 BFSS'S SERVICES DURING CONSTRUCTION:

- A. Following issuance of the Notice to Proceed for the construction contract by the District to the ASSIGNEE, the BFSS will provide services and equipment to the ASSIGNEE, for the pre-selected Ballasted Flocculation equipment and services during construction, including but not limited to, the following items:
- 1. Sign an agreement with ASSIGNEE to provide the goods and services specified in these Contract Documents.
  - 2. Attend and participate in a pre-installation conference under the direction of the ASSIGNEE to be attended by BFSS's Project Manager and Commissioning Agent in person at or near the jobsite and other BFSS staff available by phone).
  - 3. Furnish final shop drawings and other required submittals to the ASSIGNEE, for its review and coordination with BFSS, before forwarding submittals for final review and approval by the Engineer.
  - 4. Furnish and deliver equipment and materials as specified herein and in the other sections of the Contract Documents.
  - 5. Provide engineering and construction services including, but not limited to, the following items:
    - a. Factory testing services witnessed by Engineer/District prior to shipping equipment, as described in herein.
    - b. Equipment delivery, including requirements for handling and storage.
    - c. Construction support services including attendance at meetings, installation assistance, and providing Manufacturer's certificates.
    - d. Certification of proper installation prior to startup and testing.

- e. Startup and testing including functional testing, clean water testing, startup assistance, and performance testing.
  - f. Two-year warranty, including repair and replacement of defective equipment per the terms and conditions of the warranty agreement(s).
- B. Field Services:
- 1. BFSS shall provide the services, as scheduled, necessary to start-up, test, and operate the system as follows:
    - a. Assignee assistance and inspection:
      - 1) Advice during installation.
      - 2) Equipment check-up and initial testing.
      - 3) Loop tests with assistance of the Electrical Contractor.
      - 4) End-to-End test.
      - 5) Control system network test.
    - b. DCS programming assistance.
    - c. Performance testing:
      - 1) Final inspection and adjustments before testing.
    - d. Start-up and operator training:
      - 1) Start-up assistance.
      - 2) Supervision of equipment operation at start-up.
      - 3) Operator training.
    - e. Follow-up site visits.
  - 2. Fees, costs, and/or expenses resulting from BFSS's assistance, as required or requested by the Assignee, that is in excess of the scheduled field services, as presented in 3.5, shall not be incurred by the District and is the sole responsibility of the Assignee.
- C. Field Testing:
- 1. Follow all field testing requirements specified in Section 01 75 17 and technical specifications.
  - 2. Preliminary field testing, inspection, and checkout of the entire Ballasted Flocculation System, following installation, shall be performed by a qualified representative of both the BFSS and witnessed by the Engineer:
    - a. Tests shall be conducted to demonstrate to the Engineer that system components furnished by the BFSS are fully operational, that connecting piping is leak proof and properly anchored, and that the entire system furnished by the BFSS is ready for continuous safe operation.

- b. The purpose of the checkout shall be to ensure that each individual system component has been correctly installed, shall operate fully in the manner intended, and is ready to perform its function as part of an integrated system when placed in continuous operation.
  3. When preceding equipment tests have been satisfactorily performed and when water is available and can be suitably handled through the Ballasted Flocculation System, the Ballasted Flocculation System shall be started and tested as a system:
    - a. BFSS's representative shall coordinate and supervise operating personnel during the start-up period.
    - b. Start-up operations shall be continued until it is satisfactorily demonstrated that the equipment is suitable for continuous on-line service.
    - c. The system shall demonstrate meeting the specified performance parameters within two hydraulic retention times of startup.
  4. During the start-up period the process performance shall be evaluated.
- D. Process Performance Testing:
  1. Process Performance Test Period shall be one year, starting from the Ready for Service milestone per section 01 75 17 – Field Testing and Startup.
  2. If at any time during Performance Test Period, the Ballasted Flocculation System process does not meet the process performance requirements described herein and the problem cannot be remedied through verbal communication within 24 hours, the BFSS shall send a representative to the site within 48 hours of the initial notification of the problem at the expense of the BFSS.
  3. During the initial 5 days of the Performance Test Period, BFSS shall assist District's staff in the operation of the Ballasted Flocculation System and shall meet the performance criteria as listed in Section 2.3:
    - a. This initial assistance shall be provided by BFSS's on-site start-up and optimization specialist.
    - b. Assistance shall include guidance and recommendations for system operating parameters and pre-treatment chemical conditioning adjustments.
    - c. In the event that the system does not satisfactorily meet the specified process performance requirements, the test period shall be extended for a minimum of 2-days, at the expense of the BFSS.


- 4. District will provide for any necessary sampling and analysis during the Performance Testing Period.
- E. The vendor shall provide the services of a qualified representative to provide instruction and inspect equipment installation and start-up and training of District's plant personnel. Notwithstanding, manufacturers' representatives shall be present at frequent enough intervals to ensure proper installation and testing of the equipment furnished:

<b>Duties/Description</b>	<b>Minimum Requirements (1)</b>	
	<b>Man Days (days)</b>	<b>Trips to Site (no.)</b>
Assist Assignee and Inspect Work	8	2
DCS Programming Assistance	4	1
Performance Testing	8	2
Start-Up and Operator Training	4	1
Follow Up Visit	2	1
<b>TOTALS</b>	<b>26</b>	<b>7</b>
(1) All days are calendar weekdays.		

3.6 PROTECTIVE COATINGS


- A. Fabricated steel parts, excluding stainless steel, shall arrive on site with the Manufacturer's prime coat; for type of primer, as specified:
  - 1. After installation, primed fabricated steel parts shall be cleaned and coated by the Assignee as specified in the Contract Documents and applicable Specifications within the Assignee's Contract Documents.

END OF SECTION

1	RESPONSIBLE ORGANIZATION		ROTAMETER		6	SPECIFICATION IDENTIFICATIONS		
2	EBMUD		LOW PRESSURE		7	Document no	<Spec No.>	
3			Service: Water sample		8	Latest revision	0 Date	
4			Device Specification		9	Issue status		
5							10	
BODY AND TUBE					PERFORMANCE CHARACTERISTICS			
12	Tube form and size		MFR STD		61	Max press at design temp	50 psig	At 68 deg F
13	Mounting		Front panel		62	Min working temperature	60 deg F	Max 75 deg F
14	Inlet conn nominal size		Direction	Rear horizontal	63	Rated accuracy	+/- 4% of full scale or better	
15	Outlet conn nominal size		Direction	Rear horizontal	64	Repeatability	0.50%	
16	End conn termn type		Threaded	Style NPT(F)	65	Turndown	10:1 or better	
17	Fitting material		PVC		66	Fluid	Water	
18	Gasket o-ring material		Viton		67	Operating specific gravity	1.0	
19	Tube material		Borosilicate Brass		68	Max operating viscosity	1 cps	
20	Float material		SST		69			
21	Float guide		None		70			
22	Meter scale: length and type		6 in nominal, adjustable plate		71			
23	Meter scale range				72			
24					73			
25					74			
26					75			
27					76			
28					77			
29					78			
30					79			
TRANSMITTER					80			
31	Output signal		N/A		81			
32	Scale range		N/A		82			
33	Voltage		N/A		83			
34					84			
35					85	OPTIONS AND ACCESSORIES		
36					86	Valve type and size	Integral 1/8" PVC cartridge	
37					87	Valve location	Inlet	
38					88			
39					89			
SWITCHES					90			
40	No. of contacts		N/A		91			
41	Form		N/A		92	SPECIAL REQUIREMENTS		
42	Rating		N/A		93	Custom tag	Per section 01 91 13.10	
43	Housing		N/A		94	Reference specification	33 09 11	
44	Action		N/A		95	Special preparation	N/A	
45					96	Compliance standard	ISA RP 16.6	
46					97	Construction code	N/A	
47					98	Calibration report	N/A	
48					99	Weld radiographs	N/A	
49					100			
50					101	PHYSICAL DATA		
51					102	Estimated weight	MFR STD	
52					103	Face-to-face dimension	MFR STD	
53					104	Removal clearance	MFR STD	
54					105	Mfr reference dwg	MFR STD	
55					106			
56								
57								
CALIBRATIONS AND TEST					INPUT OR TEST		OUTPUT	
110	TAG NO/FUNCTIONAL IDENT		MEAS/SIGNAL/TEST		LRV	URV	LRV	URV
111								
112								
113								
114								
115								
116								
117								
COMPONENT IDENTIFICATIONS								
118	EQUIPMENT ID TAG #s		MANUFACTURER		MODEL NUMBER			
119	All		See Note 1		See Note 1			
120								
121								
122								
123								
124								
125								
NOTES								
*	Supplier shall complete or update data fields as applicable for equipment actually furnished.							
1.	Acceptable products: King 7430 series, or equal as approved by the Engineer.							
2.	7450							
3.								

Form: 20F2111 Rev 0

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1	RESPONSIBLE ORGANIZATION		PRESSURE GAUGE		6	SPECIFICATION IDENTIFICATIONS	
2	EBMUD		Service: Water or chemical, process mount		7	Document no	2139
3			Device Specification		8	Latest revision	0
4					9	Date	
5					10	Issue status	
OPERATING PARAMETERS					DIAL AND POINTER		
11	Project number		Sub project no		61	Dial scale type	Single (psi)
12	Project				62	Pointer adjustment	MFR STD
13					63	Graduations and color	White dial
14					64	Scale range type	STD or Compound as shown
15					65	Dial material	MFR STD
16					66		
17					67		
18	Service				68		
19					69	SIPHON	
20	P&ID/Reference dwg number	J-001 thru J-021		70	Siphon type	N/A	
21	Material name	Water or Chemical		71	End conn nominal size	N/A	Style N/A
22	Minimum pressure	Per P&IDs		72	Overall length	N/A	
23	Normal pressure	Per P&IDs		73	Siphon material	N/A	
24	Maximum pressure	Per P&IDs		74			
25	Normal temperature	70 deg F		75			
26	Maximum temperature	120 deg F		76			
27	Material phase	Liquid or Gas Per P&IDs		77	PERFORMANCE CHARACTERISTICS		
28				78	Max press at design temp	Per P&IDs	At 70 deg F
29				79	Min working temperature	40 deg F	Max 80 deg F
30				80	Min ambient working temp	33 deg F	Max 33 deg F
31	PROCESS CONNECTION AND CASE			81			
32	Case type	MFR STD		82			
33	Case style			83			
34	Gauge size	2-1/2" or 4-1/2" as shown on Dwg		84			
35	Process conn nominal size	1/4"	Style NPT(M)	85	ACCESSORIES		
36	Process conn location	Bottom		86	Pressure limit valve matl	N/A	
37	Case pressure relief type	N/A		87	Restrictor style	N/A	
38	Ring style	MFR STD		88	Pressure snubber matl	N/A	
39	Mounting type	Process mount		89	Pulsation dampener matl	N/A	
40	Case material	316 SST		90	Diaphragm seal (chem. only)	PVC w/ PTFE seal (Note 3)	
41	Ring material	MFR STD		91			
42	Exterior treatment-color	MFR STD		92	SPECIAL REQUIREMENTS		
43	Window material	Polycarbonate		93	Custom tag	Per Section 01 91 13.10	
44	Stem material	Water: Bronze Chem: 316 SST		94	Reference specification	33 09 11	
45	Gasket/O ring material	MFR STD		95	Special preparation	N/A	
46	Liquid fill material	N/A		96	Compliance standard	MFR STD	
47				97	Service design		
48				98			
49				99			
50	PRESSURE ELEMENT AND MOVEMENT			100			
51	Elastic element type	Bourdon tube		101	PHYSICAL DATA		
52	Movement style	MFR STD		102	Estimated weight	MFR STD	
53	Nominal accuracy grade	ANSI B40.1 Grade 1A or better		103	Maximum thickness	MFR STD	
54	Joint type	MFR STD		104	Max case outside dia	MFR STD	
55	Element material	Water: Bronze Chem: 316 SST		105	Mfr reference dwg	MFR STD	
56	Movement material	MFR STD		106			
57				107			
58							
CALIBRATIONS AND TEST					SCALE		
110	EQUIPMENT ID TAG #s	PRESSURE OR SCALE			LRV	URV	
111							
112							
113							
114							
115							
116							
117							
118							
COMPONENT IDENTIFICATIONS							
119	EQUIPMENT ID TAG #s	MANUFACTURER		MODEL NUMBER			
120							
121	All	See Note 1		See Note 1			
Notes							
*	Supplier shall complete or update data fields as applicable for equipment actually furnished.						
1.	Acceptable products: Ashcroft Series 251009-SWL02L, Marsh Bellofram "Industrial" Series, or equal as approved by the Engineer.						
2.	All gauges shall be capable of pressures 50% higher than the gauge full scale without damage.						
3.	Acceptable products: Plastomatic GGM-T, or equal as approved by the Engineer.						

Form: 20P2001 Rev 0

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01/29/25

RFQ 2505

46 44 10 - 45

Ballasted Flocculation



**ATTACHMENT A - BFSS'S SCOPE OF SUPPLY FOR  
BALLASTED FLOCCULATION SYSTEM**

## BFSS'S SCOPE OF SUPPLY FOR BALLASTED FLOCCULATION SYSTEM

At a minimum, BFSS shall provide the following scope of supply as part of their bid. If BFSS can provide specific information (including backup information such as catalog sheets, calculations, white papers, or similar materials) that indicate the equipment is not required for BFSS's ballasted flocculation offering, these deviations can be submitted to the District a minimum of 5 business days before the bid due date for review and approval.

### Mechanical Equipment and Instruments

Description	Units Per Train	Total No. of Units
Variable Speed Mixers and Accessories		
Top entering mixer(s), TEFC, NEMA Premium efficient, 460/3/60 inverter duty motor, 316 stainless steel shaft and impellers	3	6
Anti-vortex, mixing, and basin separation baffles, 316 stainless steel	AR <sup>1</sup>	AR <sup>1</sup>
VFD to be supplied by others	--	By Assignee
Sedimentation Basins		
Sludge scraper assemblies, 316 stainless steel, center drive, TEFC, 460/3/60 inverter duty motor, NEMA Premium efficient, speed reducer, complete with drive shaft, shaft protector, rake arms and blades	1	2
VFD to be supplied by others	--	By Assignee
Lamella plate module sets, 316 stainless steel	1 set	2 set(s)
Lamella plate supports, 316 stainless steel and tie-down assembly	1 set	2 set(s)
Effluent collection troughs, 2' width, 316 stainless steel	4	8
Supports for collection troughs, 316 stainless steel	1 set	2 set(s)
<u>Notes:</u>		
(1) As required. Value to be provided by BFSS		

Description	Units Per Train	Total No. of Units
Microsand Recycle System		
Microsand recirculation pumps, centrifugal, cast iron body, with rubber-lined volute and impeller, dry gland seal, drip pan, TEFC, 460/3/60 NEMA Premium efficient - severe duty - AC induction motor with V-belt and pulley drive	3 duty + 1 stand-by	8
Microsand recirculation pump seal water system including solenoid valve, flow indication, flow switch and pressure indication	4	8
Hydrocyclones with flush water inlet, and urethane body (piping and valves by Assignee)	3 duty + 1 stand-by	8
Hydrocyclone support stand, 304 stainless steel	4	8
Imhoff Cone for Sand Concentration Sampling	--	2
Microsand for Start-up (tons)	AR <sup>1</sup>	AR <sup>1</sup>
Local Control Panels	AR	AR
Spare Parts		
Mixer bearings and seals set; For each type/model of mixer provided by BFSS	--	1 set
Microsand Pump V-belt sets	--	8 set(s)
Hydrocyclone Apex Tip (assemblies)		8
<u>Notes:</u> (1) As required. Value to be provided by BFSS		

**ATTACHMENT A - BFSS'S SCOPE OF SUPPLY FOR  
BALLASTED FLOCCULATION SYSTEM**

**BFSS'S SCOPE OF SUPPLY FOR BALLASTED FLOCCULATION SYSTEM**

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**Mechanical Equipment and Instruments**

Description	Units Per Train	Total No. of Units
Variable Speed Mixers and Accessories		
Top entering mixer(s), TEFC, NEMA Premium efficient, 460/3/60 inverter duty motor, 316 stainless steel shaft and impellers	3	6
Anti-vortex, mixing, and basin separation baffles, 316 stainless steel	AR <sup>1</sup>	AR <sup>1</sup>
VFD to be supplied by others	--	By Assignee
Sedimentation Basins		
Sludge scraper assemblies, 316 stainless steel, center drive, TEFC, 460/3/60 inverter duty motor, NEMA Premium efficient, speed reducer, complete with drive shaft, shaft protector, rake arms and blades	1	2
VFD to be supplied by others	--	By Assignee
Lamella plate module sets, 316 stainless steel	1 set	2 set(s)
Lamella plate supports, 316 stainless steel and tie-down assembly	1 set	2 set(s)
Effluent collection troughs, 2’ width, 316 stainless steel	4	8
Supports for collection troughs, 316 stainless steel	1 set	2 set(s)
<u>Notes:</u>		
(1) As required. Value to be provided by BFSS		

Description	Units Per Train	Total No. of Units
Microsand Recycle System		
Microsand recirculation pumps, centrifugal, cast iron body, with rubber-lined volute and impeller, dry gland seal, drip pan, TEFC, 460/3/60 NEMA Premium efficient - severe duty - AC induction motor with V-belt and pulley drive	3 duty + 1 stand-by	8
Microsand recirculation pump seal water system including solenoid valve, flow indication, flow switch and pressure indication	4	8
Hydrocyclones with flush water inlet, and urethane body (piping and valves by Assignee)	3 duty + 1 stand-by	8
Hydrocyclone support stand, 304 stainless steel	4	8
Imhoff Cone for Sand Concentration Sampling	--	2
Microsand for Start-up (tons)	AR <sup>1</sup>	AR <sup>1</sup>
Local Control Panels	AR	AR
Spare Parts		
Mixer bearings and seals set; For each type/model of mixer provided by BFSS	--	1 set
Microsand Pump V-belt sets	--	8 set(s)
Hydrocyclone Apex Tip (assemblies)		8
<u>Notes:</u> (1) As required. Value to be provided by BFSS		

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**WALNUT CREEK WATER TREATMENT PLANT  
PRETREATMENT PROJECT**

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CONTRACT DOCUMENTS  
VOLUME 3 OF 3 – DRAWINGS

BALLASTED FLOCCULATION PRE-SELECTION  
NOT FOR CONSTRUCTION

RFQ 2505



EAST BAY MUNICIPAL UTILITY DISTRICT

INSTRUMENT IDENTIFICATION SYSTEM

INSTRUMENT IDENTIFICATION (TAG) NUMBER (SEE NOTE 2)

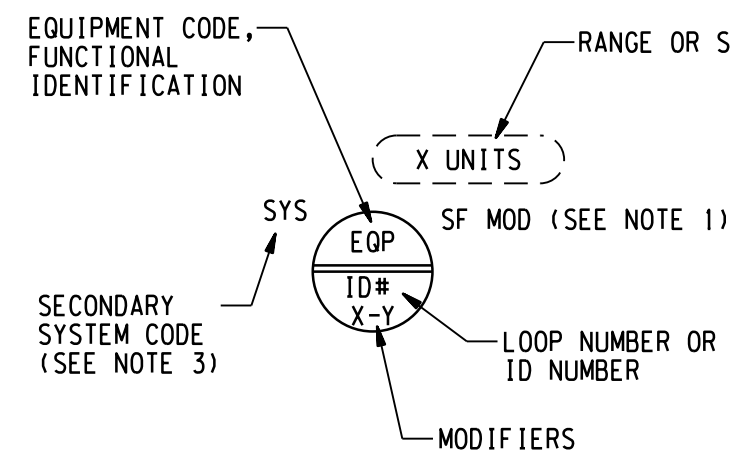
EXAMPLE: 233-CA-FIC-300-1-A  
(LOC-SYS-EQP-ID#-MOD)

Table with columns: LOCATION (LOC), SYSTEM CODE (SYS), FUNCTIONAL IDENTIFICATION OR EQUIPMENT CODE (EQP), LOOP IDENTIFICATION NUMBER (ID#), MODIFIERS (MOD) (OPTIONAL), SPECIAL FUNCTION (MOD)

UNIT NO. (MULTIPLE PROCESS TRAINS) OR MULTIPLE INSTRUMENTS IN SAME LOCATION

LETTER FOR MULTIPLE INSTRUMENTS IN DIFFERENT LOCATIONS (PANELS)

INSTRUMENT SYMBOL CONFIGURATION

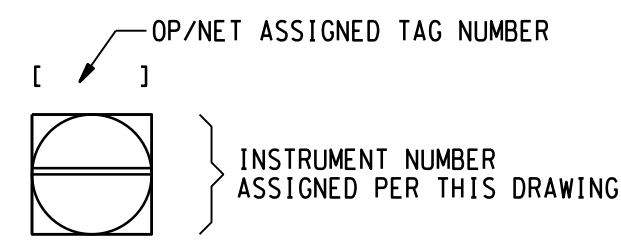


- NOTES 1. "SF" IS USED TO REPRESENT ANY "SPECIAL" FUNCTION MODIFIER OR VARIABLE AND MAY BE DEFINED AS LISTED BELOW. 2. THE APPLICABLE FACILITY NUMBER IS IDENTIFIED ABOVE THE TITLE BLOCK ON THE P&ID. 3. THE PRIMARY SYSTEM CODE IS IDENTIFIED ABOVE THE TITLE BLOCK ON THE P&ID. A SECONDARY SYSTEM CODE IS SHOWN HERE.

