

EAST BAY MUNICIPAL UTILITY DISTRICT

REQUEST FOR QUOTATION (RFQ) No. 2014 for Carbonic Acid Dissolution, Feed, and pH Control Systems

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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.

RESPONSE DUE
by
1:30 p.m.
on
April 29, 2020
at
EBMUD, Purchasing Division
375 Eleventh St., First Floor
Oakland, CA 94607



375 Eleventh Street, Oakland, CA 94607
Website: ebmud.com

EAST BAY MUNICIPAL UTILITY DISTRICT

RFQ No. 2014

for

Carbonic Acid Dissolution, Feed, and pH Control Systems

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ATTACHMENTS

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EXHIBIT B – INSURANCE REQUIREMENTS

EXHIBIT C – GENERAL CONDITIONS

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EXHIBIT E – ASSIGNMENT ASSUMPTION AND CONSENT AGREEMENT

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EXHIBIT G-- BOND FORMS

EXHIBIT H – TECHNICAL DRAWINGS AND SPECIFICATIONS

I. STATEMENT OF WORK

A. SUMMARY OF SCOPE

These specifications, terms, and conditions describe the requirements for furnishing equipment and providing services for eleven (11) complete skid mounted carbonic acid dissolution, feed and pH control systems, including PLC (Programmable Logic Controller) and all necessary piping, valves, electrical equipment and appurtenances for installation at the East Bay Municipal Utility District (District)'s Pardee Chemical Plant, Orinda Water Treatment Plant, Lafayette Water Treatment Plant and Walnut Creek Water Treatment Plant under one or more public works construction projects (each a "Construction Project." Each carbonic acid dissolution feed system and associated components shall fully dissolve the carbon dioxide gas with water and inject carbonic acid to the specified discharge points. The equipment will be furnished by the successful Bidder (also referred to, as appropriate, "Supplier") under an agreement (Supplier Agreement) with the District. In addition, the Supplier shall provide design coordination, submittals, start-up, testing, and training services as described herein. The scope of services is further described below under Specific Requirements, and are sometimes referred to in this document as the "Project," the "Work" or the "Services." The equipment will be installed by a Construction Contractor, also known as the "Installer" for each Construction Project to be selected by the District at a later date.

The Supplier Agreement between the District and Supplier will be assigned to the Installer for each Construction Project for which the equipment supplied by the Supplier will be utilized, after the Installers are selected and the Construction Project contracts awarded by the District. By submitting an RFQ response, the Bidder acknowledges and agrees to such an assignment on terms set forth in the attached Assignment Assumption and Consent Agreement form, or similar terms. The Supplier shall deliver the fully executed Assignment Assumption and Consent Agreements to the District within 15 days after receipt of request from the District.

The District intends to award a Supplier Agreement to the Bidder who meets the minimum qualifications specified herein and proposes the lowest capital bid costs.

B. BIDDER QUALIFICATIONS

1. Bidder Minimum Qualifications

- a. Bidders shall have designed, manufactured, assembled specific equipment and components, and supplied a minimum of five (5) carbonic acid dissolution, feed and pH control systems for installation at industrial or municipal drinking water facilities in the United States and/or Canada, with an established record of successful operation of such equipment and components. The referenced systems shall be currently operating

municipal or industrial installations, which have been in successful operation for a minimum of three (3) years within the previous five (5) years as of this RFQ date, and use equipment similar to what is required by this specification. 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 the Project and will be responsible for all specified deliverables shall have successfully completed a minimum of three (3) projects of comparable scope of supply and complexity to this Project within the last five (5) years. The resume of the Bidder's Project Manager, start-up, and training personnel shall be provided in the RFQ response.
- c. Bidders shall maintain under employment in the United States personnel who have a minimum of five (5) years of experience in servicing and supervising installation and start-up of carbonic acid dissolution, feed and pH control systems. The experience shall include installation and start-up of at least five (5) facilities with similar equipment within the last ten (10) years as of the RFQ date. The resumes of service personnel who will be assigned to this Project shall be provided in the RFQ response.
- d. Bidder shall possess all permits, licenses, and professional credentials necessary to supply product and perform services as specified under this RFQ.

C. SPECIFIC REQUIREMENTS

- 1. The Contract Documents for the Supplier Agreement consists of the documents listed in Section III.S.1.
- 2. Supplier shall furnish the Goods and Services as specified or indicated in the Contract Documents, further defined herein:
 - (1) Provide design support to District during, and be actively involved in, development of Construction Project contract documents, including:
 - (a) Participate in weekly progress calls with the District.
 - (b) Respond to District questions.
 - (c) Review and provide comments to Construction Project bid documents prepared by the District at the 50, 90 and 100 percent completion levels.

- (d) Attend up to four (4) design coordination meetings with the District during the Construction Project design phase at District office in Oakland, California or the Construction Project site. Meetings will be up to 8 hours each and may require attendance by two or more of the Supplier's engineering and technician staff including electrical, instrumentation, and controls.
- (e) Furnish information for use by bidders for the Construction Project contract, which shall include the following:
 - i. Final scope of supply with equipment data sheets.
 - ii. Special shipping/handling information and requirements.
 - iii. Special installation requirements.
 - iv. Draft start-up plan and schedule.
 - v. Approved submittals.
 - vi. Other requirements of the Contract Documents.
- (2) Prepare and submit all shop drawings as specified in the Technical Specifications.
- (3) Provide warrantees, bonds, and insurance in accordance with this Supplier Agreement.
- (4) Prepare and submit operation and maintenance manuals as specified in the Technical Specifications.
- (5) Coordinate with District and Contractors prior to and during the Construction Project, including the following:
 - (a) Attend the preconstruction meeting at the Construction Project work site.
 - (b) Call in or attend weekly conference calls with the District and Contractor.
 - (c) Conduct Construction Project site visits, inspections, and other construction-related activities in accordance with the Technical Specifications.

- (d) Perform all equipment testing specified in the Technical Specifications.
 - (e) Provide start-up, training, and other commissioning services in accordance with the Technical Specifications.
- 3. Risk of loss as it relates to the equipment and materials provided hereunder shall be borne by Supplier until delivery to the Construction Project site and acceptance by the Contractor, and thereafter shall be borne by the Contractor until final acceptance by the District.
- 4. All products shall be in new and unused condition and shall be of the most current and up-to-date model.
- 5. Part A Bid Items 1-5 includes furnishing, testing and commissioning, and delivery of the complete Pardee Chemical Plant equipment package and O&M Manuals in accordance with the Contract Documents to:
 - a. Pardee Chemical Plant: 3535 Sandretto Rd., Valley Springs, CA 95252
- 6. Part B Bid Items 1-5 includes furnishing, testing and commissioning, and delivery of the complete equipment package and O&M Manuals in accordance with the Contract Documents to the following locations:
 - a. Orinda Water Treatment Plant : 190 Camino Pablo, Orinda, CA 94563
 - b. Lafayette Water Treatment Plant: 3848 Mt Diablo Blvd., Lafayette, CA 94549
 - c. Walnut Creek Water Treatment Plant: 2201 Larkey Ln., Walnut Creek, CA 94597

D. DELIVERABLES / REPORTS

Goods and services to be furnished by the Supplier are described in the Contract Documents and generally include the following:

- 1. All equipment specified in the technical specifications, including but not limited to the carbonic acid injection system with all pumps ,valves gauges, meters, piping and flow nozzle, as specified in the Contract Documents .
- 2. Instruments indicated on the instrumentation drawings and/or indicated in the technical specification sections.