SPECIAL FUNCTION MOD OR VARIABLE

Table mapping letters to special function modifiers: AM AUTO-MANUAL, CL2 CHLORINE, COND CONDUCTIVITY, etc.

REMOTE SIGNAL DESIGNATION



INSTRUMENT SYMBOLS

Table of instrument symbols: FIELD MOUNTED INSTRUMENT, AUXILIARY PANEL MOUNTED INSTRUMENT, PRIMARY PANEL MOUNTED INSTRUMENT, LOCAL ON-OFF INDICATING LAMP, REMOTE ON-OFF INDICATING LAMP, BACKUP CONTROL AND DISPLAY TO CONFIGURABLE CONTROL SYSTEM, CONFIGURABLE CONTROL SYSTEM ACCESSIBLE TO OPERATOR, etc.

SIGNAL LINES

Table of signal line types: DIRECT PROCESS CONNECTION, PNEUMATIC SYSTEM, ANALOG SIGNAL, DISCRETE SIGNAL (DIGITAL), HYDRAULIC SIGNAL, CAPILLARY TUBING (FILLED SYSTEM), ELECTROMAGNETIC, RADIATION, OR SONIC SIGNAL WITH TUBING OR WIRING (GUIDED), etc.

LOGIC & CONTROL SYMBOLS

Table of logic and control symbols: INTERLOCK SYMBOL WITH NUMBER TO DESCRIBE CONTROL STATEMENTS OR INTERLOCK FUNCTIONS ON THE P&ID, RESET, CONTROL OUTPUT IS EFFECTIVE IF ALL INPUTS EXIST (TRUE), etc.

RTU / PLC SYMBOLS

Table of RTU/PLC symbols: NORMALLY ACCESSIBLE TO OPERATOR AS INDICATOR/CONTROLLER/RECORDER OR ALARM POINT, NORMALLY NOT ACCESSIBLE TO OPERATOR AS INPUT/OUTPUT INTERFACE, etc.

INSTRUMENT FUNCTIONAL IDENTIFICATION (EQUIPMENT CODE)

Table mapping letters to functional identification: A ANALYSIS, TURBIDITY, B BURNER, COMBUSTION, FIRE, C CONDUCTIVITY, etc.

NOTES FOR TABLE

- 1. ANY UNASSIGNED LETTER IS DEFINED AS A USER'S CHOICE LETTER WHICH IS INTENDED TO BE USED TO COVER A MEANING FOR A PARTICULAR PROJECT.

PROCESS LINES

Table of process line types: PRIMARY PIPE, SECONDARY PIPE, INSTRUMENT PIPE, CHANNEL, DOUBLE-WALL PIPE, HEAT TRACED PIPE, PIPE INTERIOR DETAIL

SIGNAL IDENTIFICATION

Table of signal identification: AI ANALOG INPUT, AO ANALOG OUTPUT, CO CONTROL OUTPUT FROM THE RTU WITH ASSOCIATED FEEDBACK AND HANDSHAKING SIGNAL, DI DIGITAL INPUT, etc.

PROCESS CONNECTORS & IDENTIFIERS

Table of process connectors and identifiers: EQUIPMENT NUMBER/IDENTIFIER TAG, SYSTEM CODE OR SAMPLE NUMBER IDENTIFIER, OFF-PAGE CONNECTOR, ON-PAGE CONNECTOR, etc.

NOTES

- 1. SEE ANSI/ISA 55.1, INSTRUMENTATION SYMBOLS AND IDENTIFICATION, FOR MORE DETAILS. 2. SEE DISTRICT ENGINEERING STANDARD PRACTICE 130.0 AND STANDARD DRAWING 9492-G-006 FOR DIRECTION ON ASSIGNING NEW TAG NUMBERS. 3. REFER TO ESP 130.0 FOR TAGGING INFORMATION.

Table for use in developing early pricing agreement only with columns for NO., DATE, REVISION, BY, REC., APP.

Table with project information: DESIGNED BY, DESIGN CHECKED BY, DRAWN BY, EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA, STANDARD DRAWING, GENERAL LEGEND, SYMBOLS, AND ABBREVIATIONS FOR P&ID DRAWINGS, PROJ. NO. 9492-G-002, SCALE NONE, DATE 13JUL1999, NUMBER 5, REV. 5



SPEC. NO.

USER: pcori\cso  
DATE: 26-APR-2017 15:27  
FILE: H:\sstdwg\858stdwg\94920003.R08

VALVES		ACTUATORS		FITTINGS		MISCELLANEOUS SYMBOLS	
HAND VALVES OR VALVE BODY		CHANNEL VALVES		DIAPHRAM ACTUATOR CONTROL (ASSUMED FLOW DIRECTION →)			
ANGLE VALVE BALL VALVE BUTTERFLY VALVE CIRCUIT BALANCE VALVE (HVAC) COCK CONE VALVE DIAPHRAGM VALVE ECCENTRIC PLUG VALVE NORMALLY CLOSED (NOTE 1) ECCENTRIC PLUG VALVE NORMALLY OPEN (NOTE 1) GATE VALVE (OR GENERIC VALVE) GLOBE VALVE KNIFE GATE VALVE NEEDLE VALVE NEEDLE VALVE, SCALED PINCH VALVE PLUG VALVE SELF CLOSING VALVE (SPRING) SLEEVE VALVE TRAP PRIMER THREE-WAY VALVE FOUR-WAY VALVE V-BALL VALVE	CHECK VALVES BALL CHECK OR ANTI-SYPHON VALVE BACKFLOW PREVENTER, REDUCED PRESSURE ZONE W/RELIEF DIAPHRAGM CHECK VALVE/VACUUM BREAKER FOOT VALVE (SUBMERGED) SPRING POPPET CHECK VALVE SWING CHECK VALVE (INCLUDES SWING, DOUBLE DOOR, FLAPPER, AND TILTING DISC) SWING CHECK VALVE W/HOLD OPEN DEVICE TRIPLE DUTY VALVE (ISO, CHECK, FLOW LIMIT) (HVAC)	BUTTERFLY GATE MUD VALVE SHEAR GATE SLIDE GATE SLUICE GATE STOP LOGS TELESCOPING VALVE WEIR GATE	DIAPHRAGM OR UNSPECIFIED ACTUATOR CYLINDER ACTUATOR, DOUBLE-ACTING CYLINDER ACTUATOR, SPRING-OPERATED SINGLE-ACTING MANUAL ACTUATOR OR HANDWHEEL S= SOLENOID ACTUATOR M= MOTOR ACTUATOR EH= ELECTRO HYDRAULIC ACTUATOR FLOAT ACTUATOR	BLIND FLANGE FLEXIBLE CONNECTION UNION SCREWED CAP WELDED CAP PLUG FLUSH CONNECTOR M=MALE F=FEMALE QUICK DISCONNECT COUPLING W/CAP AIR COUPLER QUICK DISCONNECT COUPLING W/PLUG CONCENTRIC REDUCER/INCHREASER ECCENTRIC REDUCER/INCHREASER REDUCING FLANGE BALL JOINT EXPANSION JOINT CLEAR VIEW PIPE DOUBLE BALL FLEXIBLE EXPANSION JOINT	PULSATION DAMPENER DIAPHRAGM SEAL PRESSURE SNUBBER ANNULAR DIAPHRAGM SEAL RUPTURE DISK LIQUID SURFACE CALIBRATION COLUMN AIR CAP OVERFLOW ATMOSPHERIC VENT ATMOSPHERIC VENT WITH BIRD SCREEN ULTRAVIOLET SENSOR		
END VALVES*		ACTUATED VALVES (WIRED OR WITH SETPOINT)					
AIR, COMBINATION, OR AIR/VACUUM RELIEF VALVE ENERGY DISSIPATION (FREE DISCHARGE) VALVE FLAP GATE FLEXIBLE SLEEVE CHECK VALVE HOSE BIB HYDRANT		BACK PRESSURE VALVE LEVEL CONTROL VALVE, FLOAT OPERATED PRESSURE REDUCING VALVE PRESSURE REDUCING & BACK PRESSURE SUSTAINING VALVE PRESSURE RELIEF OR SAFETY VALVE SOLENOID OPERATED VALVE WITH MANUAL ACTUATOR					
* ONE SIDE IS OPEN TO ATMOSPHERE		USE INSTRUMENT BUBBLE SYSTEM CODE SETPOINT					

NOTES  
1. "S" INDICATES SEATED PORT END OF ECCENTRIC PLUG VALVE.

FILLED VALVE OR N.C. DENOTES NORMALLY CLOSED VALVE  
UNFILLED VALVE OR N.O. DENOTES NORMALLY OPEN VALVE

3" ON ORIGINAL DOCUMENT  
0 1 2 3

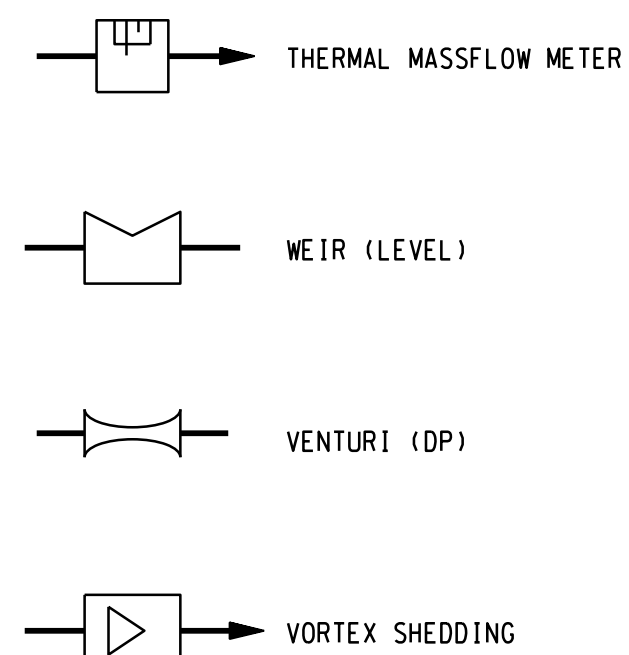
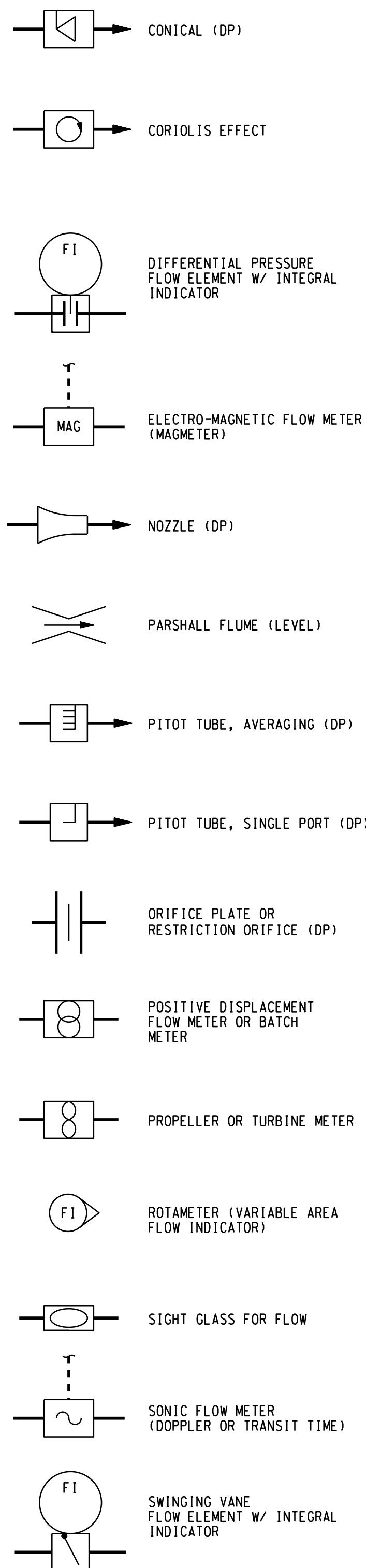
FOR USE IN DEVELOPING EARLY PRICING AGREEMENT ONLY			
NO.	DATE	REVISION	BY REC. APP.
26	26APR2017	ADDED DIAPHRAM ACTUATORS	HEA/ST
27	20DEC2016	REORGANIZED SYMBOLS, ADDED TRAP PRIMER	HEA/ST

DESIGNED BY	—
DESIGN CHECKED BY	—
DRAWN BY	—
A COPY OF THE ORIGINAL DRAWING WITH ORIGINAL SIGNATURES CAN BE FOUND IN ENGINEERING RECORDS.	
RECOMMENDED BY	—
APPROVED BY	—

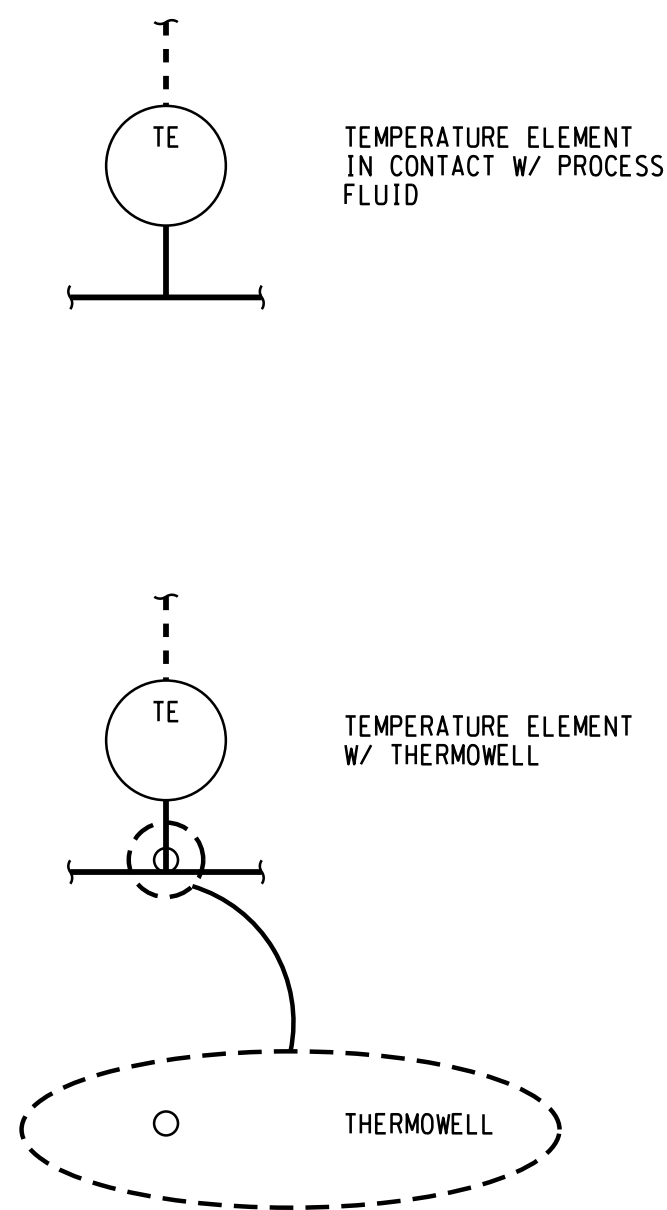
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
STANDARD DRAWING			
SYMBOLS FOR P&ID DRAWINGS VALVES, FITTINGS, AND MISCELLANEOUS SYMBOLS			
SHEET 1 OF 3		PG. 14-158	
PROJ. NO.	9492-G-003	NUMBER	8
SCALE	AS SHOWN	STRUCT.	DISC.
DATE	13JUL1999	NUMBER	REV.

SPEC. NO.

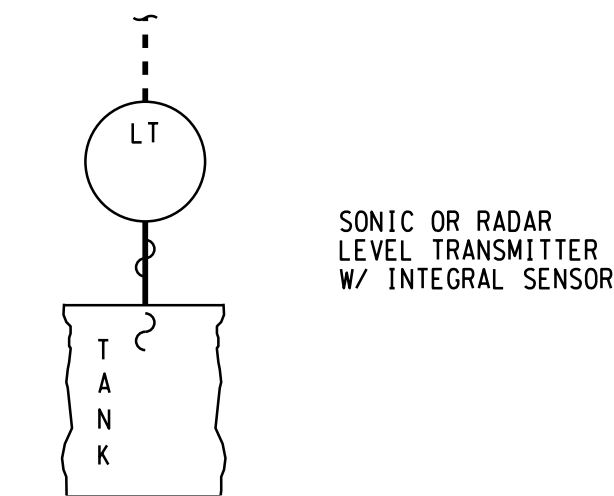
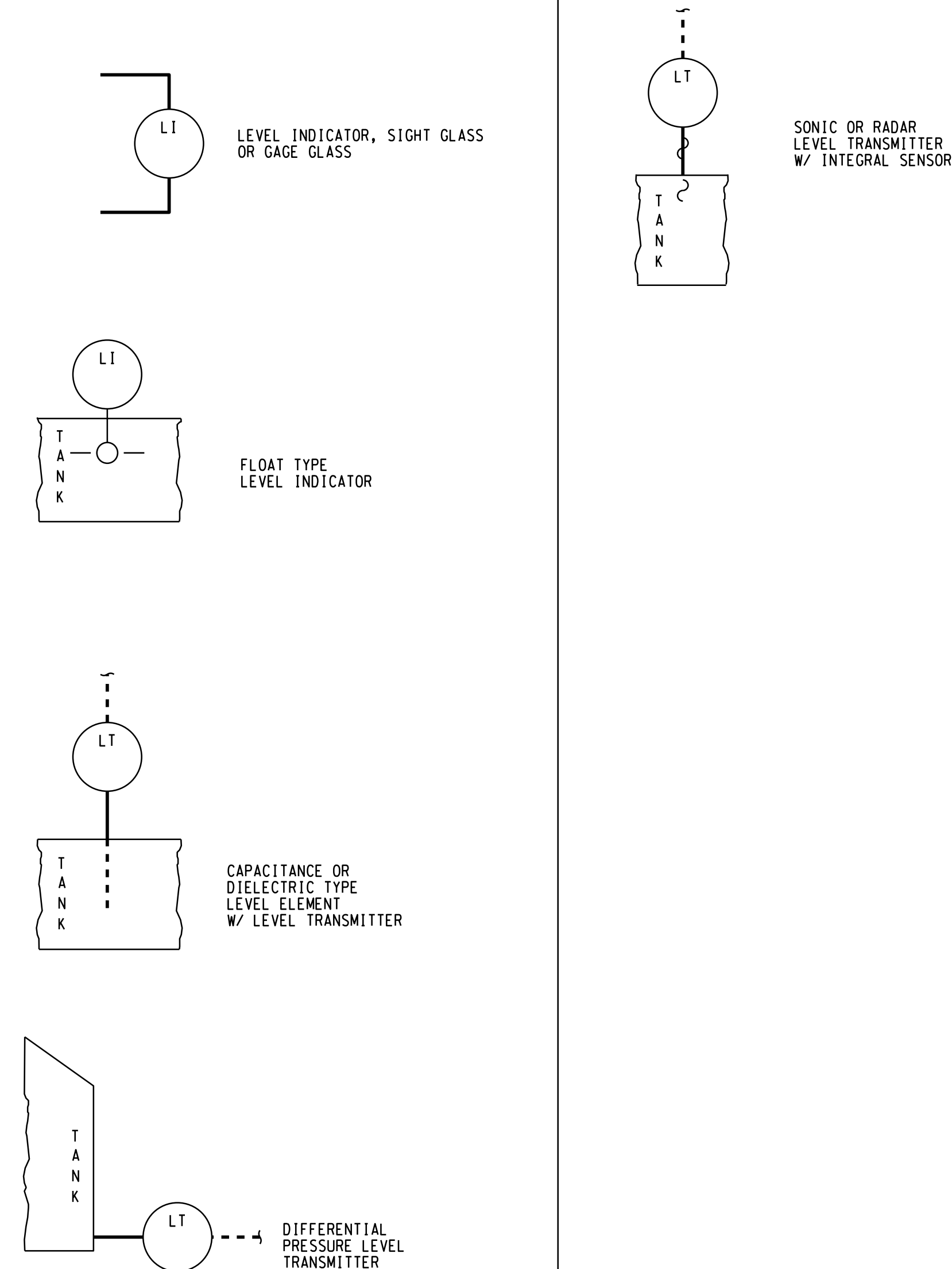
FLOW ELEMENTS