3. Programming of the PLCs and panel-mounted HMIs in control panels provided by the manufacturer.
4. Factory testing.
5. Software testing and turnover of PLC Program after successful testing.
6. Testing, training, commissioning, and supervision of equipment installation.
7. Special tools and spare parts.
8. Operation and maintenance manuals.
9. Warranties.
10. Bonds and insurance.
11. Design assistance, review of construction drawings, and preparation of shop drawing submittals.
12. Delivery of equipment to the Construction Project site within the specified time frame.

E. INSPECTION

The District shall have the right to participate in and witness any and all tests, inspections, and approvals of the Goods and Services permitted or required by agreements, and as part of the Contract Documents.

Factory Acceptance Testing- The District reserves the right-of-access to the Supplier's facility to witness Factory Acceptance Testing to verify conformance to this specification, as specified in the Technical Specifications.

Inspection Upon Delivery: The District will inspect material after its arrival at the delivery point. Supplier 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 Technical Specifications and drawings. In the case that an item is rejected, District Inspectors will provide Supplier and the District Purchasing Division with an Inspectors Job Report which will itemize the product deficiencies and required corrective action.

Field performance testing - Operating equipment and systems will be performance tested at multiple times by the Supplier as specified in the Technical Specifications, in cooperation with the Contractor, in the presence of the District, to demonstrate

compliance with the Contract Documents. Consequences of failure to meet performance objections are described in Technical Specification.

F. FAILURE TO MEET SPECIFICATIONS

In the event any shipment or shipments of the Supplier's 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 Supplier of the non-conforming product. Any costs over and above the original contract price will be charged back to the Supplier. In addition, Supplier shall bear the costs of removal and disposition for any delivery which fails to conform to the Technical Specifications and drawings.

II. CALENDAR OF EVENTS

EVENT	DATE/LOCATION
RFQ Issued	April 8, 2020
Deadline For Submission of Questions	April 22, 2020
Response Due	Wednesday, April 29, 2020 by 1:30 p.m.
Anticipated Board Award of Contract	Tuesday, June 9, 2020
Delivery of Flow Nozzle Submittal	July 7, 2020
Approval of Flow Nozzle Submittal	July 31, 2020
Delivery of Major Equipment Submittals	July 23, 2020
Required Delivery Date of Equipment	June 1, 2021 (Orinda, Lafayette, and Walnut Creek WTPs) March 1, 2022 (Pardee Chemical Plant)

Note: All dates are subject to change by the 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 has the right to decline to award this contract or any part of it for any reason.
3. Any specifications, terms or conditions, issued by the District, or those included in the bidder's submission, in relation to this RFQ, may be incorporated into any purchase order or contract that may be awarded as a result of this RFQ.
4. Award of Supplier Agreement. The District reserves the right to reject any or all bids, and to waive minor technical defects and administrative errors, as the interest of the District may require. Award will be made or bids rejected by the District as soon as possible after bids have been opened.

B. DEVIATIONS, AND EXCEPTIONS

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 Bidder's RFQ response to rejection. If no deviations are shown, the Bidder will be required to furnish the goods and services 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.

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. District shall pay the Supplier for furnishing the Goods and Services in accordance with the Contract Documents and as indicated in the Bid Form, included in Exhibit A: RFQ Response Packet.
 - a. Contract Price (to be completed after Bidder is selected).

b.

BID ITEM		LUMP SUM COST
Part A – Capital Bid Items for Pardee Chemical Plant		
1.	Equipment for Pardee Chemical Plant, exclusive of items listed below and taxes.	\$
2.	Witness Factory Tests	\$
3.	F.O.B. Freight (to Pardee Chemical Plant)	\$
4.	Supervision of Installation, Testing, Training, and Commissioning (at Pardee Chemical Plant)	\$
5.	Operation and Maintenance Manuals (for Pardee Chemical Plant)	\$
Part B – Capital Bid Items for Orinda, Lafayette, and Walnut Creek WTPs		
1.	Equipment for Orinda, Lafayette, and Walnut Creek WTPs , exclusive of items listed below and taxes.	\$
2.	Witness Factory Tests (Orinda, Lafayette, and Walnut Creek WTPs)	\$
3.	F.O.B. Freight (to Orinda, Lafayette, and Walnut Creek WTPs)	\$
4.	Supervision of Installation, Testing, Training, and Commissioning (at Orinda, Lafayette, and Walnut Creek WTPs)	\$
5.	Operation and Maintenance Manuals (Orinda, Lafayette, and Walnut Creek WTPs)	\$
Part A	Total Capital Bid Cost (Items 1-5)	\$
Part B	Total Capital Bid Cost (Items 1-5)	\$
Total Price	Sum of Part A and Part B	\$

4. Price quotes shall include any and all payment incentives available to the District.

D. PRICE ADJUSTMENTS

1. Prices for Goods and Services shall include any anticipated escalation of costs due to inflation, costs of raw materials, or any other cause for escalation, for the first three (3) years of the contract.
2. After the first 3 years of the contract, Supplier may submit a written request to the District for a price adjustment for any Goods and Services yet to be rendered. The request for an adjustment shall be made on the basis of a comparison to changes in the Producer Price Index (“PPI”) Series Title: PPI – All Commodities: 1982-100 NSA (available at www.bls.gov) and supported by other documentation as required. District will evaluate this information to determine if an adjustment to the pricing is fair and reasonable, and to the satisfaction of the District.
3. The parties hereto recognize that such change will only be evaluated if the PPI has increased after the first 3 years. The parties recognize that if the PPI has decreased at that time, that there will not be changes in the contract price.
4. Supplier shall note that the PPI will remain the basis for all cost adjustment requests. There are no provisions for adjustments due to changes in foreign exchange rates.

E. NOTICE OF INTENT TO AWARD AND PROTESTS

At the conclusion of the RFQ response evaluation process, all Bidders 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 of the Notice of Intent to Award must be in writing and must be received no later than seven (7) work days 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 work day time limit. Any bid protest filed with any other District office shall be forwarded immediately to the Manager of Purchasing.

The Manager of Purchasing shall consider the bid protest and make a determination. The bid protester can appeal the Manager of Purchasing's determination to the requesting department's Department Director. The appeal must be submitted to the Department Director no later than five work days 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.

F. METHOD OF ORDERING

1. Written POs may be issued upon approval of written itemized quotations received from the Supplier.
2. POs and payments for products and/or services will be issued only in the name of Supplier.