TEMPERATURE ELEMENTS



LEVEL ELEMENTS



NOTES

1. SEE ANSI/ISA S5.1, INSTRUMENTATION SYMBOLS AND IDENTIFICATION, FOR MORE INFORMATION.



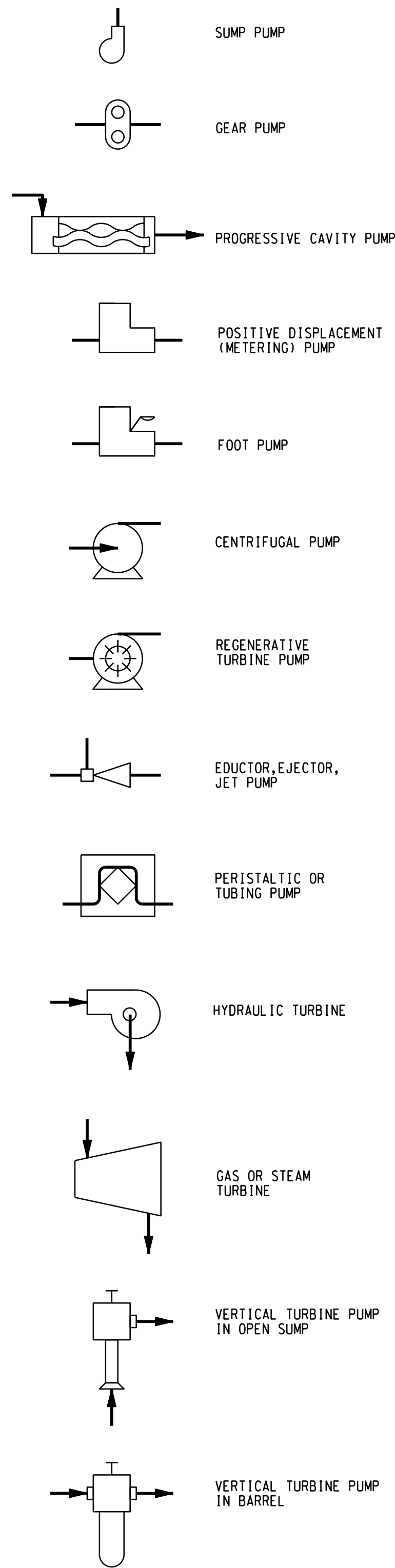
FOR USE IN DEVELOPING EARLY PRICING AGREEMENT ONLY

NO.	DATE	REVISION	BY	REC.	APP.
26	APR 2017	REORGANIZED SYMBOL	MSB	ST	

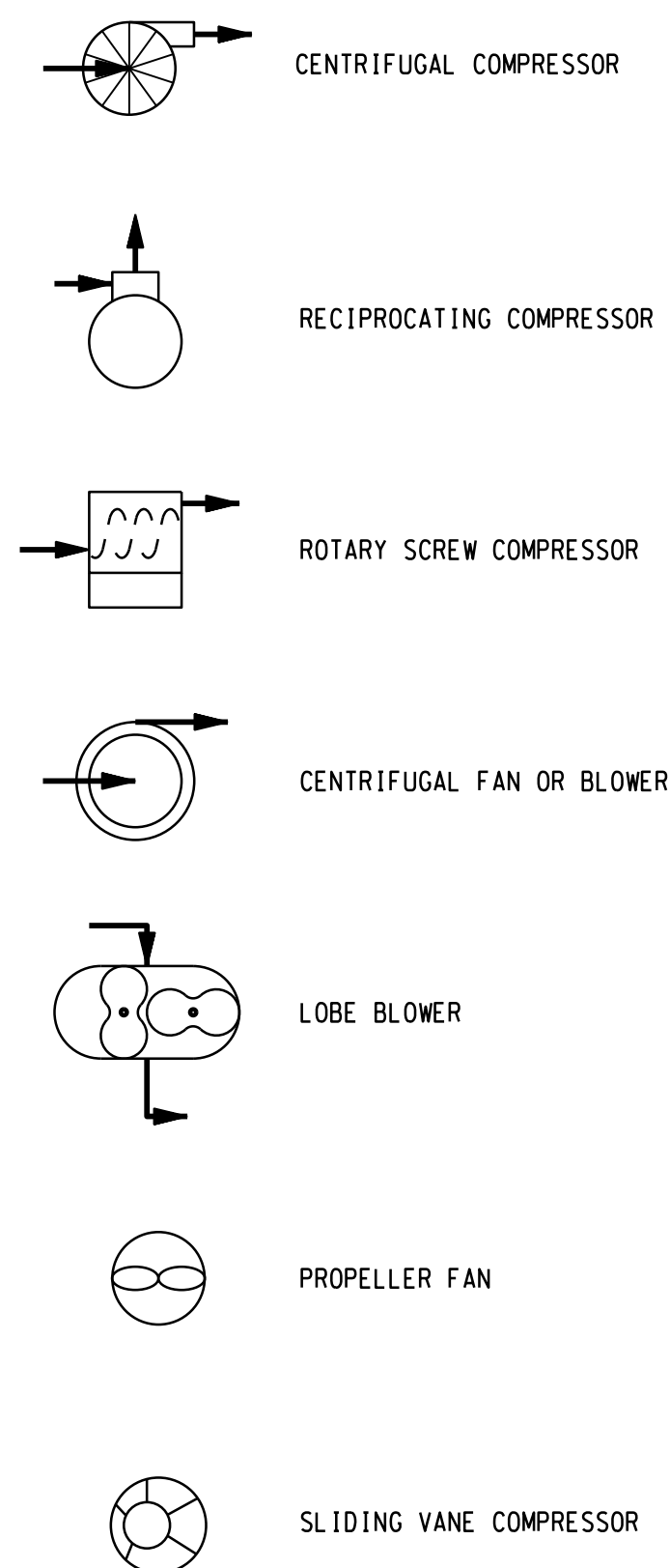
DESIGNED BY	—	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
DESIGN CHECKED BY	—	STANDARD DRAWING			
DRAWN BY	—	SYMBOLS FOR P&ID DRAWINGS SENSING ELEMENTS			
A COPY OF THE ORIGINAL DRAWING WITH ORIGINAL SIGNATURES CAN BE FOUND IN ENGINEERING RECORDS.		SHEET 2 OF 3 PG. 14-159			
RECOMMENDED:	—	PROJ. NO. NONE	9492-G-004	4	
APPROVED:	—	SCALE NONE			
		DATE 13JUL1999	STRUCT. DISC. NUMBER	REV.	

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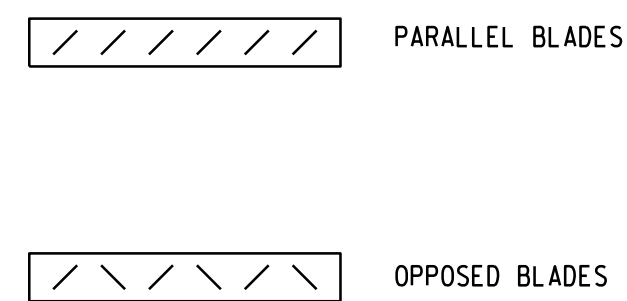
PUMPS/ TURBINES



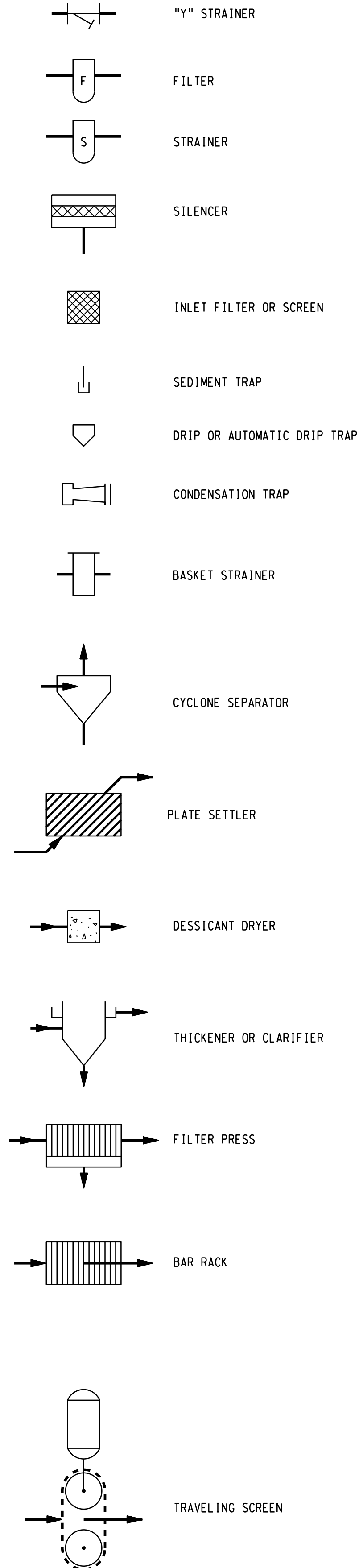
FANS/ COMPRESSORS



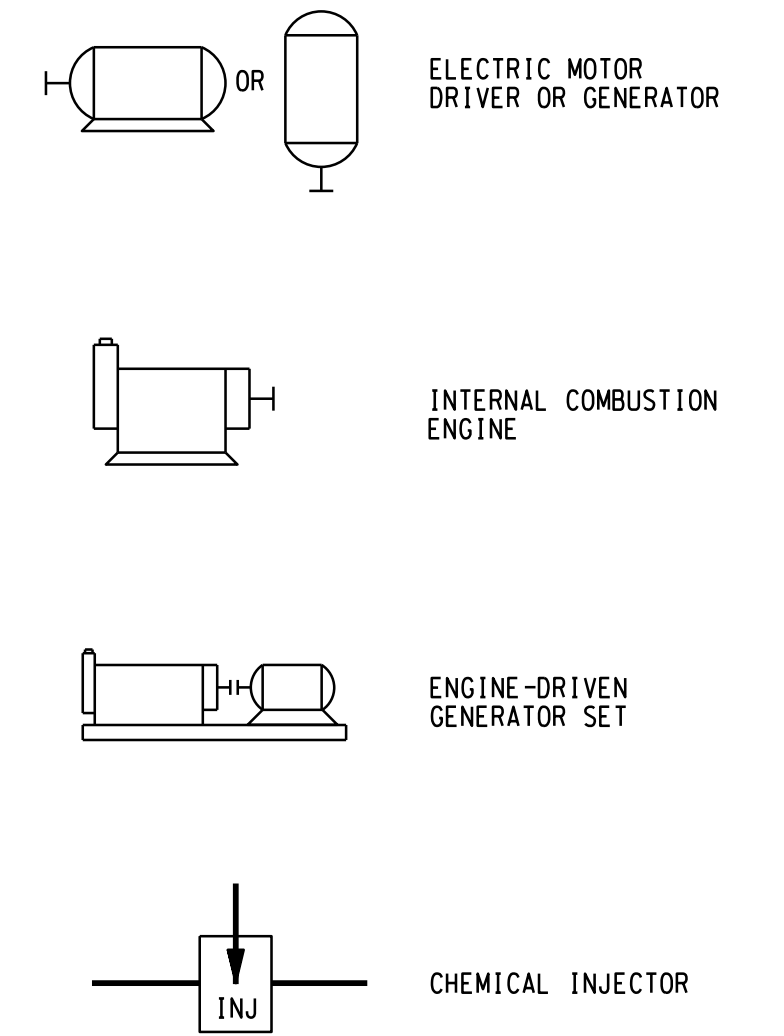
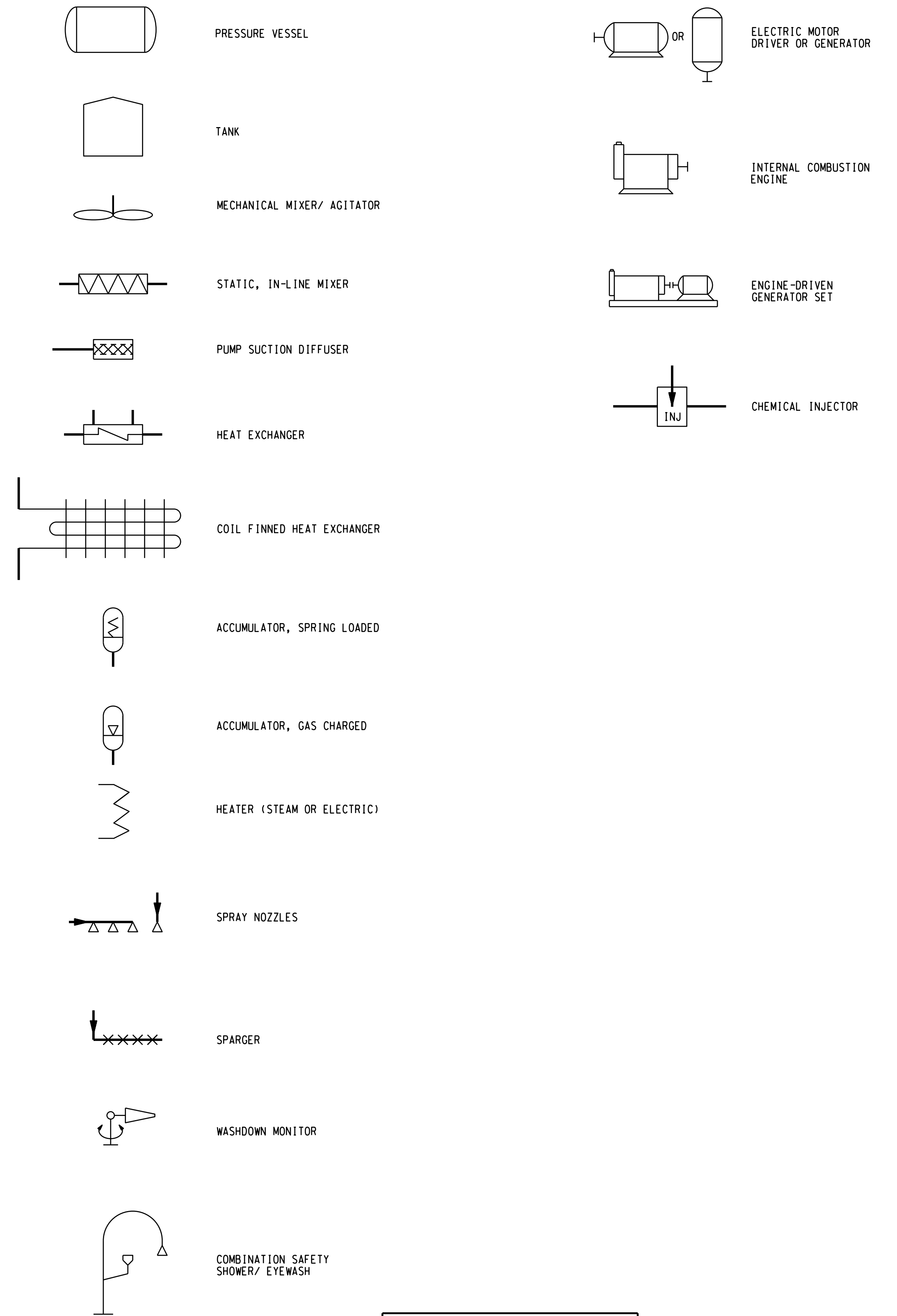
DAMPERS



FILTRATION/ SEPARATION EQUIPMENT



MISCELLANEOUS EQUIPMENT



USER: P:\C01\G09... PLOT SCALE: REF 3: REF 4: REF 1: REF 2:

A MICROFILM COPY OF THE ORIGINAL DRAWING WITH ORIGINAL SIGNATURES CAN BE FOUND IN ENGINEERING RECORDS.  
 N. E. GRONLUND  
 MICHAEL AMBROSE  
 BAS  
 SR. ELEC. ENGR. R.P.E. No. E 11116 GUIDO G. ZITO  
 DESIGNED BY  
 CHECKED BY DL PRATT/DT WAGNER  
 R.P.E. No. C 39851  
 APPROVED BY DAVID PRATT FOR ML MILLER  
 R.P.E. No. C 31966

EAST BAY MUNICIPAL UTILITY DISTRICT  
 OAKLAND, CALIFORNIA  
**STANDARD DRAWING**  
 SYMBOLS FOR P&ID DRAWINGS  
 EQUIPMENT  
 SH 3 OF 3 PG. 14-160  
 PROJ. NO. NONE  
 SCALE NONE  
**9492-G-005**  
 DATE 13JUL1999  
 STRUCT. DISC. NUMBER REV.

FOR USE IN DEVELOPING EARLY PRICING AGREEMENT ONLY

NO.	DATE	REVISION	BY	REC.	APP.
1	26JAN2012	ADDED CHEMICAL INJECTOR	HEA/OSB/DP		
2	22SEP2010	MODIFIED CENTRIFUGAL COMPRESSOR SYMBOL	HEA/OSB/DP		
3	13APR2010	ADDED WASHDOWN MONITOR	HEA/OSB/DP		
4	09FEB2010	ADDED STRAINER	HEA/OSB/DP		

SPEC. NO.