3. Any and all change orders shall be in writing and agreed upon, in advance, by Supplier and the District.

G. TERMINATION

1. See Article 11 of the General Conditions.

H. WARRANTY

Supplier 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. Supplier expressly warrants that all goods to be furnished will be fit and sufficient for the purpose(s) intended. Supplier 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. Supplier 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 Supplier 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, Supplier's aforesaid warranties and guarantees shall be in full force and effect for a period of two year 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.

I. INVOICING

1. Supplier shall submit Applications for Payment for Part A and Part B Bid Items 1 through 5 in accordance with the District standards, as described below. Applications for Payment will be processed by the District within thirty (30)

calendar days following receipt of a correct application and upon complete satisfactory receipt of product and/or performance of services.

2. Applications for Payment shall contain, at a minimum, District purchase order number, invoice number, remit to address, and itemized products and/or services description.
3. District shall notify the Supplier of any invoice adjustments required.
4. Schedule of Payments. Supplier shall be entitled to claim payments for Goods and Services in accordance with the following schedule:
 - a. Part A Bid Items 1 through 5 are anticipated to be paid by the respective Contractor to the Supplier after the Assignment Assumption and Consent Agreement is executed. However, the District has the option of authorizing the Supplier to proceed with any portions of Part A Bid Items 1 through 5 in advance of executing the Assignment Assumption and Consent Agreement. In this case, the District will pay the Supplier directly for the authorized work in accordance with the schedule below. Contractor will pay the Supplier the balance of remaining payments in accordance with the schedule below after the Assignment Assumption and Consent Agreement is executed.
 - (1) One percent (1%) of Bid Item 1 upon completion of successful approval of the flow nozzle design submittals by the District.
 - (2) Two percent (2%) of Bid Item 1 upon testing and delivery of flow nozzle to Construction Project site and acceptance by the District.
 - (3) Seventy two percent (72%) of Bid Item 1 and Seventy Five percent (75%) of Bid Items 2 and 3 upon completion of successful factory testing of equipment, delivery to Construction Project sites and acceptance by the District;
 - (4) Twenty percent (20%) of the sum of Bid Items 1, 2,3, plus ninety five percent (95%) of Bid Item 4 upon successful installation, performance testing and commissioning of all equipment;
 - (5) Ninety five percent (95%) of Bid Item 5 upon receipt of all final approved Operation and Maintenance manuals;
 - (6) Remaining five percent (5%) of the sum of Bid Items 1 through 5 upon successful completion all training.
 - b. Part B Bid Items 1 through 5 are anticipated to be paid by the respective Contractor to the Supplier after the Assignment Assumption and Consent Agreement is executed. However, the District has the option of authorizing the Supplier to proceed with any portions of Part B Bid Items 1 through 5 in advance of executing the Assignment Assumption and Consent

Agreement. In this case, the District will pay the Supplier directly for the authorized work in accordance with the schedule below. Contractor will pay the Supplier the balance of remaining payments in accordance with the schedule below after the Assignment Assumption and Consent Agreement is executed.

- (7) Seventy Five percent (75%) of the sum of Bid Items 1, 2, and 3 upon completion of successful factory testing of equipment, delivery to Construction Project sites and acceptance by the District;
- (8) Twenty percent (20%) of the sum of Bid Items 1, 2,3, plus ninety five percent (95%) of Bid Item 4 upon successful installation, performance testing and commissioning of all equipment;
- (9) Ninety five percent (95%) of Bid Item 5 upon receipt of all final approved Operation and Maintenance manuals;
- (10) Remaining five percent (5%) of the sum of Bid Items 1 through 5 upon successful completion of all training.

J. MILESTONES

1. Dates for Milestones, Contract Completion, and Final Payment for the units supplied at Pardee Chemical Plant, shown below are predicated upon District award of the Supplier Agreement by June 9, 2020, award of the installation construction contract to Contractor and/or authorization to Supplier to begin equipment fabrication by September 2, 2021. Authorization to begin design, testing and fabrication of the flow nozzle shall begin as soon as Contractor receives award of the Supplier Agreement. Adjustments to Milestone dates shown below will be made by District if the above dates are delayed:
 - a. Milestone 0: Test, fabricate and deliver Pardee Chemical Plant flow nozzle as the required in the Contract Documents: Within 120 calendar days after Notice to Proceed.
 - b. Milestone 1: Submit all general arrangement shop drawings in the Contract Documents: Pardee Flow Nozzle shop drawings: Within 15 calendar days of Notice to Proceed, All other drawings: Within 30 calendar days after Notice to Proceed.
 - c. Milestone 2: Obtain favorable review by the District of all shop drawings required in the Contract Documents. The District will finish its review and return comments within 21 calendar days of receiving complete submittal and re-submittal packages from Supplier: Within 120 calendar days after Notice to Proceed.

- d. Milestone 3: Furnish equipment: Unless otherwise agreed or requested in writing by District, begin delivery of equipment to Pardee Chemical Plant, or designated storage area within 50 miles no earlier than March 1, 2022 and complete delivery of equipment no later than March 1, 2023. Contractor shall be responsible for unloading equipment and providing proper storage at the Construction Project sites.
 - e. Milestone 4: Complete successful start-up testing, training, final O&M Manual submittal and Process Operational Period at Pardee Chemical Plant as specified in the Technical Specifications: No later than December 30, 2023.
2. Dates for Milestones, Contract Completion, and Final Payment for the units supplied at Orinda WTP, Lafayette WTP, and Walnut Creek WTP, shown below are predicated upon District award of the Supplier Agreement by May 26, 2020, award of the installation construction contract to Contractor and/or authorization to Supplier to begin equipment fabrication by December 3, 2020. Adjustments to Milestone dates shown below will be made by District if the above dates are delayed:
- a. Milestone 1: Submit all general arrangement shop drawings required in the Contract Documents: Within 30 days after Notice to Proceed.
 - b. Milestone 2: Obtain favorable review by the District of all shop drawings required in the Contract Documents. The District will finish its review and return comments within 15 days of receiving complete submittal and re-submittal packages from Supplier: Within 120 days after Notice to Proceed.
 - c. Milestone 3: Furnish equipment: Unless otherwise agreed or requested in writing by District, begin delivery of equipment to Orinda WTP, Lafayette WTP, and Walnut Creek WTP, or designated storage area within 50 miles no earlier than June 1, 2021 and complete delivery of equipment no later than December 1, 2021. Contractor shall be responsible for unloading equipment and providing proper storage at the Construction Project sites.
 - d. Milestone 4: Complete successful start-up testing, training, final O&M Manual submittal and Process Operational Period at Orinda WTP, Lafayette WTP and Walnut Creek WTP as specified in Technical Specifications: No later than March 1, 2022.
3. All time limits for completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

K. LIQUIDATED DAMAGES

1. Supplier and District recognize that time is of the essence of this Agreement and that District will suffer financial loss if the Work is not completed within the times specified in Section J - Milestones, plus any extensions thereof allowed in accordance with the General Conditions. The parties also recognize that it will be impracticable and extremely difficult to determine actual damages, which District will sustain in the event of or by reason of the delay.
2. Accordingly, instead of requiring any such proof, District and Supplier agree that as liquidated damages for delay (but not as a penalty). Supplier shall pay District liquidated damages, in the event such delays are attributable to Supplier's failure to perform any of its obligations, in accordance with the following schedule:

Contract Times	Description	Liquidated damages for each day that expires after the specified time in Section J - Milestones for completion until the Work listed under each deadline.
Milestone 0	Failure to Design, test, fabricate flow nozzle within the time frame specified in Section J – Milestones.	\$500 per day
Milestone 1	Failure to submit general arrangement Shop Drawings within the time frame specified in Section J – Milestones.	\$500 per day
Milestone 2	Failure to obtain favorable review by the District of all shop drawings required in the Contract Documents within the time frame specified in Section J – Milestones.	\$ 1,000 per day
Milestone 3	Failure to deliver the systems to the Locations specified within the time frame specified in Section J - Milestones.	\$2,000 per day
Milestone 4	Failure to successfully perform system start-up, training, Process Operational Period, and submittal of final O&M Manual within the time frame specified in Section J - Milestones.	\$1,000 per day

3. It is further agreed that the amount stipulated for liquidated damages per day of delay is a reasonable estimate of the damages that would be sustained by District, and Supplier agrees to pay such liquidated damages as herein provided. In case the liquidated damages are not paid, Supplier agrees that District may deduct the amount thereof from any money due or that may become due to Supplier by progress payments or otherwise under the Contract Documents, or if said amount is not sufficient, recover the total amount. Should the amount of the damages exceed the amount due the Supplier, the Supplier and its sureties shall be liable for the excess.
4. 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.
5. Liquidated damages cover only damages related to the cost of administration, overhead, and general delay, and 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 Contractors, Subcontractors or tenants), and defense cost thereof. The Supplier shall be fully responsible for the actual amount of any such damages it causes, in addition to the liquidated damages otherwise due the District.

L. BONDS

1. Each Bidder shall submit with its proposal a bid security for not less than 10 percent of the Bidder's Total Capital Bid Cost shown in the Bid Form in Exhibit A. The bid security shall be one of the following:
 - a. Certified Check or Cashier's Check - Check shall be made payable to the order of East Bay Municipal Utility District. The District will return checks, a) to unsuccessful bidders as soon as practicable after opening of the bids and b) to the successful bidders upon execution of contractual documents and bonds.
 - b. Surety Bond –The surety bond shall be properly executed by the Bidder and by a sufficient, admitted surety insurer (ie: as listed on website [http://interactive.web.insurance.ca.gov/webuser/idb_co_list\\$.startup](http://interactive.web.insurance.ca.gov/webuser/idb_co_list$.startup)) admitted to transact such business in California by the California Department of Insurance, using 00 43 13 – Bidder's Bond (Form E-103) contained in this Specification. The corporate seal of the surety company

must be affixed to the bond. The signature of the surety on the bond must be acknowledged before a Notary Public. The notarial acknowledgement and an executed power of attorney, indicating that the surety's representative is authorized to bind the surety, must accompany the bond. Any alteration of said form of bidder's bond, or imperfection in the execution thereof, as herein required, will render it informal and may, at the option of the District, result in the rejection of the proposal under which the bidder's bond is submitted. A Bidder submitting a bid bond may be required before the award of contract to furnish evidence that the persons signing such bond on behalf of the Bidder and the corporate surety are fully authorized to do so.

- c. The bid security shall be a guarantee that the Bidder, if awarded the contract, will execute the required contract and bonds as provided in these Instructions to Bidders within 15 days after such contract and bonds have been received by the Bidder or such additional time as may be allowed by the District. If the Bidder fails, is legally unable to, or refuses to execute the required contract and bonds within said time, the money and proceeds from bid security shall be applied toward payment of the damage to the District on account of the delay in the execution of the contract and bonds and the performance of the work thereunder, and the necessity of accepting a higher or less desirable proposal, resulting from such failure or refusal to execute the contract and bonds as required. The amount of bid security shall not constitute a limitation upon the right of the District to recover the full amount of such damage.
2. The successful bidder will be required to post and maintain the following bonds included in Exhibit G for 100 percent (100%) of the Total Capital Bid Cost in the Bid Form with the District. Bonds must be on District forms attached to this RFQ as **Exhibit G - Bond Forms**.
 - a. Payment bond
 - b. Faithful Performance bond
 - c. Warranty bond for equipment provided by the Supplier.
 3. Refer to Article 9 of the General Conditions for additional requirements.

M. COPY RIGHTS AND WORK PRODUCTS

All materials that the Supplier develops rendering Services hereunder, including any inventions or copyrightable work products, shall become the sole and exclusive property of the District without limitation at the time of their creation excluding any modification

and improvement to the Supplier's own proprietary intellectual property which shall remain the sole and exclusive property of the Supplier. Supplier shall deliver all such materials to the District at the completion, suspension, or termination of this agreement, unless otherwise directed by the District. Supplier agrees to execute all documents and to take all steps that the District deems necessary or desirable to protect the District's ownership of and property rights in these materials and hereby assigns all such rights to the District. Nothing in this agreement transfers any right, title, or interest in any proprietary, intellectual property of the Supplier to the District, or any other party.

The District shall have the right to copy or modify any manuals provided by Supplier under the Supplier Agreement in furtherance of the District's business needs. In the event Supplier's work includes manuals provided by third parties, Supplier shall obtain written permission from those third parties for the District to copy and modify those manuals in furtherance of the District's work.

N. INDEPENDENT CONTRACTOR

Supplier undertakes performance of the Services as an independent contractor and shall be wholly responsible for the means and methods of its performance.

O. NONDISCLOSURE OF CONFIDENTIAL INFORMATION

Supplier agrees to maintain in confidence and not disclose to any person or entity, without the District's prior written consent, any trade secret or confidential information, knowledge or data relating to the products, process, or operation of the District. Supplier further agrees to maintain in confidence and not to disclose to any person or entity, any data, information, technology, or material developed or obtained by Supplier during the term on the contract. The covenants contained in this Section shall survive the termination of this contract for whatever cause.

P. ASSIGNMENTS/SUBCONTRACTS

Supplier shall not assign or subcontract any rights or duties under this agreement without the prior written consent of the District. Any such purported assignment or subcontract without the District's prior written consent shall be null and void. Unless otherwise stated in the written consent to an assignment, no assignment will release or discharge the Supplier from any obligation under this agreement.

Q. THIRD PARTY RIGHTS

Nothing in this agreement shall be construed to give any rights or benefits to anyone other than the District or Supplier.