EQUIPMENT CODES

VALVES		MECHANICAL DEVICES		MECHANICAL DEVICES, CONT.		INSTRUMENTATION (NOTE 2)		INSTRUMENTATION, CONT. (NOTE 2)	
EQUIPMENT TYPE	EQUIPMENT CODE	EQUIPMENT TYPE	EQUIPMENT CODE	EQUIPMENT TYPE	EQUIPMENT CODE	EQUIPMENT TYPE	EQUIPMENT CODE	EQUIPMENT TYPE	EQUIPMENT CODE
AIR / VACUUM VALVE	AVV	ACCUMULATOR	ACC	OZONE DESTRUCT UNIT	ODR	ANALYZER ELEMENT	AE	POSITION LIGHT CLOSED, (INTERMEDIATE), (OPEN)	ZLL, (ZLM, ZLH)
AIR FILTER REGULATOR	AFRG	AERATOR	AER	OZONE GENERATOR	OGR	ANALYZER INDICATING CONTROLLER	AIC	POSITION CONTROLLER	ZC
AIR RELEASE VALVE	ARV	AIR COMPRESSOR	ACR	PACKED TOWER AERATOR	PTA	ANALYZER INDICATING TRANSMITTER	AIT	POSITION SWITCH CLOSED, (INTERMEDIATE), (OPEN)	ZSL, (ZSM, ZSH)
BACKFLOW PREVENTER	BFP	AIR CONDITIONING PACKAGE UNIT	ACU	PLATE SETTLER	PLS	ANALYZER SWITCH HIGH, (LOW)	ASH, (ASL)	POSITION TRANSMITTER	ZT
CHECK VALVE	CV	AIR FILTER	AF	PORTABLE PUMPING UNIT	PPU	CALIBRATION COLUMN	FQI	POWER INDICATING CONTROLLER	JC
COMBINATION AIR VALVE	ACV	AIR HANDLING UNIT	AHU	PRESSURE VESSEL	PVL	CONDUCTIVITY ELEMENT	CE	POWER INDICATOR	JL
HAND VALVE (ISOLATION)	HV	AIR RECEIVER	ARR	PULSATION DAMPENER	PDR	CONDUCTIVITY INDICATING TRANSMITTER	CIT	POWER TOTALIZING INDICATOR	JQI
HOSE BIB	HB	AUTOMATIC DRAIN TRAP	ADT	PUMP	PMP	CONDUCTIVITY INDICATOR	CI	POWER TRANSMITTER	JT
POST INDICATING VALVE	PIV	BAR RACK	RK	REACTOR	RCT	CONDUCTIVITY SWITCH HIGH	CSH	PRESSURE DIFFERENTIAL INDICATING TRANSMITTER	PDIT
SLIDE GATE	SDG	BASIN	BSN	RECEIVER	RCV	CONDUCTIVITY TRANSMITTER	CT	PRESSURE DIFFERENTIAL SWITCH HIGH	PDSH
SLUICE GATE	SCG	BASKET STRAINER	STR	REDUCING GEAR	RGR	ELAPSED TIME METER (TIME TOTALIZING INDICATOR)	KQI	PRESSURE DIFFERENTIAL TRANSMITTER	PDT
TRAP PRIMER VALVE	TPM	BATCH METER	FQI	REFRIGERATED DRYER	RDR	FLOW ELEMENT	FE	PRESSURE DIFFERENTIAL TRANSMITTER	PDT
TRIPLE DUTY VALVE	TDV	BLOWER	BLO	REFRIGERATOR UNIT	RFU	FLOW INDICATING CONTROLLER	FIC	PRESSURE INDICATING CONTROLLER	PIC
VACUUMBREAKER VALVE (ANTI-SYPHON)	VBV	BOILER	BLR	RELIEF FAN	RF	FLOW INDICATING RECORDER	FIR	PRESSURE INDICATING RECORDER	PIR
WICKET GATE	WKT	CABINET (MSC)	CAB	RESTRICTING ORIFICE	OR	FLOW INDICATING TRANSMITTER	FIT	PRESSURE INDICATING TRANSMITTER	PIT
		CHILLER UNIT	CHU	RUPTURE DISK	RD	FLOW INDICATOR	FI	PRESSURE INDICATOR	PI
		CLARIFIER	CLF	SAFETY SHOWER	SHR	FLOW QUANTITY INDICATOR (CALIBRATION COLUMN)	FQI	PRESSURE SWITCH HIGH, (LOW)	PSH, (PSL)
		COLLECTOR	COL	SCREEN	SCN	FLOW SWITCH HIGH, (LOW)	FSH, (FSL)	PRESSURE TRANSMITTER	PT
		COMPRESSOR	CMP	SCRUBBER	SCB	FLOW TRANSMITTER	FT	SPEED CONTROL	SC
		COMPRESSOR CONDENSER UNIT	CCU	SEPARATOR	SEP	HAND SWITCH	HS	SPEED INDICATOR	SI
		CONDENSATE NEUTRALIZATION UNIT	CNU	SETTLER	SET	INSTRUMENT CABINET	IC	SPEED SENSING ELEMENT	SE
		CONDENSER	COND	SILENCER	SIL	LEVEL INDICATING CONTROLLER	LIC	STATUS INDICATOR	NI
		CONDENSING UNIT	CDU	SLUDGE VACUUM COLLECTOR	SVC	LEVEL INDICATING RECORDER	LIR	STATUS LIGHT, (OPEN), (CLOSED)	NL, (NLO), (NLC)
		COOLER	CLR	SLUICE/SLIDE/WEIR/SHEAR/BUTTERFLY GATE/LOG	SGT	LEVEL INDICATING TRANSMITTER	LIT	TEMPERATURE INDICATING CONTROLLER	TIC
		COOLING TOWER	CTW	SPARGER	SPG	LEVEL INDICATOR	LI	TEMPERATURE INDICATING RECORDER	TIR
		COUPLING	CPL	STRAINER	STR	LEVEL SWITCH HIGH	LSH	TEMPERATURE INDICATING TRANSMITTER	TIT
		CRANE	CRN	STOP LOG	LOG	LEVEL SWITCH LOW	LSL	TEMPERATURE INDICATOR	TI
		DAMPER	DMP	SUPPLY FAN	SF	LEVEL TRANSMITTER	LT	TEMPERATURE SWITCH HIGH, (LOW)	TSH, (TSL)
		DESSICANT DRYER	DDR	SURGE TANK	TNK	MOISTURE INDICATING TRANSMITTER	MT	TEMPERATURE TRANSMITTER	TT
		DIFFUSER	DIF	SYPHON	SYP	MOISTURE SENSOR (OR DEW POINT)	ME	TIME TOTALIZING INDICATOR	KQI
		DRYER	DRY	TANK	TNK	MOISTURE SWITCH HIGH	MSH	TIME TOTALIZING SWITCH	KQS
		DIAPHRAM SEAL	DSL	TIMER (MECHANICAL)	TMR	MULTIPOINT INDICATOR	UI	TOTAL STATION	TS
		EDUCTOR	EDR	TRAP	TRP	MULTIPOINT INDICATING RECORDER	UIR	VIBRATION INDICATOR	VI
		EMERGENCY EYEWASH	EYW	TRAILER	TRL	MULTIPOINT SCAN INDICATOR	UJI	VIBRATION SENSOR (AXIAL THRUST)	VZE
		ENGINE	ENG	TRASH RAKE	RKE	OCCUPANCY SWITCH (SENSOR)	OS	VIBRATION SENSOR (RADIAL, X-DIRECTION)	VXE
		ENGINE GENERATOR SET	EGS	TURBINE	TRB			VIBRATION SENSOR (RADIAL, Y-DIRECTION)	VYE
		EVAPORATOR	EVP	ULTRAVIOLET REACTOR	UVR			VIBRATION SWITCH HIGH	VSH
		EXHAUST AIR DAMPER	EAD	VARIABLE AIR VOLUME UNIT	VAV			VIBRATION TRANSMITTER (AXIAL THRUST)	VZT
		EXHAUST FAN	EF	VAPORIZER	VPR			VIBRATION TRANSMITTER (RADIAL, X-DIRECTION)	VXT
		FAN	FAN	VENT	VNT			VIBRATION TRANSMITTER (RADIAL, Y-DIRECTION)	VYT
		FAN COIL UNIT	FCU	WASHDOWN MONITOR	WWR			VOLTAGE SWITCH LOW	ESL
		FEEDER (DRY)	FDR	WATER HEATER	WHR			WEIGHT INDICATING TRANSMITTER	WT
		FILTER	FLT	WYE STRAINER	STR				
		FILTER PRESS	FLP						
		FIRE DAMPER	FD						
		FLEXIBLE CONNECTOR	FCO						
		FLOCCULATOR	FLC						
		FLOW STRAIGHTENER	FSR						
		FUEL DELIVERY HOSE	FDH						
		GOVERNOR	G5						
		HEAT EXCHANGER	HX						
		HEAT PUMP	HP						
		HEATER	HTR						
		HYDRANT	H						
		HEATING VENTILATING UNIT	HVU						
		HYDRO PNEUMATIC TANK	TNK						
		INDIRECT EVAPORATIVE COOLER	IEC						
		INSTRUMENT CABINET	IC						
		INSTRUMENT PANEL	IP						
		INSULATING JOINT	IJ						
		INTAKE FAN	IF						
		LOUVER	LVR						
		METERING PUMP	PMP						
		MIXER	MX						
		NEEDLE / POWER NOZZLE	NED						
		NOZZLE	NZL						

CONTROL VALVES	
EQUIPMENT TYPE	EQUIPMENT CODE
ALTITUDE VALVE (LEVEL CONTROL VALVE)	LCV
CIRCUIT BALANCE VALVE	CBV
FLOW CONTROL VALVE	FCV
HYDRAULIC OPERATED VALVE (ISOLATION)	HOV
LEVEL CONTROL VALVE	LCV
MOTOR OPERATED VALVE (ISOLATION)	MOV
PILOT VALVE	PV
PNEUMATIC OPERATED VALVE (ISOLATION)	ADV
PRESSURE CONTROL VALVE	PCV
PRESSURE REDUCING VALVE	PCV
PRESSURE REGULATING VALVE	PCV
PRESSURE RELIEF VALVE (OPENS PROPORTIONAL TO PRESSURE)	PRV
PRESSURE SAFETY VALVE (FULL OPENING POP ACTION)	PSV
SERVO VALVE & INTEGRAL OPERATING CYLINDER	SVO
SOLENOID VALVE	SV
TEMPERATURE CONTROL VALVE	TCV
SEISMIC CONTROL VALVE	SCV

CONTROL VALVES	
EQUIPMENT TYPE	EQUIPMENT CODE
PNEUMATIC ACTUATOR	PNA
HYDRAULIC ACTUATOR	HYA
MOTOR OPERATED ACTUATOR	MOA

NOTES

- THIS DRAWING PROVIDES A LIST OF CODES TO ASSIGN EQUIPMENT TAG NUMBERS AS GIVEN IN ESP 130.0.
- THIS LIST IS NOT ALL INCLUSIVE. NEW EQUIPMENT CODES SHALL FOLLOW ANSI/IEEE 803.1-1992. SEE STANDARD DRAWING 9492-G-002 FOR MORE INFORMATION REGARDING INSTRUMENTS CODES.
- TAG COLORS SHALL CONFORM WITH TABLE SHOWN ON THIS DRAWING AND ANSI Z535.1 "SAFETY COLOR CODE".
- AIM MAY USE ADDITIONAL EQUIPMENT CODES NOT INCLUDED ON THIS LIST. THESE ADDITIONAL CODES TYPICALLY REPRESENT A COMPONENT OF A MAJOR PIECE OF EQUIPMENT THAT HAS A CODE LISTED HEREIN.
- COOLING WATER SYSTEMS CONSISTING OF A LOOP WITH THE SUPPLY FROM AND RETURN TO THE TWS OR RWS SHALL BE TAGGED GREEN.
- ADD THE APPROPRIATE RELATED ENCLOSURE EQUIPMENT TYPE AS A MODIFIER, ie. MCC, SWR, ETC.
- USE INSTRUMENT FUNCTIONAL IDENTIFIER.
- PROTECTION RELAYS MAY USE THE ANSI/IEEE C37.2 DEVICE NUMBER(S) AS MODIFIER(S).
- REFER TO DRAWING G-001.2 FOR SECURITY EQUIPMENT CODES.
- SPS - OPTIMAL POWER SYSTEM AS DEFINED BY NEC ARTICLE 702.  
- LEGALLY REQUIRED POWER SYSTEM AS DEFINED BY NEC ARTICLE 701.
- LSP - POWER SYSTEM AS DEFINED BY NEC ARTICLE 700.
- ELECTRICAL EQUIPMENT HANGING TAGS BACKGROUND IS ORANGE. PANEL TAGS BACKGROUND IS WHITE.

3" ON ORIGINAL DOCUMENT  
0 1 2 3

FOR USE IN DEVELOPING EARLY PRICING AGREEMENT ONLY

NO.	DATE	REVISION	BY	REC.	APP.
04MAR2020		ADDED VALVE & GATE ACTUATORS EQUIPMENT CODE	ST		

DESIGNED BY <i>Nathan E. Grunlund</i> NATHAN E. GRUNLUND	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA <b>STANDARD DRAWING</b>
DESIGN CHECKED BY <i>David J. Baskley</i> DAVID J. BASKLEY	
DRAWN BY FACILITY DRAFTING	
SR. MECH. ENGR. R.P.E. NO. 423634 <i>David J. Baskley</i> DAVID J. BASKLEY	EQUIPMENT TAG NUMBERING & INSTRUMENTATION CODES SHEET 1 OF 2 PG. 14-161
RECOMMENDED MGR. OF DESIGN R.P.E. NO. C48598 <i>S. Terentjeff</i> SERGE V. TEREENTJEFF	PROJ. NO. <b>9492-G-006.1</b>
APPROVED DIRECTOR OF ENG & CONST R.P.E. NO. C44782 <i>James Lee</i> JAMES LEE	SCALE AS SHOWN
	DATE 2/FEB/2019
	STRUCT. DISC. NUMBER REV.

USER: mdfrow - 2020 06:02  
DATE: 05-MAR-2020 06:02  
FILE: H:\sstdwg\858stdwg\9492006.1.R01

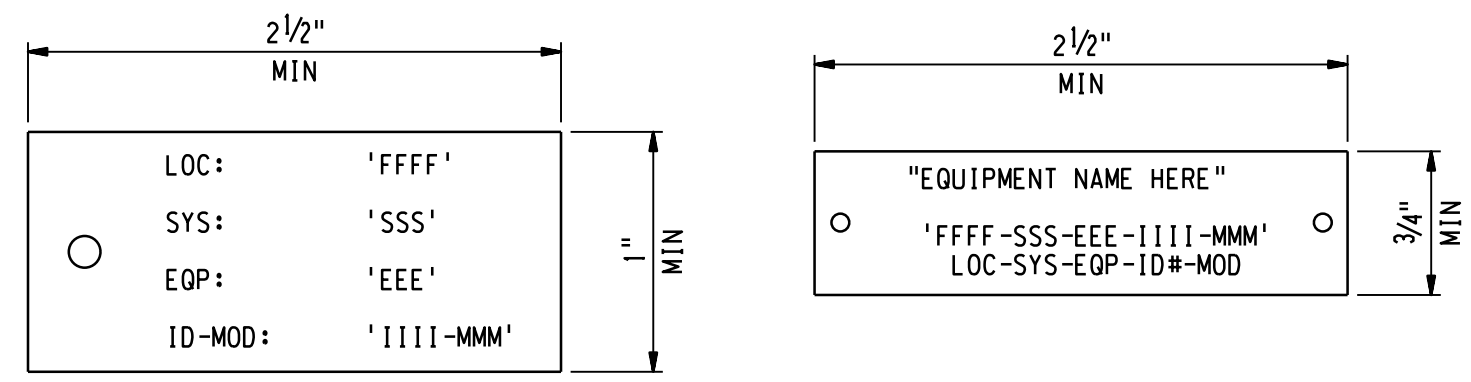
SPEC. NO.

FACILITY RELATED SYSTEM CODES & TAG COLORS							
SYSTEM TYPE	SYSTEM CODE	TAG COLOR		SYSTEM TYPE	SYSTEM CODE	TAG COLOR	
		LETTER COLOR	BACKGROUND COLOR			LETTER COLOR	BACKGROUND COLOR
<b>WATER</b>				<b>GAS</b>			
CHILLED WATER SYSTEM	CHW	WHITE	BROWN	CARBON DIOXIDE SYSTEM	CDS	WHITE	RED
DECANT WATER SYSTEM	DWS	WHITE	BROWN	COMPRESSED AIR SYSTEM	CAS	WHITE	BLUE
DRAIN	DRN	WHITE	BROWN	INSTRUMENT AIR SYSTEM	IAS	WHITE	BLUE
FILTER-TO-WASTE SYSTEM	FTW	WHITE	BROWN	SCOURING AIR SYSTEM	SAS	WHITE	BLUE
HOT PROCESS WATER	HWP	WHITE	BROWN	NATURAL GAS	NPG	BLACK	YELLOW
HYDRAULIC CONTROL WATER	HCW	WHITE	BROWN	OXYGEN SUPPLY	OXS	BLACK	YELLOW
IRRIGATION WATER SYSTEM	IWS	WHITE	BROWN	OZONE GAS SYSTEM	OGS	BLACK	YELLOW
QUALITY MONITORING SYSTEM	QMS	WHITE	BROWN	<b>TREATMENT CHEMICAL</b>			
SEAL WATER SYSTEM	SLW	WHITE	BROWN	AMMONIA LIQUID	NH	BLACK	YELLOW
SERVICE WATER SYSTEM	SVW	WHITE	BROWN	CALCIUM THIOSULFATE	CT	BLACK	YELLOW
SOLIDS REMOVAL SYSTEM	SDS	WHITE	BROWN	CAUSTIC SODA	CA	BLACK	YELLOW
WASTE STREAM SYSTEM	WSS	WHITE	BROWN	COAGULANT POLYMER	CP	BLACK	YELLOW
COOLING WATER SYSTEM (NOTE 5)	CWS	WHITE	BROWN, (GREEN)	FILTER CONDITIONER POLYMER	PF	BLACK	YELLOW
APPLIED WATER SYSTEM	AWS	WHITE	GREEN	FLUORIDE	FL	BLACK	YELLOW
FILTERED WATER SYSTEM	FWS	WHITE	GREEN	HYDROGEN PEROXIDE	HP	BLACK	YELLOW
RAW WATER SYSTEM	RWS	WHITE	GREEN	LIME SOLUTION	LS	BLACK	YELLOW
RECLAIMED WATER SYSTEM	RCW	WHITE	PURPLE	PERMANGANATE	PE	BLACK	YELLOW
REWASH WATER	RWW	WHITE	GREEN	PHOSPHORIC ACID	PA	BLACK	YELLOW
SETTLED WATER SYSTEM	SWS	WHITE	GREEN	PRIMARY COAGULANT	PC	BLACK	YELLOW
SURFACE WASH	SFW	WHITE	GREEN	SODIUM BISULFITE	SB	BLACK	YELLOW
TREATED WATER SYSTEM	TWS	WHITE	GREEN	SODIUM HYPOCHLORITE	SH	BLACK	YELLOW
WASH WATER SYSTEM	WWS	WHITE	GREEN	SOLIDS CONDITIONER POLYMER	PS	BLACK	YELLOW
NON-POTABLE WATER	NPW	WHITE	BROWN	SULFURIC ACID	SA	BLACK	YELLOW
FIRE SUPPRESSION SYSTEM	FSS	WHITE	RED	TREATMENT AID POLYMER	PT	BLACK	YELLOW
<b>SEWAGE</b>				<b>POWER SYSTEMS</b>			
PRIMARY TREATED SEWAGE	PTS	WHITE	BROWN	ELECTRIC POWER GENERATION	EPG	BLACK	ORANGE (WHITE, NOTE 12)
RAW SEWAGE SYSTEM	RSS	WHITE	BROWN	ELECTRIC POWER SUPPLY	EPS	BLACK	ORANGE (WHITE, NOTE 12)
SECONDARY TREATED SEWAGE	STS	WHITE	BROWN	LIFE SAFETY POWER SUPPLY (NOTE 11)	LPS	BLACK	ORANGE (WHITE, NOTE 12)
TERTIARY TREATED SEWAGE	TTS	WHITE	BROWN	STANDBY POWER SUPPLY (NOTE 10)	SPS	BLACK	ORANGE (WHITE, NOTE 12)
<b>OTHER LIQUID</b>				<b>AUXILIARY SYSTEMS</b>			
HYDRAULIC CONTROL OIL	HCO	BLACK	YELLOW	BUILDING AUXILIARY SYSTEM	BAS	BLACK	WHITE
LIQUID FUEL SUPPLY	LFS	BLACK	YELLOW	COMMUNICATIONS SYSTEM	COM	BLACK	WHITE
LUBE OIL SYSTEM	LOS	BLACK	YELLOW	CATHODIC PROTECTION SYSTEM	CPS	BLACK	WHITE
WASTE CHEMICAL SYSTEM	WCS	BLACK	YELLOW	FACILITY CONTROL SYSTEM	FCS	BLACK	WHITE
				HVAC	HVS	BLACK	WHITE
				LIGHTING CONTROL SYSTEM	LCS	BLACK	WHITE
				SITE SECURITY SYSTEM	SSS	BLACK	WHITE
				FIRE DETECTION SYSTEM	FDS	BLACK	WHITE

RAW WATER AQUEDUCT SYSTEM CODES & TAG COLORS			
AQUEDUCT	SYSTEM CODE	TAG COLOR	
		LETTER COLOR	BACKGROUND COLOR
FOLSOM SOUTH PIPELINE	FSP	WHITE	GREEN
GERBER PIPELINE	GEP	WHITE	GREEN
MCKELUMNE AQUEDUCT NO. 1	AQ1	WHITE	GREEN
MCKELUMNE AQUEDUCT NO. 2	AQ2	WHITE	GREEN
MCKELUMNE AQUEDUCT NO. 3	AQ3	WHITE	GREEN
MORAGA AQUEDUCT	MOR	WHITE	GREEN
BRIONES AQUEDUCT	BNS	WHITE	GREEN
LAFAYETTE AQUEDUCT NO. 1	LF1	WHITE	GREEN
LAFAYETTE AQUEDUCT NO. 2	LF2	WHITE	GREEN

INSTRUMENT AND EQUIPMENT ID (LOOP OR SERIES NUMBER) DESIGNATION		
SYSTEM	LOOP OR SERIES NUMBER	
NH = AMMONIA LIQUID	000-099	MSC.
CA = CAUSTIC SODA	100-199	STORAGE
CP = COAGULANT POLYMER	200-299	TRANSFER
FL = FLUORIDE	300-399	FEED
PF = FILTER CONDITIONER POLYMER	400-499	WASTED/DRAIN
HP = HYDROGEN PEROXIDE		
LM = LIME SOLUTION		
PE = PERMANGANATE		
PC = PRIMARY COAGULANT		
SA = SULFURIC ACID		
SB = SODIUM BISULFITE		
SH = SODIUM HYPOCHLORITE		
PS = SOLIDS CONDITIONER POLYMER		
PT = TREATMENT AID POLYMER		
	000-099	MSC.
	100-199	APPLIED WATER
	200-299	RAW WATER
QMS = QUALITY MONITORING	300-399	COAGULATED WATER
	400-499	TREATED WATER
	500-599	SETTLED WATER
	600-699	FILTERED WATER
	700-799	SPILL/WASH WATER
ALL OTHER SYSTEMS	000-999	