R. SUPPLIER'S REPRESENTATIONS

1. Supplier makes the following representations:
 - a. Supplier has examined and carefully studied the Contract Documents and the other related data identified in the Contract Documents.
 - b. If specified or if, in Supplier's judgment, any local condition may affect cost, progress or the furnishing of the Goods and Services, Supplier has become familiar with and is satisfied as to the local conditions that may affect cost, progress, or the furnishing of the Goods and Services.
 - c. Supplier is familiar with and is satisfied as to all local federal, state, and local Laws and Regulations that may affect cost, progress, and the furnishing of the Goods and Services.
 - d. Supplier has carefully studied and correlated the information known to Supplier, and information and observations obtained from Supplier's visits, if any, to the Construction Project sites, with the Contract Documents.
 - e. Supplier has given District written notice of all conflicts, errors, ambiguities, or discrepancies that Supplier has discovered in the Contract Documents, and the written resolution thereof by District is acceptable to Supplier.
 - f. The Contract Documents are sufficient to indicate and convey understanding of all terms and conditions for furnishing Goods and Services.
2. Supplier shall exercise that degree of skill and judgment commensurate with that, which is normally exercised by experienced suppliers specializing in providing goods and services comparable to those provided for in the Contract Documents. Supplier shall comply with all applicable federal, state, and local laws, rules, ordinances and regulations, including without limitation, applicable occupational safety and health acts and rules and regulations promulgated to implement such acts, in the performance of, and shall possess all required licenses to perform the work under this Supplier Agreement. Supplier shall re-perform, at no cost or expense to District, any work that is deficient because of Supplier's failure to perform such services in accordance with the standards set forth in this Supplier Agreement. Supplier shall correct any incomplete, inaccurate, or defective work at no additional cost or expense to District.
3. Supplier agrees to provide technically qualified personnel that meet the qualifications listed in the RFQ and who are employed full-time by Supplier.

District shall have the right to reject any or all personnel for immediate replacement at any time during performance if submitted qualifications are not representative of personnel's actual experience or abilities, at the sole discretion of District. District will notify Supplier prior to taking such action. Supplier shall notify District of any proposed change in key personnel (including without limitation Supplier's Project Manager) at least twenty-one (21) days before such change is made, and District shall have the right to review and reject as insufficient the qualifications of any such replacement personnel.

4. Drawings, reports and other documents pertaining to existing facilities or conditions that are provided by District or its representatives are provided for informational purposes only. District does not guarantee the accuracy of the information contained therein and Supplier shall be responsible for confirming all locations, measurements and other critical information. All drawings, reports and other documents, including manuals and other information, provided to District by Supplier shall be the property of District and District shall own the copyright and have the full right and authority to copy, distribute and use such documents in any manner and for any purpose District deems appropriate.
5. Supplier agrees that all information disclosed by District and identified in writing as proprietary shall be held in confidence and be used only in the performance of the Goods and Services. Supplier further agrees that, except as mandated by law, Supplier shall not, disclose to any person or entity, or use for its own benefit, any such information supplied to it by District; provided, however, that any information which is or becomes publicly known and made generally available through no wrongful act in violation of this Section shall not be considered proprietary.

S. CONTRACT DOCUMENTS

1. The Contract Documents consist of the following:
 - a. The Request for Quotation;
 - b. Certificates of Insurance;
 - c. General Conditions and Supplementary General Conditions;
 - d. Bonds;
 - e. Technical Specifications and Drawings;
 - f. Addenda;

- g. The following, which may be delivered or issued on or after the effective date of the agreement and are not attached hereto:
 - (1) Notice to Proceed;
 - (2) Written Amendments(s);
 - (3) Change Order(s);
 - (4) Field Order(s);
 - (5) Engineer's Written Interpretation(s);
 - (6) Final approved shop drawings.
- 2. The documents listed above are attached to this Supplier Agreement (except as expressly noted otherwise above).
- 3. The Contract Documents may only be amended, or supplemented as provided in Article 7 of the General Conditions.
- 4. In the event of any conflict between terms and conditions in the Supplier Agreement and terms and conditions elsewhere in the Contract Documents, the following order of precedence shall apply:
 - a. Change Orders
 - b. Contract Forms (Request for Quotation/Supplier Agreement)
 - c. Addenda
 - d. Supplier's Bid (Bid Form)
 - e. Supplementary General Conditions
 - f. General Conditions
 - g. Specifications (Division 01 – 49)
 - h. Drawings/Plans
 - i. Referenced Standard Specifications

T. SEVERABILITY

Should any part of the Contract Documents be declared by a final decision by a court or tribunal of competent jurisdiction to be unconstitutional, invalid or beyond the

authority of either party to enter into or carry out, such decision shall not affect the validity of the remainder of the Contract Documents, which shall continue in full force and effect, provided that the remainder of the Contract can be interpreted to give effect to the intentions of the parties.

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: Emily Sing, P.E.

EBMUD- Infrastructure Management

E-Mail: emily.sing@ebmud.com

PHONE: (510) 287-0655

CONTRACT EQUITY PROGRAM:

Attn: Contract Equity Office

PHONE: (510) 287-0114

AFTER AWARD:

Attn: Emily Sing, P.E.

EBMUD- Infrastructure Management

E-Mail: emily.sing@ebmud.com

PHONE: (510) 287-0655

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. RFQ responses submitted via electronic transmissions will not be accepted. Electronic transmissions include faxed RFQ responses or those sent by electronic mail (“e-mail”).

4. RFQ responses will be received only at the address shown below, must be SEALED, and must be received at the District Purchasing Division by 1:30 p.m. on the due date specified in the Calendar of Events. Any RFQ response received after that time or date, or at a place other than the stated address cannot be considered and will be returned to the bidder unopened.

All RFQ responses must be received and time stamped at the stated address by the time designated. The Purchasing Division's timestamp shall be considered the official timepiece for the purpose of establishing the actual receipt of RFQ responses.

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

Mailed:

Kelley Smith, Manager of Purchasing
East Bay Municipal Utility District
Carbonic Acid Dissolution, Feed, and pH Control System
RFQ No. 2014
EBMUD–Purchasing Division
P.O. Box 24055
Oakland, CA 94623

Hand Delivered or delivered by courier or package delivery service:

Kelley Smith, Manager of Purchasing
East Bay Municipal Utility District
Carbonic Acid Dissolution, Feed, and pH Control System
RFQ No. 2014
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. Bidders are to submit one (1) original hardcopy RFQ response (Exhibit A – RFQ Response Packet, including Contract Equity Program forms and all additional documentation stated in the “Required Documentation and Submittals” section of Exhibit A), all with original ink signatures.
7. Bidders shall also submit an electronic copy of their RFQ response, with their hardcopy RFQ response package. The file must be on a disk or USB flash drive and enclosed with the sealed original hardcopy of the RFQ response. The electronic copy should be in a single file (PDF) format, and shall be an exact scanned image of the original hard copy Exhibit A – RFQ Response Packet, Contract Equity

Program forms and all additional documentation stated in the “Required Documentation and Submittals” section of Exhibit A.

8. All costs required for the preparation and submission of an RFQ response shall be borne by the bidder.
9. 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.
10. 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.
11. The RFQ response shall remain open to acceptance and is irrevocable for a period of one hundred eighty (180) days, unless otherwise specified in the RFQ documents.
12. It is understood that the District reserves the right to reject any or all RFQ responses.
13. 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.

C. RESPONSE FORMAT

1. **Bidders shall not modify any part of Exhibits A, B, C, D, E, F or G or qualify their RFQ responses. Bidders shall not submit to the District a re-typed or otherwise re-created version of these documents or any other District-provided document.**

RFQ No. 2014

EXHIBIT A
RFQ RESPONSE PACKET



EXHIBIT A

RFQ RESPONSE PACKET

RFQ No. 2014 – Carbonic Acid Dissolution, Feed, and pH Control System

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, ONE COPY, AND ONE (1) ELECTRONIC COPY (in PDF format on a CD or flash drive) CONTAINING THE FOLLOWING, IN THEIR ENTIRETY:**
 - **EXHIBIT A – RFQ RESPONSE PACKET INCLUDING ALL REQUIRED DOCUMENTATION AS DESCRIBED IN “EXHIBIT A- REQUIRED DOCUMENTATION AND SUBMITTALS”**
- **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.**



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.

Addendum No.	Date

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: Suppliers 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.

*If no box is checked, it will be assumed that the bidder is ineligible for bid preference and none will be given. 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

Joint Venture

Limited Liability Partnership

Partnership

Limited Liability Corporation

Non-Profit / Church

Other: _____

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_____



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 supplier, 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 cost quoted below shall be the cost the District will pay for the term of any contract that is a result of this RFQ process.

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.

BID ITEM		LUMP SUM COST
Part A – Capital Bid Items for Pardee Chemical Plant		
1.	Equipment for Pardee Chemical Plant, exclusive of items listed below and taxes.	\$
2.	Witness Factory Tests	\$
3.	F.O.B. Freight (to Pardee Chemical Plant)	\$
4.	Supervision of Installation, Testing, Training, and Commissioning (at Pardee Chemical Plant)	\$
5.	Operation and Maintenance Manuals (for Pardee Chemical Plant)	\$
Part B – Capital Bid Items for Orinda, Lafayette, and Walnut Creek WTPs		
1.	Equipment for Orinda, Lafayette, and Walnut Creek WTPs, exclusive of items listed below and taxes.	\$
2.	Witness Factory Tests (Orinda, Lafayette, and Walnut Creek WTPs)	\$
3.	F.O.B. Freight (to Orinda, Lafayette, and Walnut Creek WTPs)	\$
4.	Supervision of Installation, Testing, Training, and Commissioning (at Orinda, Lafayette, and Walnut Creek WTPs)	\$
5.	Operation and Maintenance Manuals (Orinda, Lafayette, and Walnut Creek WTPs)	\$
Part A	Total Capital Bid Cost (Items 1-5)	\$
Part B	Total Capital Bid Cost (Items 1-5)	\$
Total Price	Sum of Part A and Part B	\$



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.

1. **Description of the Proposed Equipment/System:** RFQ response shall include a description of the proposed equipment/system, as it will be finally configured. The description shall include diagrams, data sheets, approximate equipment dimensions, and shall specify how the proposed equipment/system will meet or exceed the requirements of the Contract Documents. The description shall include additional data needed to support any proposed exceptions, clarifications and amendments. The description shall indicate location of manufacture and local contact for O&M support.
2. **Bid Security:** Bidders shall provide a Bid Security as specified in Section III.L of the RFQ.
3. **References:** Bidders shall submit a minimum of 5 references demonstrating compliance with Section 1.B.1a of this RFQ.
 - (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.
4. **Project Manager, Startup and Training Personnel Resumes:** Bidders shall provide the resumes of their Project Manager, start-up, and training personnel who will be assigned to this Project demonstrating the experience necessary to meet the minimum qualifications described in Section I.B.b and Section I.B.c of the RFQ.
5. **Sustainability Statement:** Suppliers 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>

6. **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.**

7. **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.

8. **Iran Contracting Act Certification:** Every bidder must fill out, sign and submit the "Iran Contracting Act Certification" form provided in Exhibit F.



REFERENCES

RFQ No. 2014 – Carbonic Acid Dissolution, Feed, and pH Control System

Bidder Name: _____

Bidder must provide a minimum of Five (5) references.

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

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

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

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

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



EXCEPTIONS, CLARIFICATIONS, AMENDMENTS

RFQ No. 2014 - Carbonic Acid Dissolution, Feed, and pH Control System

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 (suppliers) 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 be found at the following direct link:

[Contract Equity Guidelines and 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.

RFQ No. 2014

**EXHIBIT B
INSURANCE REQUIREMENTS**



EXHIBIT B

INSURANCE REQUIREMENTS

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 award.

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 and must be before the date of this Agreement, and before the beginning of any Services related to this Agreement.

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 Supplier.

The following are the minimum insurance limits, required by the District, to be held by the Supplier performing on this RFQ:

INSURANCE

A. Insurance Requirements

Supplier shall take out and maintain during the life of the Agreement all the insurance required in this section, and if requested shall submit certificates for review and approval by the District. The Notice to Proceed shall not be issued, and Supplier shall not commence work until such insurance has been approved by the District. The certificates shall be on forms approved by the District (refer to Exhibit B of the RFQ). Acceptance of the certificates shall not relieve Supplier of any of the insurance requirements, nor decrease the liability of Supplier. The District reserves the right to require Supplier to provide insurance policies for review by the District.

B. Workers Compensation Insurance

Supplier shall take out and maintain during the life of the Agreement Workers Compensation Insurance for all of its employees on the Project. In lieu of evidence of Workers Compensation Insurance, the District will accept a Self-Insured Certificate from the State of California. Supplier shall require any subcontractor to provide it with evidence of Workers Compensation Insurance.

Waiver of Subrogation. Workers' Compensation insurance must contain a waiver of subrogation endorsement providing that each insurer waives any rights of recovery by subrogation, or otherwise, against the DISTRICT, its directors, officers, officials, agents, volunteers, and employees. Supplier shall defend and pay any damages as a result of failure to provide the waiver of subrogation from the insurance carrier.

C. Commercial General Liability and Automobile Liability Insurance

Supplier shall take out and maintain during the life of the Agreement Automobile and General Liability Insurance, and Excess Liability Insurance that provides protection from claims which may arise from operations or performance under this Agreement. If Supplier elects to self-insure (self-fund) any liability exposure during the contract period above \$50,000, Supplier is required to notify the District immediately. Any request to self-insure must first be approved by the District before the changed terms are accepted. Supplier shall require any subcontractor to provide evidence of liability insurance coverages.

D. Professional Liability Insurance

Supplier shall take out and maintain during the life of the Agreement, professional liability insurance (Errors and Omissions) the required liability coverage. A deductible may be acceptable upon approval of the DISTRICT. The policy shall provide 30 days advance written notice to DISTRICT for cancellation or reduction in coverage.

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, CONSULTANT must purchase an extended period of coverage for a minimum of three (3) years after completion of the Services.