**HANGING TAG**

LOC: 'FFFF'  
 SYS: 'SSS'  
 EQP: 'EEE'  
 ID-MOD: 'IIII-MMM'

**CABINET TAG (NAMEPLATE)**

"EQUIPMENT NAME HERE"  
 'FFFF-SSS-EEE-IIII-MMM'  
 LOC-SYS-EQP-ID#-MOD

**EQUIPMENT TAG DETAIL (NOTE 3)**  
 NTS

'FFFF' = FACILITY NUMBER OR STATION NUMBER FOR RAW WATER AQUEDUCTS (SEE APPLICABLE P&ID)  
 'SSS' = SYSTEM CODE  
 'EEE' = EQUIPMENT CODE  
 'IIII-MMM' = EQUIPMENT ID NUMBER AND OPTIONAL MODIFIER (SEE APPLICABLE P&ID)



**NOTES**  
 1. REFER TO DWG G-006.1 FOR NOTES.

USER: wchow DATE: 21-FEB-2019 16:33 FILE: H:\ss1ds\85851ddwg\9492g007.r05

FOR USE IN DEVELOPING EARLY PRICING AGREEMENT ONLY				
NO.	DATE	REVISION	BY	REC. APP.
1	20FEB2019	GENERAL UPDATE	Wchow	ST

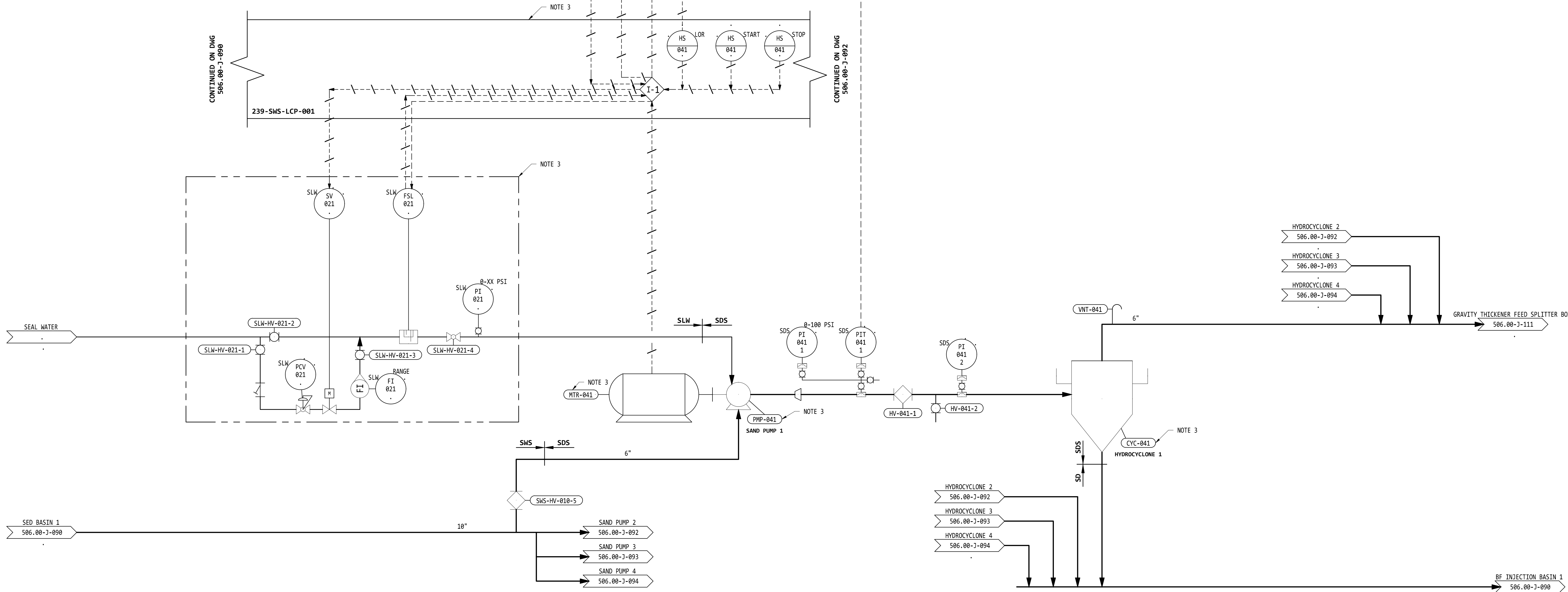
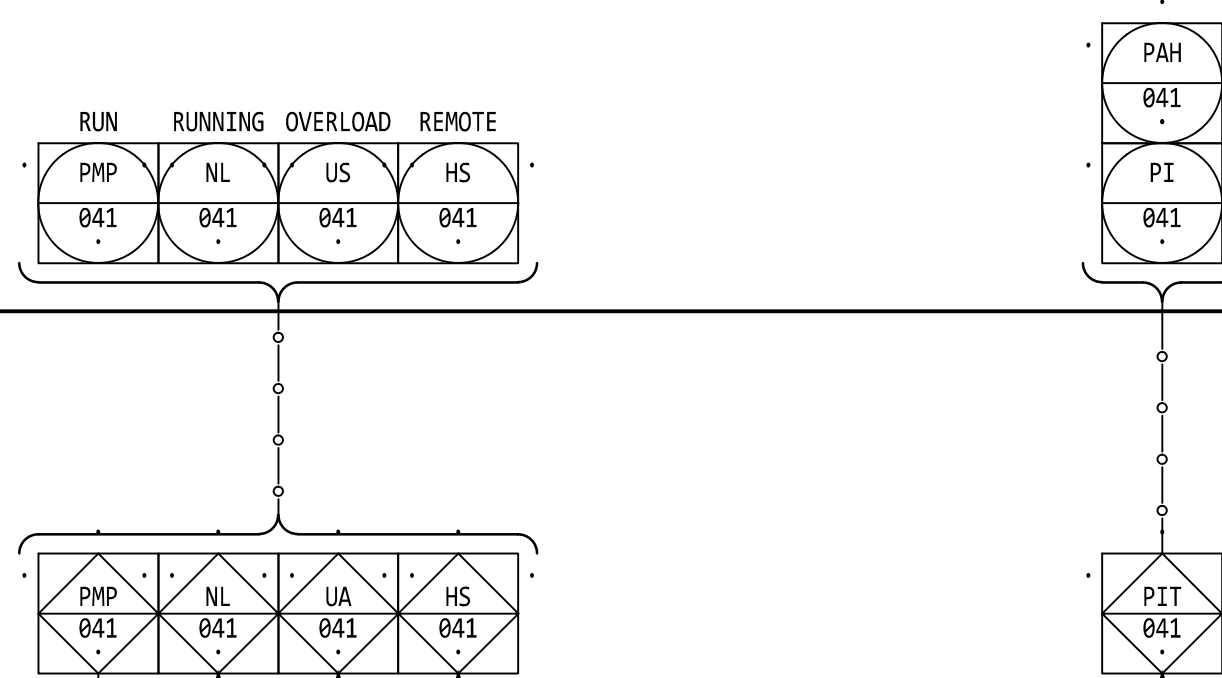
DESIGNED BY	---	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA		
DESIGN CHECKED BY	---	STANDARD DRAWING		
DRAWN BY	---	EQUIPMENT TAG NUMBERING SYSTEM CODES AND COLORS		
A COPY OF THE ORIGINAL DRAWING WITH ORIGINAL SIGNATURES CAN BE FOUND IN ENGINEERING RECORDS.		PG. 14-162		
RECOMMENDED:	---	STRUCTURE OR ZONE	9492-G-007	5
APPROVED:	---	SCALE		
		DATE	25APR2005	STRUCT. DISC. NUMBER REV.



NOTES

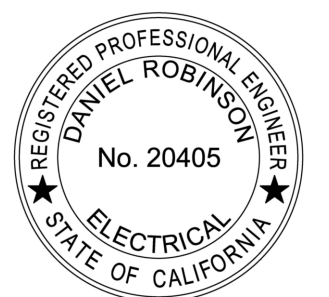
1. P&ID REFERENCE DRAWINGS:  
LEGENDS & SYMBOLS: 506.00-G-001 THRU 005  
EQUIPMENT TAGS: 506.00-G-006 & 007  
ABBREVIATIONS: 506.00-G-1 & 2
2. FULL EQUIPMENT OR INSTRUMENT TAG NUMBER IS PRECEDED BY FACILITY NUMBER AND SYSTEM CODE, I.E. 506-RMS-PMP-001 WHERE PMP-001 IS THE PUMP TAG #.
3. EQUIPMENT PROVIDED BY BALLASTED FLOC EQUIPMENT VENDOR. VENDOR SUPPLIED EQUIPMENT INCLUDES A LOCAL CONTROL PANEL FOR MANUAL OPERATION AND INTERLOCKS. I/O FOR INSTRUMENTS AND REMOTE CONTROL SHALL CONNECT TO THE DCS REMOTE I/O PANEL.
4. EQUIPMENT TAGGING IS PRELIMINARY. VENDOR WILL NEED TO UPDATE THE TAGGING DURING THE SUBMITTAL PROCESS.

I-1 CONTROL STRATEGY



USER: NVE\_BORDELON  
DATE: 1/15/2025 12:47 PM  
FILE: C:\USERS\BORDELON\APPDATA\LOCAL\AUTOCAD PLANT\_3D\COLORATION\CACHE\001-50600P3D\PID\_DWG\50600-J-091.DWG

PLOT SCALE: 1:2.5849



FOR USE IN DEVELOPING EARLY PRICING AGREEMENT ONLY



DESIGNED BY: DSR  
 DESIGN CHECKED BY:  
 DRAWN BY: CEY  
 SDS PROJ. ENGR. R.P.E. NO.  
 APPROVED:  
 PRINCIPAL IN CHARGE, R.P.E. NO.

PROJECT ENGINEER R.P.E. NO.  
 RECOMMENDED SDS PROJ. ENGR. R.P.E. NO.  
 APPROVED MGR. OF DESIGN R.P.E. NO.

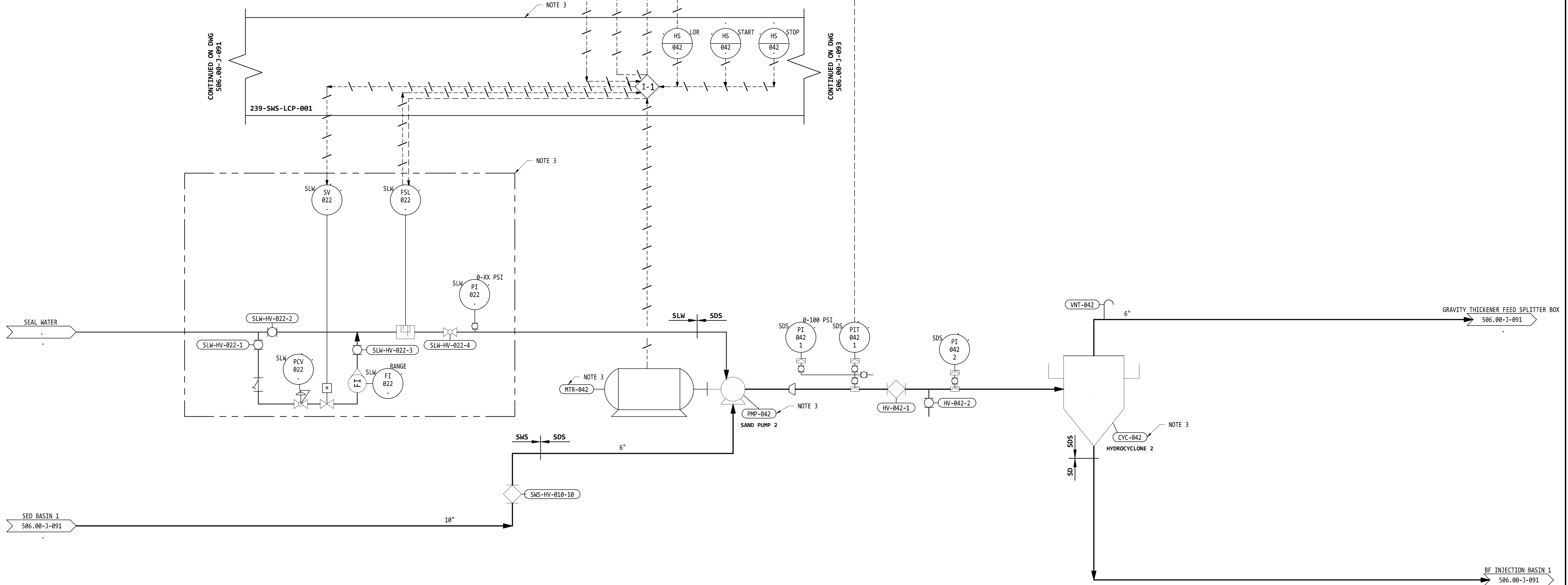
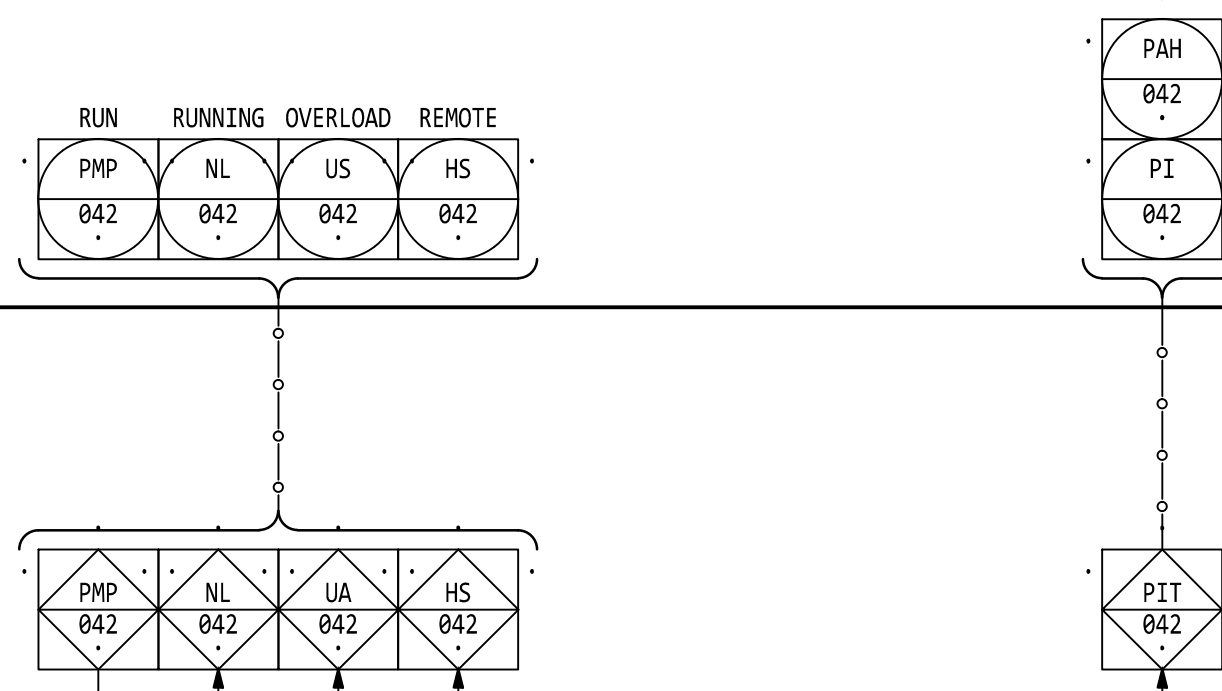
FACILITY NO. 239		SYSTEM CODE SDS	
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
WALNUT CREEK WATER TREATMENT PLANT			
PROCESS BALLASTED FLOCCULATION - NORTH BASIN 1 SAND PUMP 1 P&ID			
PROJ. NO. SPECS 2200	506.00-J-091	0	
SCALE NONE			
DATE JAN 2025	STRUCT.	DISC.	NUMBER
			REV.

NO.	DATE	REVISION	BY	REC.	APP.

NOTES

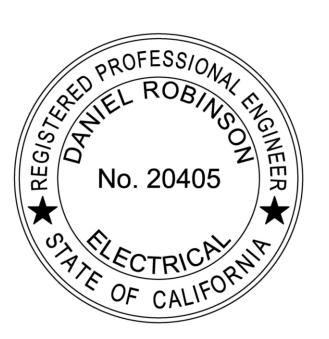
- 1. P&ID REFERENCE DRAWINGS: LEGENDS & SYMBOLS: 506.00-G-001 THRU 005 EQUIPMENT TAGS: 506.00-G-006 & 007 ABBREVIATIONS: 506.00-G-1 & 2
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- 4. EQUIPMENT TAGGING IS PRELIMINARY. VENDOR WILL NEED TO UPDATE THE TAGGING DURING THE SUBMITTAL PROCESS.

I-1 CONTROL STRATEGY



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 DATE: 1/11/2025 12:48: PM  
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PLOT SCALE: 1:2



FOR USE IN DEVELOPING EARLY PRICING AGREEMENT ONLY



DESIGNED BY: DSR  
 DESIGN CHECKED BY:  
 DRAWN BY: CEY  
 SDI PROJ ENGR:  
 R.P.E. NO.  
 APPROVED:  
 MGR. OF DESIGN  
 R.P.E. NO.  
 PRINCIPAL IN CHARGE, R.P.E. NO.

PROJECT ENGINEER  
 R.P.E. NO.  
 RECOMMENDED  
 ENGR.  
 R.P.E. NO.  
 APPROVED  
 MGR. OF DESIGN  
 R.P.E. NO.

FACILITY NO. 239		SYSTEM CODE SDS	
<b>EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA</b>			
<b>WALNUT CREEK WATER TREATMENT PLANT</b>			
PROCESS BALLASTED FLOCCULATION - NORTH BASIN 1 SAND PUMP 2 P&ID			
PROJ. NO. SPEL 2200	506.00-J-092	0	
SCALE NONE			
DATE JAN 2025	STRUCT.	DISC.	NUMBER
			REV.