The amounts of insurance shall be not less than the following:

- \$2,000,000/Occurrence, Bodily Injury, Property Damage -- Automobile.
- \$2,000,000/Occurrence, Bodily Injury, Property Damage -- General Liability.
- \$2,000,000/Occurrence, Professional Liability.
- \$4,000,000 for Excess Liability Policy

The following coverages or endorsements must be included in the policy(ies):

1. The District, its Directors, officers, and employees are Additional Insureds in the policy(ies) as to the work being performed under the contract.
2. The coverage is *Primary and non-contributory* to any other applicable insurance carried by the District.

3. The policy(ies) covers *contractual liability*.
4. The policy(ies) is written on an *occurrence* basis.
5. The policy(ies) covers the District's Property in Consultant's care, custody, and control.
6. The policy(ies) covers *personal injury* (libel, slander, and wrongful entry and eviction) liability.
7. The policy(ies) covers *products and completed operations*.
8. The policy(ies) covers the use of *owned, non-owned* and hired automobiles.
9. The policy(ies) will not be canceled nor the above coverages/endorsements reduced without 30 days written notice to East Bay Municipal Utility District at the address above.

RFQ No. 2014

**EXHIBIT C
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,

- e) 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 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.
- .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;

- e) 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 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.

5.2 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.

5.3 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.

5.4 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 15th of the previous month to the 15th 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 not withstanding 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

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**EXHIBIT D
SUPPLEMENTARY GENERAL CONDITIONS**

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**:

Delete Item **.9**, and replace with: “**.9 Contract Sum**: The contract price as stated in the Supplier Agreement bid form.”

Delete Item **.11** and replace with: “**.11 Contractor**: The individual, partnership, joint venture, or corporation with whom the Supplier Agreement is made by the District. The term Contractor in these General Conditions is synonymous with the term Supplier.”

Add the following sentence at the end of Item **.27**: “In these General Conditions the term Superintendent shall be synonymous with the term Project Manager.”

Delete Items **.28** and **.31**.

2. In Article **1.3**:

Delete Article **1.3.2** and replace with: “**1.3.2** The Contract Documents are as stated in Section III.S.1 of the Supplier Agreement.”

In Article **1.3.3**, delete Item **.1** and replace with: “**.1** In the case of conflicts, errors, or discrepancies in any of the Contract Documents, the order of precedence shall be as stated in Section III.S.4 of the Supplier Agreement. Within the same order of precedence, specific requirements shall take precedence over general requirements.

Delete Article **1.3.5** and replace with: “**1.3.5** Command type sentences used in the Contract Documents refer to and are directed to the Supplier.”

3. In Article **3.2**, delete Articles **3.2.1** through **3.2.4** and replace with: “**3.2.1** Provisions for the inspection of work and non-conforming work are set forth in Sections I.E and I.F of the Supplier Agreement.”

4. In Article **3.4**.

Delete the second sentence of Article **3.4.2.3** and replace with: “**3.4.2.3** The analysis of schedule impacts shall contain a written narrative and a schedule diagram depicting how the alleged changed Work affects other schedule activities and an analysis of the potential mitigation efforts.”

Replace Articles **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 online document system (known as “EADOC”) 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 EADOC 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.”
5. In Article **4.2**, delete Article **4.2.1** and replace with: “**4.2.1 Superintendent.** The Supplier 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 Supplier, Subcontractors, and their respective agents and employees to ensure that the Work is being carried out in accordance with the Contract Documents. The Supplier shall designate, in writing, the name, scope, and authority of the superintendent before the Work begins. Instructions and information given by the District to the Supplier’s superintendent about the Work are binding on the superintendent. Failure of the Supplier to have a designated superintendent at the project site as required by this paragraph shall constitute a material breach of the Supplier Agreement, and shall further constitute grounds for suspension of all work until the Supplier has fully complied with the requirements of this paragraph. Any such suspension shall be considered an inexcusable delay by the Supplier, and may serve as grounds for termination for default at the election of the District.”
 6. Delete Article **4.3**, Contractor’s Employees.
 7. Delete Article **5.2**.
 8. Delete Article **6.2**, Public Safety.
 9. Delete Article **6.3**, Engineer’s Responsibility.
 10. Delete Article **6.4**, Emergency Work.
 11. Delete Article **7.7**, Differing or Unusual Site Conditions
 12. In Article **8.2**, delete Article **8.2** and replace with: “**8.2 Liquidated Damages.** Liquidated damages shall be as stated in Section III.K of the Supplier Agreement.”
 13. Delete Article **8.3**, Use of Facilities Prior to Completion of Contract.
 14. In Article **8.5**, delete Article **8.5.1**.
 15. In Article **9.1**, delete Article **9.1.3** and replace with: “**9.1.3** The Payment Bond and the Faithful Performance Bond shall be on the forms of the District as provided in Exhibit D of the Supplier Agreement and shall be properly executed as described therein.”

16. In Article **10**, Warranty, delete Articles **10.1** through **10.8** and replace with “**10.1** The warranty shall be as stated in Section III.H of the Supplier Agreement.”

17. 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

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**EXHIBIT E
ASSIGNMENT ASSUMPTION AND CONSENT
AGREEMENT**

ASSIGNMENT AND ASSUMPTION AGREEMENT

Equipment Pre-purchase Contract for Procurement of [name of purchased items]

This Assignment and Assumption Agreement (the "Assignment and Assumption Agreement") is entered into as of [date] by and between the East Bay Municipal Utility District ("Assignor") and [name of Contractor] ("Assignee"). All terms used, but not defined, herein shall have the meanings ascribed to them in the Underlying Agreement (defined below).

WHEREAS, Assignor and Assignee are parties to the [name and specification number of Construction Contract], (the "Construction Agreement"); and

WHEREAS, Assignor and [name of Supplier] ("Supplier"), are parties to the Equipment Pre-purchase Contract for Procurement of [name of purchased items], a complete copy of which (including all exhibits, amendments and modifications thereto) is attached hereto and incorporated herein by this reference (the "Underlying Agreement");

WHEREAS, Assignor has agreed to assign to Assignee all of its rights and obligations under the Underlying Agreement; and

WHEREAS, Assignee has agreed to assume all of Assignor's rights and obligations under the Underlying Agreement; and

WHEREAS, Supplier consents to the assignment of the Underlying Agreement to Assignee; and

WHEREAS, Assignee's Surety for Assignee's Payment and Performance Bonds for the Construction Agreement ("Surety") consents to the assignment of the Underlying Agreement to Assignee;

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. Assignment. Assignor hereby assigns to Assignee all of Assignor's rights and obligations under the Underlying Agreement.
2. Assumption. Assignee hereby accepts the foregoing assignment and assumes all of the rights and obligations of Assignor under the Underlying Agreement.
3. Effective Date. The date on which the assignment and assumption of rights and obligations under the Underlying Agreement is effective is _____.
4. Successors. All future transfers and assignments of the Underlying Agreement transferred and assigned hereby are subject to the transfer and assignment

provisions of the Underlying Agreement. This Assignment and Assumption Agreement shall inure to the benefit of, and be binding upon, the permitted successors and assigns of the parties hereto.