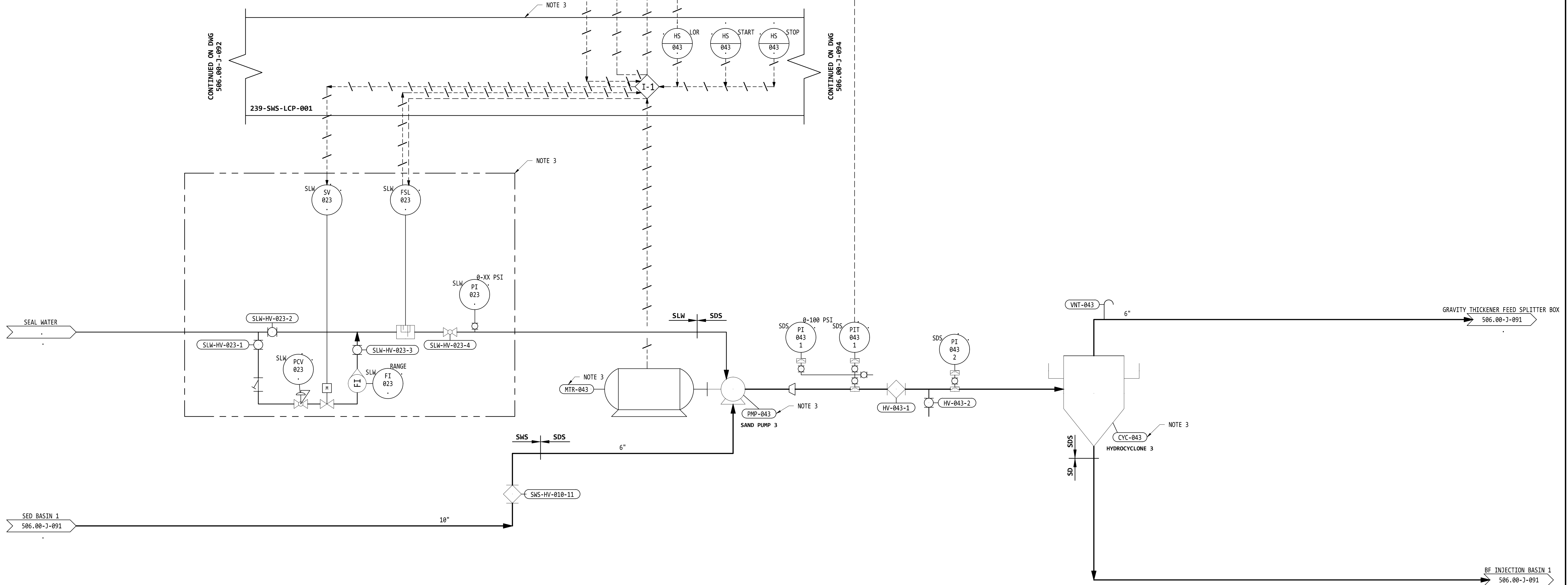
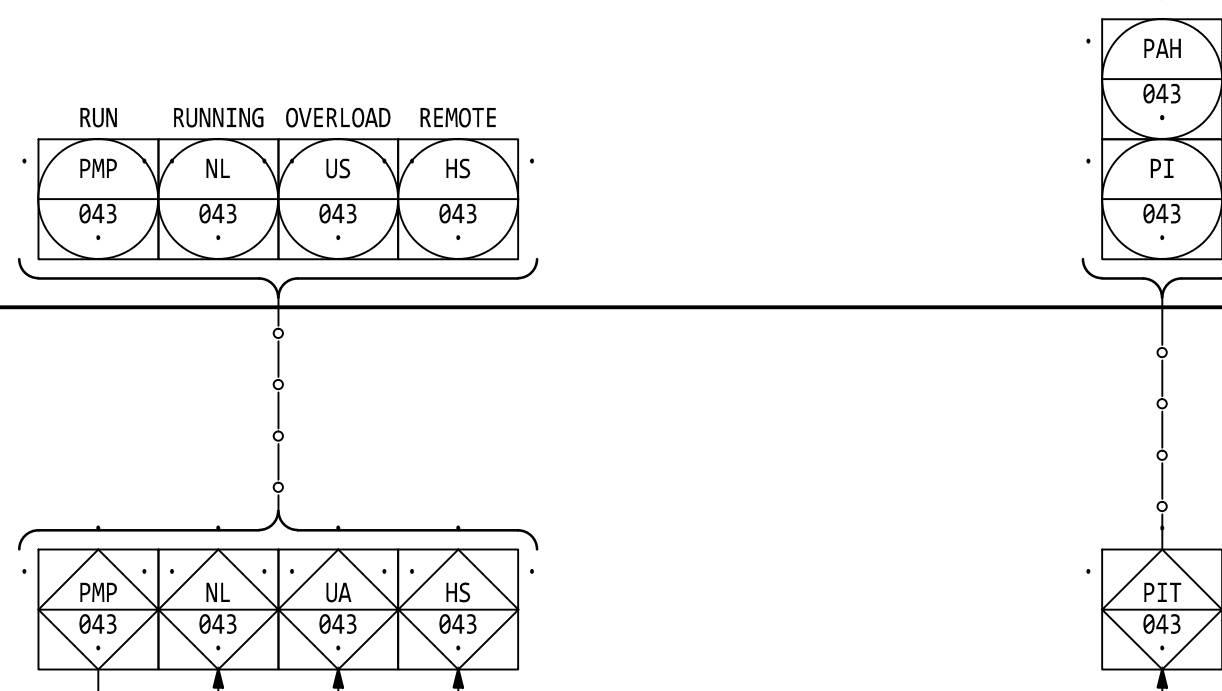
NO.	DATE	REVISION	BY	REC.	APP.



NOTES

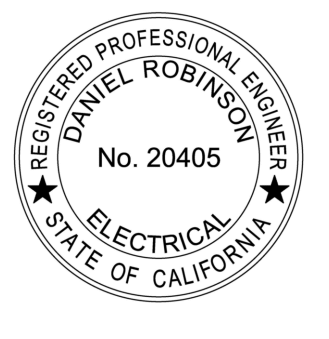
- 1. P&ID REFERENCE DRAWINGS: LEGENDS & SYMBOLS: 506.00-G-001 THRU 005 EQUIPMENT TAGS: 506.00-G-006 & 007 ABBREVIATIONS: 506.00-G-1 & 2
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- 4. EQUIPMENT TAGGING IS PRELIMINARY. VENDOR WILL NEED TO UPDATE THE TAGGING DURING THE SUBMITTAL PROCESS.

I-1 CONTROL STRATEGY



USER: NVE BORDELON  
 DATE: 1/11/2025 12:48 PM  
 FILE: C:\USERS\BORDELON\APPDATA\LOCAL\AUTOCAD PLANT\_3D\COLORATION\CACHE\001-50600F3D\PID\_DWG\50600-J-093.DWG

PLOT SCALE: 1:2



FOR USE IN DEVELOPING EARLY PRICING AGREEMENT ONLY



DESIGNED BY: DSR  
 DESIGN CHECKED BY:  
 DRAWN BY: CEY  
 SDI PROJ ENGR:  
 R.P.E. NO.  
 APPROVED:  
 MGR. OF DESIGN  
 R.P.E. NO.  
 PRINCIPAL IN CHARGE, R.P.E. NO.

PROJECT ENGINEER  
 R.P.E. NO.  
 RECOMMENDED  
 ENGR.  
 R.P.E. NO.  
 APPROVED  
 MGR. OF DESIGN  
 R.P.E. NO.

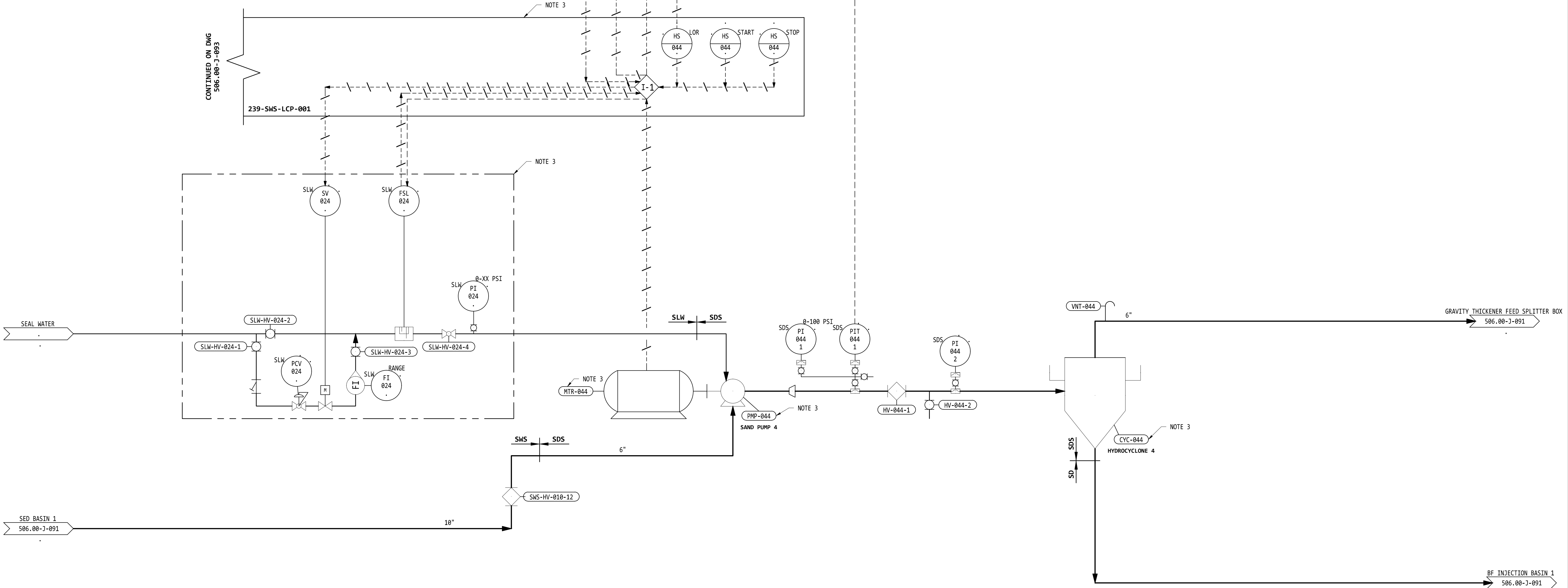
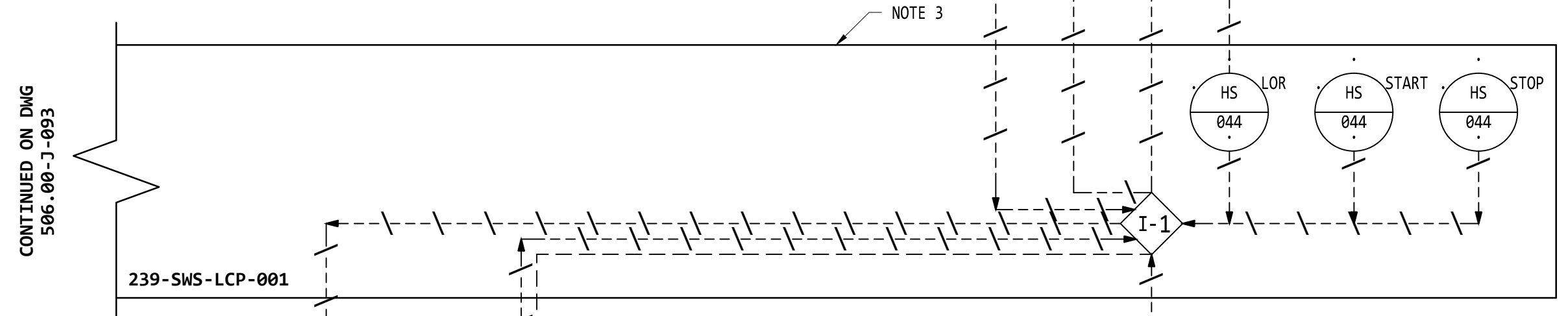
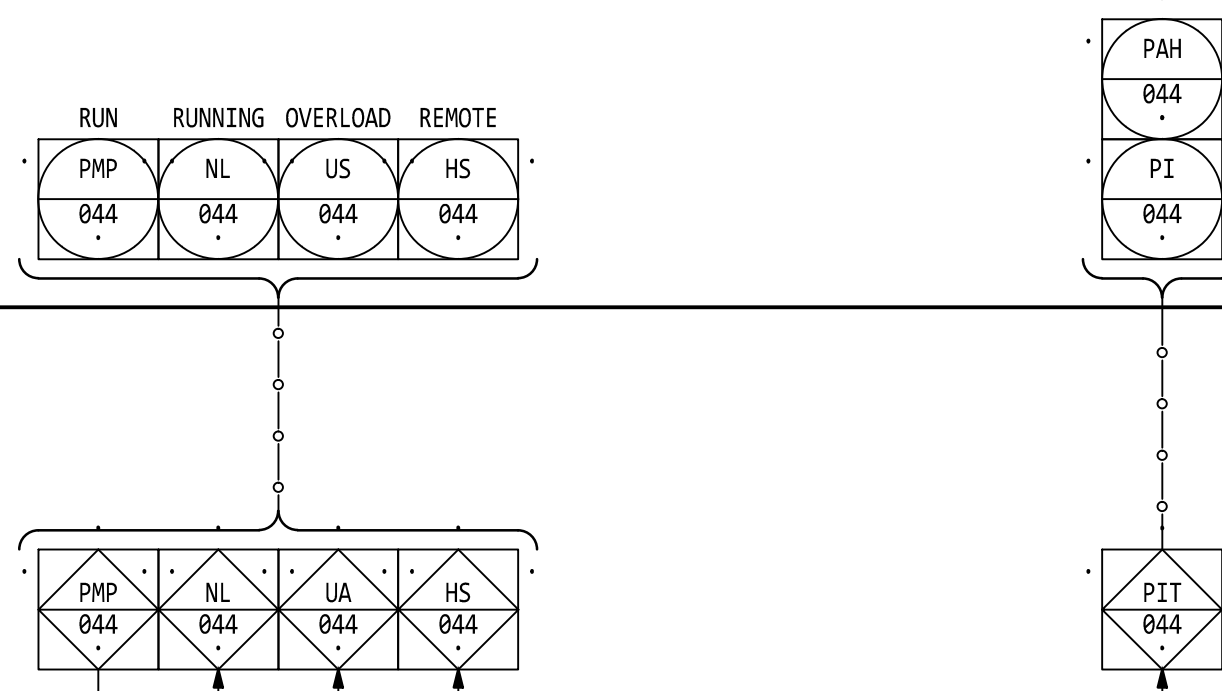
FACILITY NO. 239		SYSTEM CODE SDS	
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
WALNUT CREEK WATER TREATMENT PLANT			
PROCESS BALLASTED FLOCCULATION - NORTH BASIN 1 SAND PUMP 3 P&ID			
PROJ. NO. SPECS 2200	506.00-J-093	0	
SCALE NONE			
DATE JAN 2025	STRUCT.	DISC.	NUMBER
			REV.

NO.	DATE	REVISION	BY	REC.	APP.

NOTES

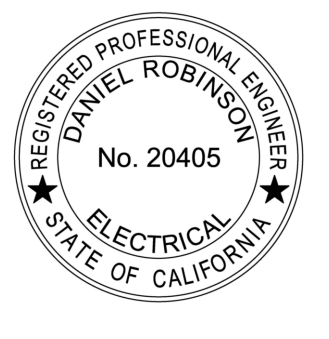
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- 4. EQUIPMENT TAGGING IS PRELIMINARY. VENDOR WILL NEED TO UPDATE THE TAGGING DURING THE SUBMITTAL PROCESS.

I-1 CONTROL STRATEGY



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PLOT SCALE: 1:2



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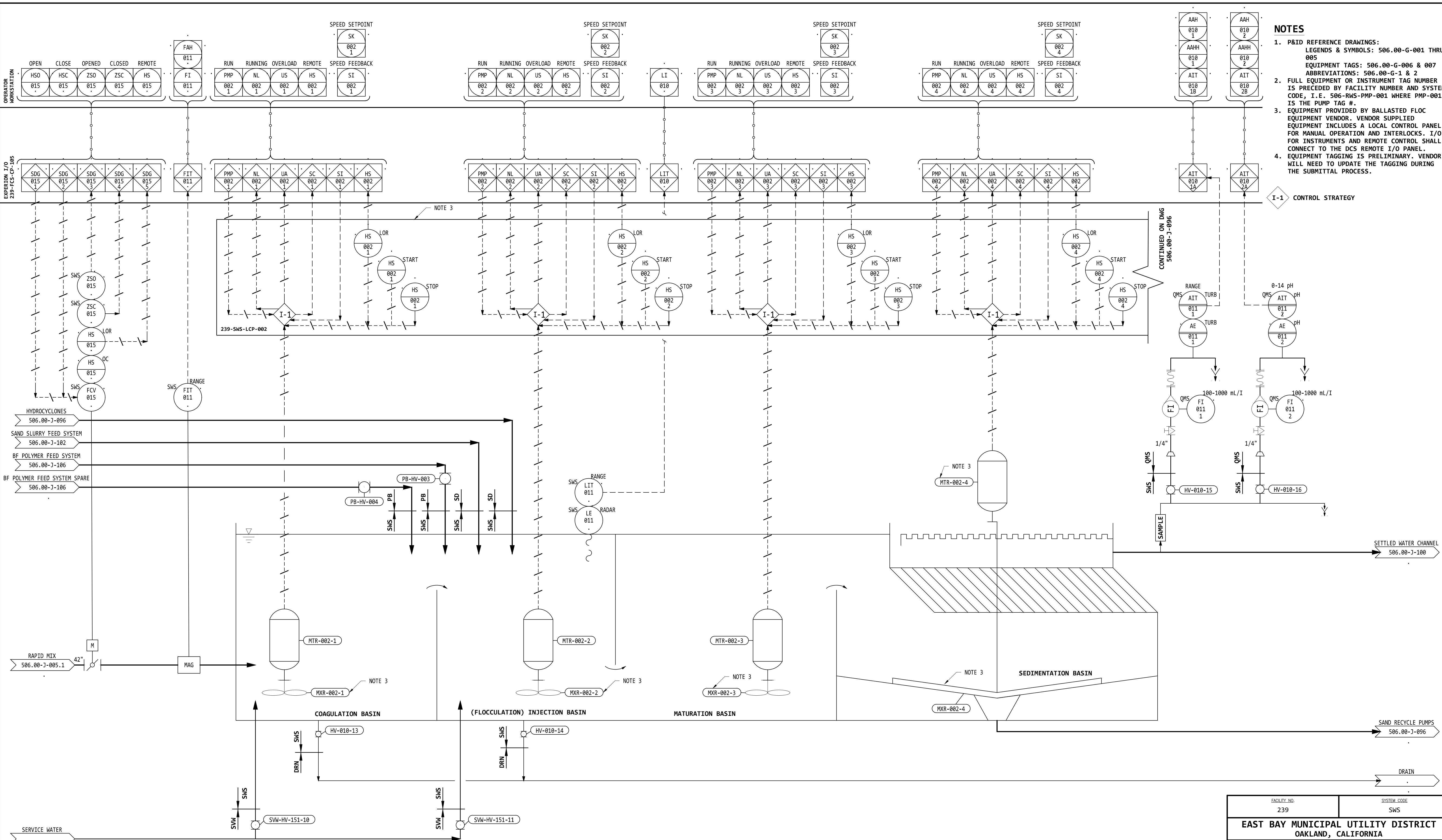
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DESIGNED BY	DSR
DESIGN CHECKED BY	
DRAWN BY	CEY
SEAL PROJ. ENGR.	
APPROVED	
PRINCIPAL IN CHARGE, R.P.E. NO.	

PROJECT ENGINEER	R.P.E. NO.
RECOMMENDED	ENGR.
APPROVED	MGR. OF DESIGN
	R.P.E. NO.

FACILITY NO.	239	SYSTEM CODE	SDS
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
WALNUT CREEK WATER TREATMENT PLANT			
PROCESS BALLASTED FLOCCULATION - NORTH BASIN 1 SAND PUMP 4 P&ID			
PROJ. NO.	SPEC 2200	506.00-J-094	0
SCALE	NONE		
DATE	JAN 2025	STRUCT.	DISC. NUMBER



- NOTES**
1. P&ID REFERENCE DRAWINGS:  
LEGENDS & SYMBOLS: 506.00-G-001 THRU 005  
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ABBREVIATIONS: 506.00-G-1 & 2
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I-1 CONTROL STRATEGY

CONTINUED ON DWG 506.00-J-096



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SPE. PROJ. ENGR. R.P.E. NO.  
APPROVED  
PRINCIPAL IN CHARGE, R.P.E. NO.

PROJECT ENGINEER R.P.E. NO.  
RECOMMENDED ENGR. R.P.E. NO.  
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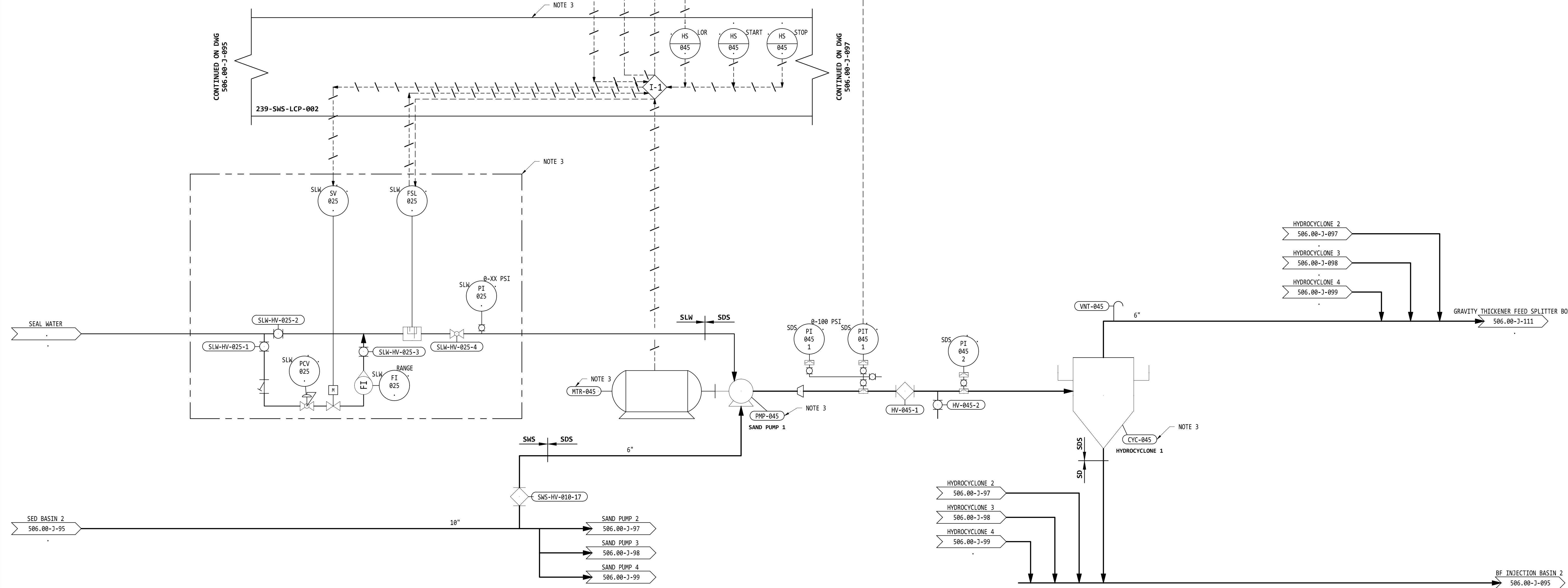
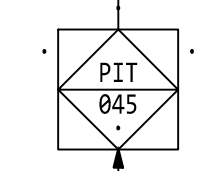
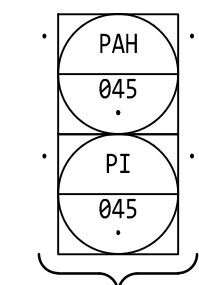
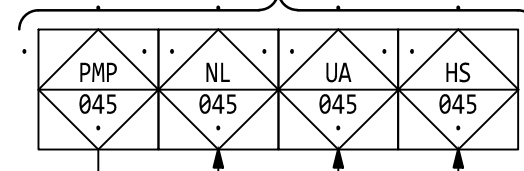
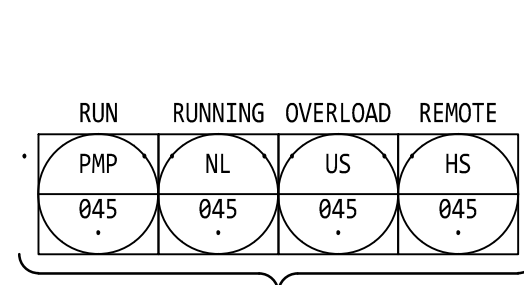
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<b>WALNUT CREEK WATER TREATMENT PLANT</b>			
PROCESS <b>BALLASTED FLOCCULATION - NORTH BASIN 2 P&amp;ID</b>			
PROJ. NO. SPEC 2200	506.00-J-095	0	
SCALE NONE			
DATE JAN 2025	STRUCT.	DISC.	NUMBER
			REV.

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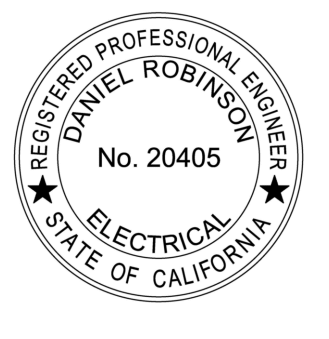
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I-1 CONTROL STRATEGY



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 PLOT SCALE: 1:2



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 DESIGN CHECKED BY:  
 DRAWN BY: CEY  
 SDR PROJ ENGR:  
 APPROVED:  
 PRINCIPAL IN CHARGE, R.P.E. NO.

PROJECT ENGINEER R.P.E. NO.  
 RECOMMENDED R.P.E. NO.  
 ENGR.  
 MR. OF DESIGN R.P.E. NO.

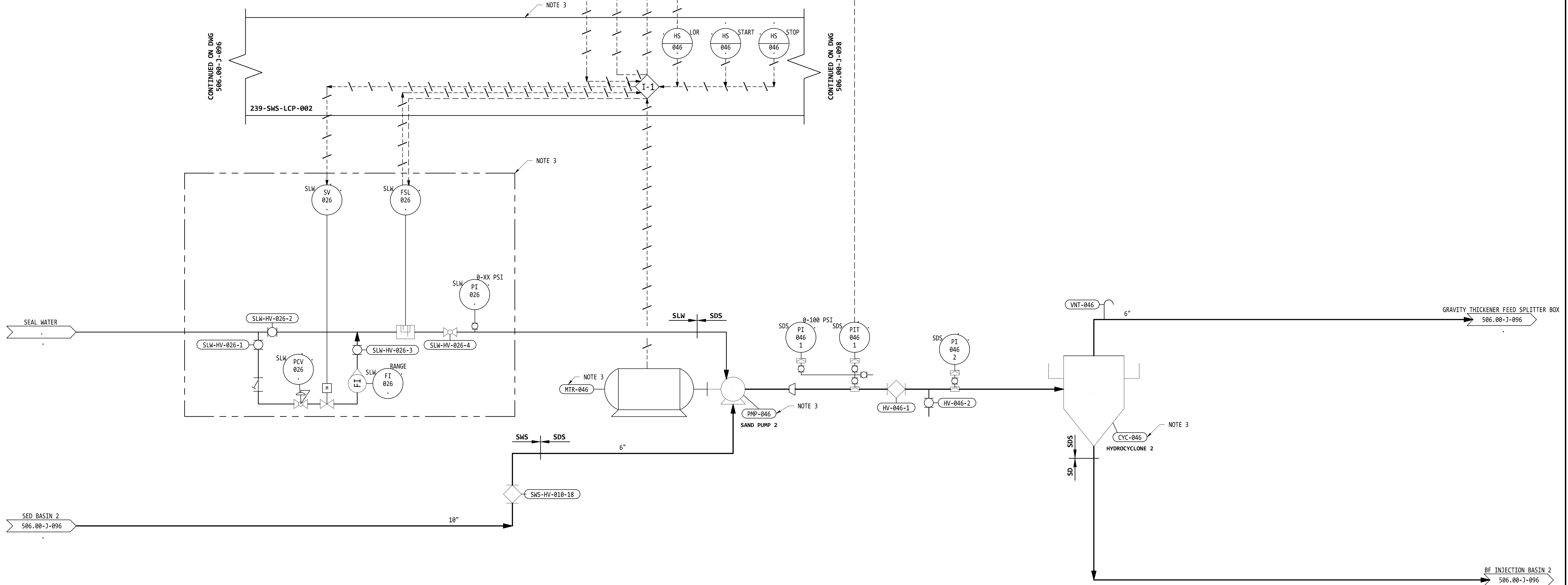
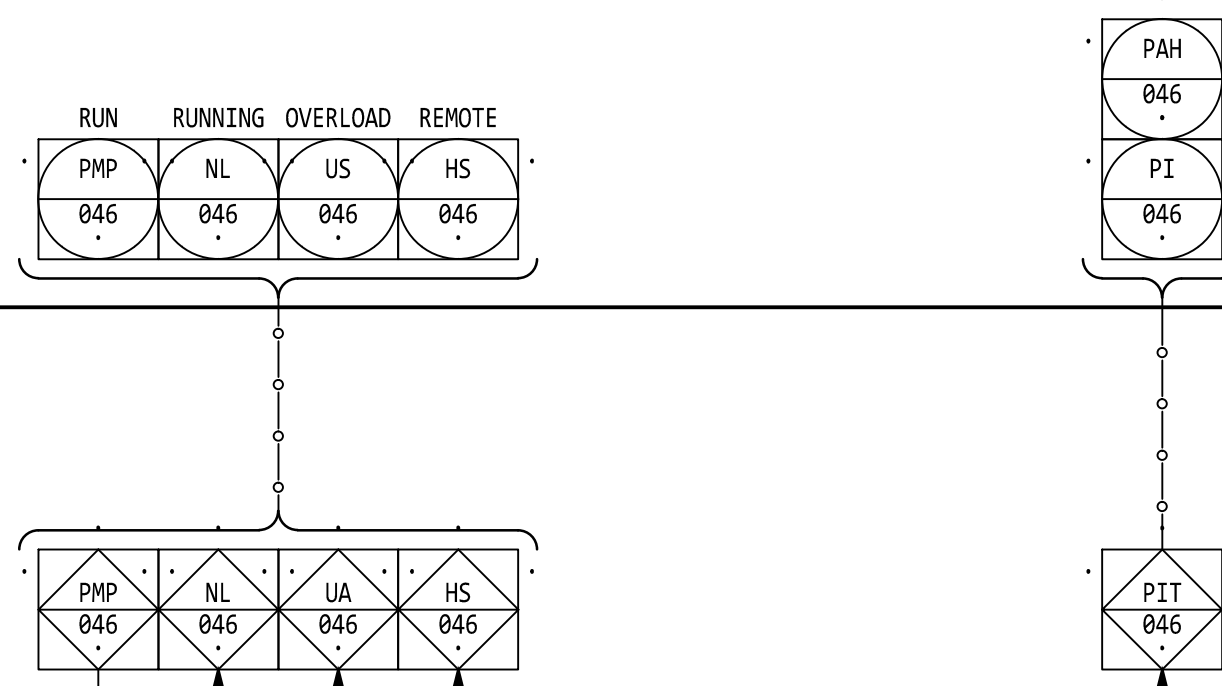
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<b>WALNUT CREEK WATER TREATMENT PLANT</b>			
PROCESS BALLASTED FLOCCULATION - NORTH BASIN 2 SAND PUMP 1 P&ID			
PROJ. NO. SPEL 2200	506.00-J-096	0	
SCALE NONE			
DATE JAN 2025	STRUCT.	DISC.	NUMBER
			REV.

NO.	DATE	REVISION	BY	REC.	APP.

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PLOT SCALE: 1:2



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DESIGNED BY: DSR  
 DESIGN CHECKED BY:  
 DRAWN BY: CEY  
 SDS PROJ ENGR:  
 APPROVED:  
 PRINCIPAL IN CHARGE, R.P.E. NO.

PROJECT ENGINEER R.P.E. NO.  
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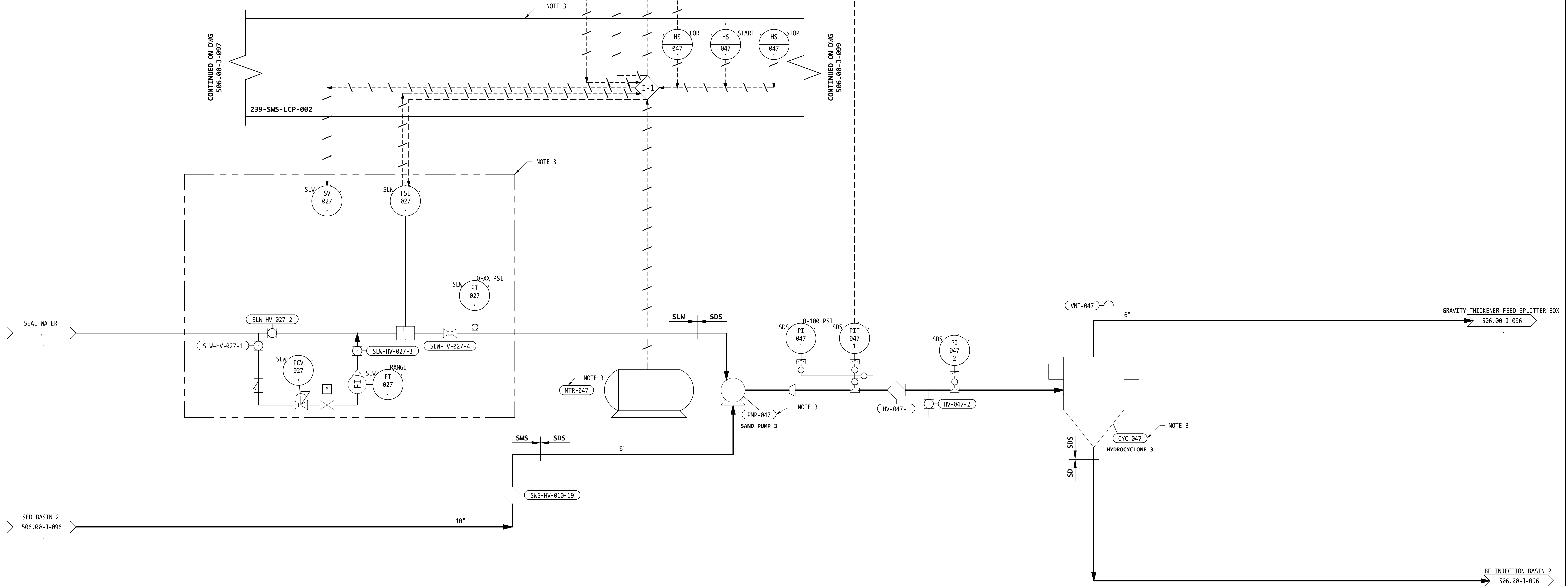
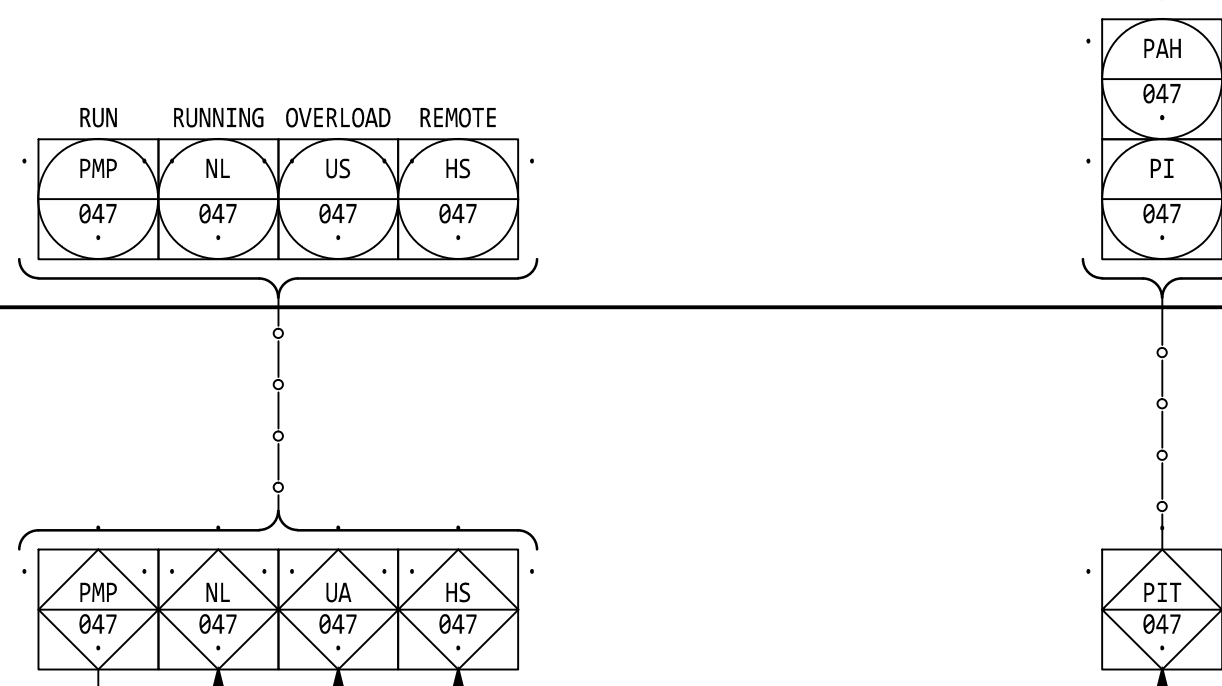
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<b>WALNUT CREEK WATER TREATMENT PLANT</b>			
PROCESS BALLASTED FLOCCULATION - NORTH BASIN 2 SAND PUMP 2 P&ID			
PROJ. NO.	SPEC 2200	506.00-J-097	0
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DATE	JAN 2025	STRUCT. DISC. NUMBER	REV.

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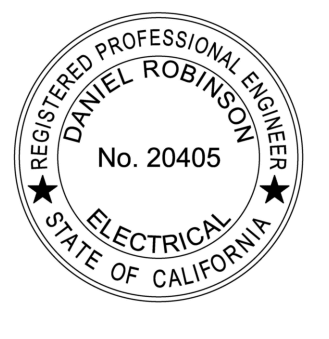
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DESIGNED BY: DSR  
 DESIGN CHECKED BY:  
 DRAWN BY: CEY  
 SDI PROJ. ENGR.  
 R.P.E. NO.  
 APPROVED:  
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 R.P.E. NO.  
 PRINCIPAL IN CHARGE, R.P.E. NO.

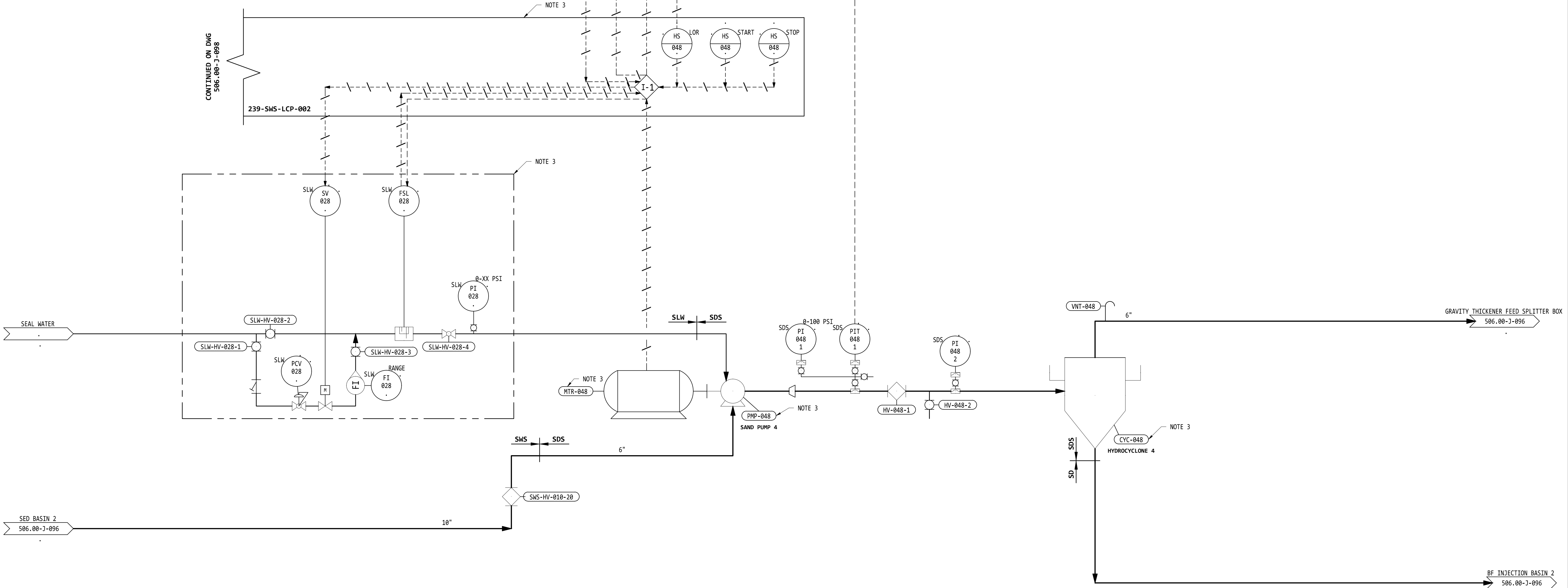
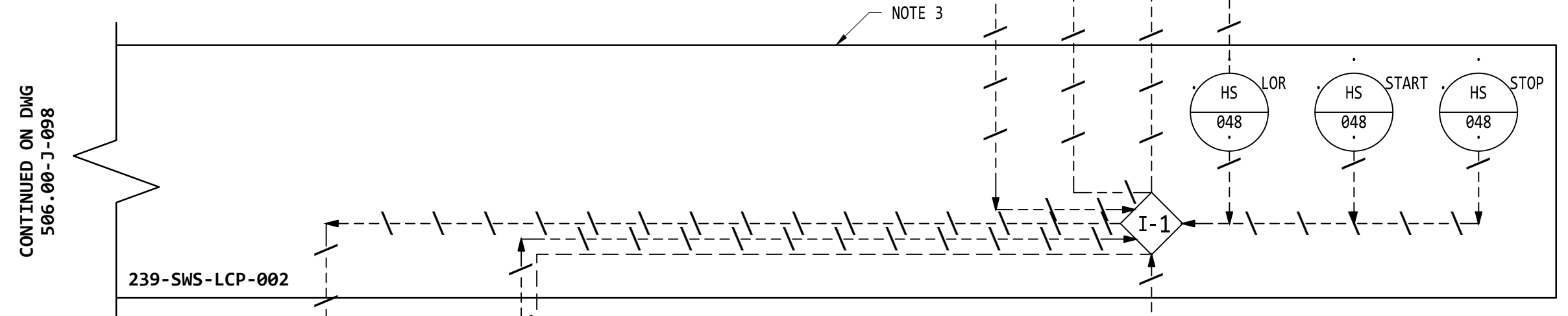
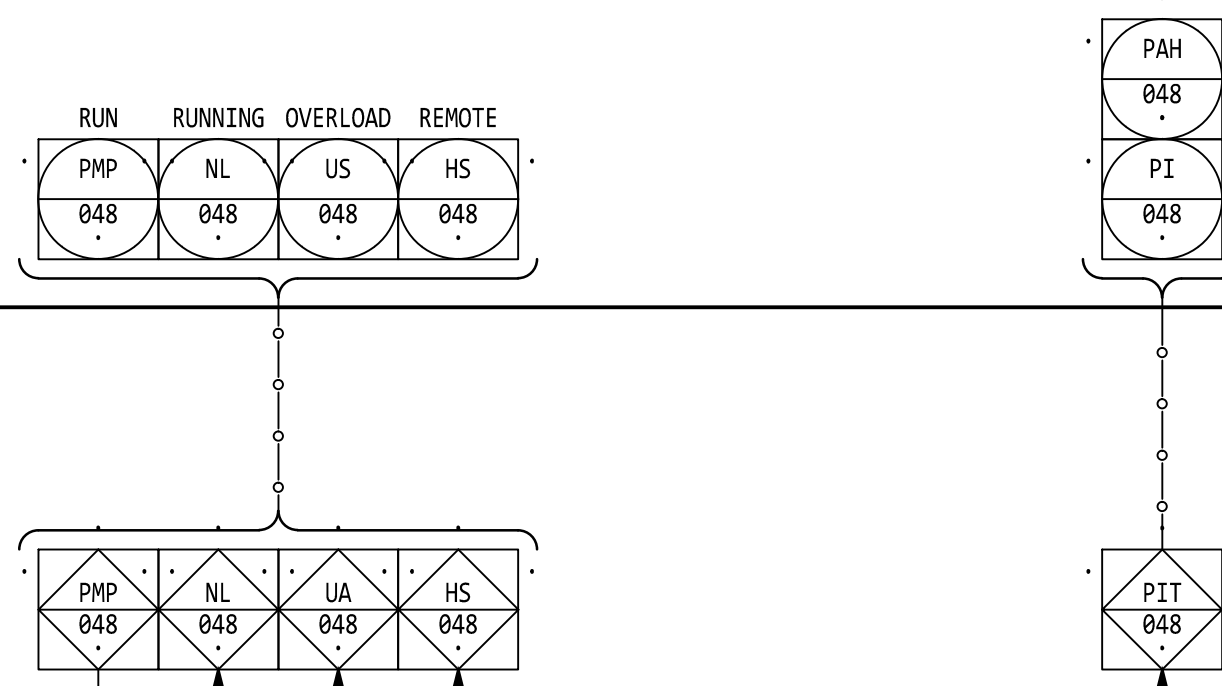
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 ENGR.  
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 R.P.E. NO.

FACILITY NO. 239		SYSTEM CODE SDS	
<b>EAST BAY MUNICIPAL UTILITY DISTRICT</b> OAKLAND, CALIFORNIA			
<b>WALNUT CREEK WATER TREATMENT PLANT</b>			
PROCESS BALLASTED FLOCCULATION - NORTH BASIN 2 SAND PUMP 3 P&ID			
PROJ. NO. SPEX 2200	506.00-J-098	0	
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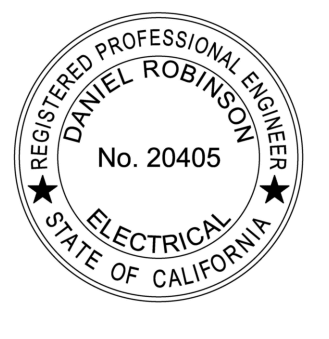
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PLOT SCALE: 1:2



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DESIGNED BY: DSR  
 DESIGN CHECKED BY:  
 DRAWN BY: CEY  
 SDS PROJ ENGR:  
 APPROVED:  
 PRINCIPAL IN CHARGE, R.P.E. NO.

PROJECT ENGINEER R.P.E. NO.  
 RECOMMENDED SDS PROJ ENGR. R.P.E. NO.  
 APPROVED MGR. OF DESIGN R.P.E. NO.

FACILITY NO. 239		SYSTEM CODE SDS	
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
WALNUT CREEK WATER TREATMENT PLANT			
PROCESS BALLASTED FLOCCULATION - NORTH BASIN 2 SAND PUMP 4 P&ID			
PROJ. NO. SPEL 2200	506.00-J-099	0	
SCALE NONE			
DATE JAN 2025	STRUCT.	DISC.	NUMBER
			REV.

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**EXHIBIT F**  
**ASSIGNMENT ASSUMPTION AND CONSENT**  
**(To be provided via forthcoming Addendum)**



**EXHIBIT G**  
**BALLASTED FLOCCULATION BID FORM AND WORKBOOK**



## BID FORM(S)

Cost shall be submitted on this Bid Form as is. The prices quoted shall not include Sales Tax or Use Tax; said tax, wherever applicable, will be paid by the District to the contractor, if licensed to collect, or otherwise directly to the State.

No alterations or changes of any kind to the Bid Form(s) are permitted. RFQ responses that do not comply may be subject to rejection in total.

The Bid Form contains both a Lump Sum Bid Price for the bidder’s proposed scope of work and several additional cost elements including construction cost for concrete facilities and operating expenses. The contract resulting from this RFQ will be awarded to the responsible Bidder whose Bid is lowest after factoring in all cost information from each line item entered in the bid form (Item 1.02 Total Bid Price). The total Lump Sum Bid Item costs quoted below for Goods and Special Services, Item 1.01.A, shall be the cost the District will pay for the term of any contract that is a result of this RFQ process. The Total Lump Sum Bid Items, if accepted and incorporated in the Procurement Contract to be awarded, will be subject to any District-accepted Alternates and to final Unit Price and District’s Contingency Allowance adjustments.

A digital copy of the filled-out ‘Bid Form – Workbook.xlsx’ spreadsheet shall be submitted alongside this bid form. Refer to **Instructions For Completion of Bid Form Workbook** below.

Quantities listed herein are annual estimates based on past usage and are not to be construed as a commitment. No minimum or maximum is guaranteed or implied.

### ARTICLE 1 – BASIS OF BID

#### 1.01 Lump Sum, Construction Cost for Additional Facilities, and Operating Expenses:

- A. Bidder will furnish the Goods and Special Services in accordance with the Procurement Contract Documents for the following Procurement Contract Price(s):

Lump Sum Bid Item	Unit of Measure	Estimated Quantity	Unit Cost	Extended Cost
<u>Design Support Services</u> – Part A. Collaboration with District and Engineer	Hours	250	\$	\$
<u>Design Support Services</u> – Part B. Preparation of Shop Drawings and Submittals for the Ballasted Flocculation System	Hours	250	\$	\$
<u>Construction Phase Services</u> – Supervision of Installation, Testing, Training, and Commissioning	Hours	400	\$	\$

Lump Sum Bid Item	Unit of Measure	Estimated Quantity	Unit Cost	Extended Cost
<u>Construction Phase Services</u> – DCS Programming Support	Hours	80	\$	\$
<u>Construction Phase Services</u> – Shop Inspection and Factory Acceptance Test (FAT) Witnessing	LS	1	-	\$
<u>Construction Phase Services</u> - Equipment as specified, exclusive of taxes	LS	1	-	\$
<b>Goods and Special Services Total</b>				\$

- B. After filling out the spreadsheet titled ‘Bid Form – Additional Evaluation’ and the ‘Construction Cost’ tab, please enter the values specified below:

<b>Construction Cost Evaluation Form Total:</b>	\$
---	----

- C. After filling out the spreadsheet titled ‘Bid Form – Additional Evaluation’ and the Operations Cost’ tab, please enter the values specified below:

<b>Operations Cost: Waste Stream Total 20-Year Cost</b>	\$
<b>Operations Cost: Energy Use Total 20-Year Cost</b>	\$

- D. Bidder indicates provision of the following equipment, included in the lump sum bid items above (Item 1.01.A). All deviations to the required equipment scope of supply must be Submitted to the District a minimum of 5 business days in advance of RFQ Response Deadline for approval. Backup materials and a copy of the approval for any submitted and approved deviation shall be included in the RFQ Response Packet:

**Mechanical Equipment, Instruments, and Electrical Panels**

Equipment Item	Number Required	Number Provided	Date of Owner Approval of Deviation, if required <sup>2</sup>
Variable Speed Mixers	6		
Anti-Vortex Baffles	AR <sup>1</sup>		
Sludge scraper assemblies	2		
Lamella module sets, 316 stainless steel	2 set(s)		

Equipment Item	Number Required	Number Provided	Date of Owner Approval of Deviation, if required <sup>2</sup>
Lamella plate supports, 316 stainless steel and tie-down assembly	2 set(s)		
Effluent collection troughs, 2' width, 316 stainless steel	8		
Supports for collection troughs, 316 stainless steel	2 set(s)		
Microsand recirculation pumps	8		
Microsand recirculation pump seal water systems	8		
Hydrocyclones	8		
Hydrocyclone support stands	2		
Imhoff Cones	2		
Microsand for Start-up	AR <sup>1</sup>		
Local Control Panels	AR <sup>1</sup>		
<b>Spare Parts</b>			
Mixer bearings and seals set for each provided mixer model	1 set per mixer model		
Microsand Pump V-belt sets	8 set(s)		
Hydrocyclone Apex Tips (assemblies)	8		

Notes:

(1) As required. Value to be provided by Seller.

(2) All deviations to the required equipment scope of supply must be approved by the District.

1.02 Total Bid Price

- A. The following Total Bid Price is the sum of the Lump Sum Bid items (1.01.A), Construction Costs for Additional items (1.01.B), and the Operating Expenses items (1.01.C).

<b>Total Bid Price</b>	<b>\$</b>
------------------------	-----------



## INSTRUCTIONS FOR COMPLETION OF BID FORM WORKBOOK

Bidder to refer to Microsoft Excel Workbook titled 'Bid Form Workbook' for completion of the Bid Form. **Bidders must contact the following person to receive a copy of the 'Bid Form Workbook' spreadsheet template:**

Attn: Sarah Plummer  
E-Mail: sarah.plummer@ebmud.com  
PHONE: (510) 287-2099

### 1.01 Lump Sum, Construction Cost for Concrete Facilities, and Operating Expenses:

#### A. Costs related to the construction cost of facilities will be calculated as follows:

1. With the 'Bid Form Workbook.xlsx' spreadsheet on the 'Construction Cost' tab included as part of the bid packet; bidders shall use the provided table to fill in the following information:
  - a. Bidder shall enter the value for the total length of the perimeter water bearing concrete walls within the proposed ballasted flocculation train and the height of the perimeter walls.
    - 1) Wall length for perimeter walls shall be measured as the inside length for each concrete wall that has water on at least one side. Bidders shall count any shared wall between ballasted flocculation trains as one perimeter wall.
    - 2) Minimum height of perimeter walls is the assumed average water depth in each train plus thirty inches (30") of freeboard.
  - b. Bidder shall enter the value for the total length of interior walls in the water bearing portion of the ballasted flocculation train.
    - 1) Wall length for interior walls shall be measured as the inside length. Any vertical concrete structure over 6' in height is considered a wall. The length of walls shall be provided for each train, individually. No sharing of interior walls between trains shall be assumed.
    - 2) Height of interior walls is assumed to be approximately three (3) feet shorter than perimeter walls. This value shall not be changed.
  - c. Bidder shall enter the values for the footprint (in square feet) of the overall floor slab inside the ballasted flocculation trains.
    - 1) Area shall be measured as the projected inside footprint of all water bearing structures in the ballasted flocculation trains.
  - d. Bidder shall enter the values for the total excavation perimeter for the ballasted flocculation trains.
    - 1) Generally, this should be the perimeter of the footprint calculated in item 'c', above.

- 2) Height of shoring is assumed to be approximately eight (8) feet shorter than perimeter walls, based on existing hydraulics and finished grade. This value shall not be changed.
  2. The values entered should be easily reviewed and replicated by the District using the Bidder's submitted general arrangement drawings.
  3. Additional calculations and District provided values are given to complete the calculations. No altering of the spreadsheet equations or logic is permitted. The values entered are used to develop a comparative Construction Cost for the facilities.
  4. Example calculations are provided as part of the included spreadsheet.
- B. Costs related to operating expenses will be calculated as follows:
1. With the 'Bid Form Workbook.xlsx' spreadsheet on the 'Operations Cost' tab included as part of the bid packet, bidders shall use the provided 2023 daily flow and turbidity data to fill in the following information:
    - a. The total annual flow (in millions of gallons) to the residuals handling facility.
      - 1) Calculated based on the average (whole number) number of sand pumps in service each day, based on the flow rate and water quality given for that day.
      - 2) Bidders shall assume that 20% of the hydrocyclone flow is recycled directly to the BF basin and 80% of the hydrocyclone flow is rejected to residuals processes.
      - 3) The value should be easily reviewed and replicated by the District and Engineer using the Bidders submitted equipment scope of supply and operational strategy.
      - 4) The value entered shall be multiplied by the multiplier indicated to yield an estimated annual operations cost for treatment and recycling of BF residuals.
    - b. The total energy load (in kilowatt-hours) required to run the BF mixers and pumps.
      - 1) Calculated based on the average (whole number) number of trains and sand pumps online, based on flow rate and water quality for the given day.
      - 2) The total annual load, calculated as the sum of the average load for each day, shall be multiplied by the value indicated to yield an estimated annual energy cost.
  2. Additional calculations and District provided values are given to complete the calculations. No altering of the spreadsheet equations or logic is permitted. The values entered are used to develop a comparative annual Operations Cost for the facilities.
- C. Scope of supply checklist shall be filled out completely as follows:
1. Provide the values for each row in the checklist, indicating that Bidder has provided the required equipment in their bid.
  2. If deviations to the required equipment scope of supply have been previously submitted and approved Bidder shall indicate as such, including the date approval for this deviation was received from the District.
  3. Backup materials and a copy of the approval for any submitted and approved deviation shall be included in the submitted bid.

**EXHIBIT H  
BOND FORMS**



DATE \_\_\_\_\_

# FAITHFUL PERFORMANCE BOND

CONTRACTOR (Name and California address where service may be effected)
SURETY (Name and California address where service may be effected)
AMOUNT OF BOND (Sum in words and figures)
CONTRACT DOCUMENTS (As named in the Contract)

**KNOW ALL PERSONS BY THESE PRESENTS:**

THAT, the contractor named above, hereinafter called the Contractor, as Principal, and the Surety named above, as Surety, are held and firmly bound unto the East Bay Municipal Utility District, hereinafter called the District, in the sum entered above, lawful money of the United States of America, for the payment of which sum well and truly to be made to the District, we, and each of us, bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

The condition of the above obligation is such that whereas the Contractor and the District entered into a Contract of even date herewith, by the terms and conditions of which the Contractor agreed to perform and complete the work, or manufacture, complete, and deliver the material or equipment, set forth in the Contract Documents named in the Contract, all now on file in the office of the Secretary of the District, as will more fully appear by reference to said Contract, which is made a part of this bond;



# FAITHFUL PERFORMANCE BOND

NOW, THEREFORE, if the Contractor shall well and truly carry out, execute and perform all things by the Contractor to be carried out, executed and performed, according to the terms and conditions of said Contract, including any and all warranty and guaranty obligations contained therein, then this obligation shall become null and void, otherwise to remain in full force and effect throughout the period of performance, including any warranty or guaranty period.

No prepayment or delay in payment, and no change, extension, addition, or alteration of any provision of said Contract or Contract Documents agreed to between the Contractor and the District, and no forbearance on the part of the District shall operate to release the Surety from liability on this Bond, and consent to make such alterations without further notice to or consent by the Surety is hereby given, and the Surety hereby waives the provisions of Section 2819 of the Civil Code and Section 359.5 of the Code of Civil Procedure of the State of California.

Each signator to this bond hereby declares under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Dated the day and year entered on the first page hereof.

\_\_\_\_\_  
Contractor

By \_\_\_\_\_

\*Title \_\_\_\_\_

By \_\_\_\_\_

\*\*Title \_\_\_\_\_

(SEAL OF SURETY)

\_\_\_\_\_  
Surety

By \_\_\_\_\_

Title \_\_\_\_\_

*Note: The signature of the Surety on this bond must be acknowledged before a Notary Public. An executed Power of Attorney indicating that the Surety's representative is authorized to bind the Surety must accompany this bond.*

The foregoing Bond was accepted and approved this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_

\_\_\_\_\_, East Bay Municipal Utility District

Specifications / Proposal No. \_\_\_\_\_

\*If corporation, Corporate President or CEO; if Partnership, Partner.

\*\*Corporate Secretary or financial officer.



DATE \_\_\_\_\_

# PAYMENT BOND

CONTRACTOR (Name and California address where service may be effected)

SURETY (Name and California address where service may be effected)

AMOUNT OF BOND (Sum in words and figures)

CONTRACT DOCUMENTS (As named in the Contract)

**KNOW ALL PERSONS BY THESE PRESENTS:**

THAT, WHEREAS, the contractor named above, hereinafter called the Contractor, has this day entered into a Contract with East Bay Municipal Utility District, hereinafter called the District, to perform and complete the work set forth in the Contract Documents named in the Contract, all now on file in the office of the Secretary of the District, as will more fully appear by reference to said Contract, which is made a part hereof; and

WHEREAS, Sections 9550 to 9566 inclusive of the Civil Code of the State of California, and any amendments thereof, require contractors upon public work to file with the body by whom such contract was awarded a good and sufficient bond to secure the claims to which reference is made in said sections, NOW THESE PRESENTS

WITNESSETH: That the Contractor, as Principal, and the Surety named above, as Surety, are held and firmly bound unto any and all materialmen, persons, firms, or corporations furnishing materials, provisions, or other supplies used in, upon, for, or about the performance of the work contracted to be done, and to all persons, firms or corporations renting or hiring implements or machinery for or contributing to the said work to be done and to all persons who perform work or labor of any kind or nature thereon, or in connection therewith, and to all persons who supply both work and materials, in the sum entered on the first page hereof, lawful money of the United States of America, being not less than the total amount payable by the terms of said Contract, for which payment well, truly and promptly to be made we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly, and severally, firmly by these presents.

**PAYMENT BOND**

The condition of the above obligation is such that if the Contractor, or the Contractor’s subcontractors, fail to pay for any materials, provisions or other supplies used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts due under the Unemployment Insurance Act with respect to such work or labor, the Surety will pay for the same, in an amount not exceeding the sum specified in this Bond, provided that any and all claims hereunder shall be filed and proceedings had in connection therewith as required by the provisions of said Sections 9550 to 9566 inclusive of the Civil Code of the State of California, and any amendments thereof: PROVIDED ALSO, that in case suit is brought upon this Bond a reasonable attorney’s fee shall be awarded by the court to the prevailing party in said suit, said attorney’s fee to be fixed as costs in said suit, and to be included in the judgment therein rendered.

No prepayment or delay in payment and no change, extension, addition, or alteration of any provision of said Contract or Contract Documents agreed to between the Contractor and the District, and no forbearance on the part of the District, shall operate to release the Surety from liability on this Bond, and consent to make such alterations without further notice to or consent by the Surety is hereby given, and the Surety hereby waives the provisions of Section 2819 of the Civil Code of the State of California.

Dated the day and year entered on the first page hereof.

Each signator to this bond hereby declares under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

\_\_\_\_\_  
Contractor

By \_\_\_\_\_

\*Title \_\_\_\_\_

By \_\_\_\_\_

\*\*Title \_\_\_\_\_

(SEAL OF SURETY)

\_\_\_\_\_  
Surety

By \_\_\_\_\_

Title \_\_\_\_\_

*Note: The signature of the Surety on this bond must be acknowledged before a Notary Public. An executed Power of Attorney indicating that the Surety’s representative is authorized to bind the Surety must accompany this bond.*

The foregoing Bond was accepted and approved this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_

\_\_\_\_\_, East Bay Municipal Utility District

Specifications / Proposal No. \_\_\_\_\_

\*If corporation, Corporate President or CEO; if Partnership, Partner.  
\*\*Corporate Secretary or financial officer.