5. This Assignment and Assumption Agreement and all matters relating to it shall be governed by the laws of the State of California.
6. Counterparts. This Assignment and Assumption Agreement may be executed in counterparts, each of which shall be an original, but all of which together constitute one and the same instrument.

IN WITNESS WHEREOF, the parties hereto have duly executed this Assignment and Assumption Agreement as of the date first set forth above.

ASSIGNMENT DIRECTED BY (Assignor):

East Bay Municipal Utility District (Print name)

By: _____
(Signature) (Title)

APPROVED AS TO FORM:

_____, 20____

By: _____
Counsel of the District

ASSIGNMENT CONSENTED TO BY (Supplier):

[Supplier Name] (Print name)

By: _____
(Signature) (Title)

ASSIGNMENT ACCEPTED BY (Assignee):

[Contractor Name] (Print name)

By: _____
(Signature) (Title)

SURETY'S
AGREEMENT TO ASSIGNMENT

Equipment Pre-purchase Contract for Procurement of [name of purchased items]

Surety hereby acknowledges and agrees that the Equipment Pre-purchase Contract for the procurement of [name of item(s) purchased] by and between [name of Supplier] and the East Bay Municipal Utility District ("District") shall be assigned, transferred, and set over to [name of Contractor], the Contractor in accordance with Specification [number and name].

Surety further agrees that, upon assignment of the Equipment Pre-purchase Contract, the Contractor shall have all the rights previously conferred upon the District under the Pre-purchase Contract Performance Bond.

(Corporate Seal)

SURETY

Company:

Signature:

Name/Title:

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EXHIBIT F
IRAN CONTRACTING ACT CERTIFICATION



EXHIBIT F 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 proposer/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.*

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**EXHIBIT G
BONDFORMS**



BIDDER'S BOND

KNOW ALL PERSONS BY THESE PRESENTS:

That _____

as Principal (name and California address where service may be effected), and _____

as Surety (name and California address where service may be effected), are held and firmly bound unto the EAST BAY MUNICIPAL UTILITY DISTRICT, hereinafter called the District, in the sum equal to Ten Per Cent of the Total Amount of the Bid submitted by the Principal to the District under the Specifications accompanying this bond and which are incorporated by reference herein, or One Thousand Dollars (\$1,000), whichever is greater, for the payment of which sum in lawful money of the United States of America to the District we 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 Principal has submitted said bid to the District;

NOW, THEREFORE, if the Principal is awarded a contract by the District and, within the time and in the manner required by said Specifications, enters into a written contract with the District and furnishes the requisite bond or bonds, then this obligation shall become null and void, otherwise to remain in full force and effect.

In the event suit is brought upon this bond by the District and judgment is recovered, the Surety shall pay all costs incurred by the District in such suit, including a reasonable attorney's fee to be fixed by the Court.

DATE: _____

Principal

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.

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.



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.

RFQ No. 2014

EXHIBIT H
TECHNICAL DRAWINGS AND SPECIFICATIONS

RFQ No. 2014 Specifications

Table of Contents

Number	Title
01 31.23.10	Web-based Construction Document Management
01 33 00	Submittal Procedures
01 45 27	Shop Inspection
01 61 01	Electrical Requirements for Mechanical Package Systems
01 75 17	Field Testing and Startup
01 79 00	Demonstration and Training
01 81 02	Seismic Design Criteria
05 05 26	Flange Bolting
26 29 23	Low Voltage Variable Frequency Drives
40 41 13.13	Process Piping Electrical Electrical Resistance Heat Tracing
40 95 13	Process Control Panels and Hardware
41 35 60	Carbon Dioxide Feed System

SECTION 01 31 23.10

WEB-BASED CONSTRUCTION DOCUMENT MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. The Supplier, and its subSupplier shall utilize EADOC (EADOC is a registered trademark of Bentley Systems, Inc.) 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. EADOC is a web-based construction management software hosted by Bentley Systems, Inc.
2. EADOC is paid for by the District.
3. EADOC will be made available to all Supplier's personnel, subsupplier 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. EADOC 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 Supplier's access to EADOC by allowing access and assigning user profiles to accepted Supplier 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 EADOC. Subsuppliers and suppliers will be given access to EADOC by and through the Supplier. Entry of information exchanged and transferred between the Supplier and its subsuppliers and suppliers on EADOC shall be the responsibility of the Supplier.

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 EADOC system) by the Engineer and the Supplier will be jointly owned.

1.4 AUTOMATED SYSTEM NOTIFICATION AND AUDIT LOG TRACKING

- A. Review comments made (or lack thereof) by the District on Supplier-submitted documentation shall not relieve the Supplier from compliance with requirements of the Contract Documents. The Supplier 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 Supplier's 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, Supplier shall submit:
 - 1. List of Supplier's personnel responsible for EADOC administration, as well as that for the Supplier's subsuppliers and suppliers
 - 2. Include descriptions of key personnel's roles and responsibilities for this project. Supplier shall also identify its organization's administrator on the list.

1.6 COMPUTER REQUIREMENTS

- A. The Supplier shall use PC based computer hardware and software that meets the requirements of EADOC system as recommended by Bentley Systems, Inc. and as described herein to access and utilize EADOC. As recommendations are modified by EADOC, the Supplier shall upgrade its system(s) to meet or exceed the recommendations. Upgrading of the Supplier's computer systems shall not be justification for a cost or time modification to the Contract.
- B. The Supplier shall ensure that connectivity to the EADOC system 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. EADOC currently supports the current and prior two versions of Chrome, Firefox, Internet Explorer and Safari.
- D. The Supplier shall use applications compatible with Adobe Acrobat Professional Version 7.0 or later to create Portable Document Format (PDF) files.

1.7 SUPPLIER RESPONSIBILITY

- A. Supplier shall be responsible for scanning or otherwise converting to electronic format all project submittals and Supplier correspondence, drawings, sketches, etc., and uploading them to the EADOC web site.
- B. The Supplier shall be responsible for the validity of its information placed in EADOC.
- 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 Supplier shall utilize the existing forms in EADOC to the maximum extent possible. If a required form does not exist in EADOC, the Supplier 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 EADOC 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 Supplier shall provide a “bookmark” for each section. The Supplier is responsible for the training of its personnel in the use of EADOC (outside what is provided by the District) and the other programs indicated above as needed. The Supplier 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 Supplier’s key EADOC personnel for the Engineer’s acceptance. Supplier is responsible for informing the Engineer of additional personnel, subSuppliers and suppliers to be added to the system, or of personnel, subSuppliers 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. EADOC is a web-based environment and therefore, subject to the inherent speed and connectivity limitations of the Internet. The Supplier is responsible for its own connectivity to the Internet. EADOC response time is dependent on the Supplier’s 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 EADOC including, but not limited to: slow response time, down time periods, connectivity problems, or loss of information. The Supplier shall ensure connectivity to the EADOC system (whether at the home office or job site). Under no circumstances will usage of EADOC be grounds for a time extension or cost adjustment to the Contract.

1.9 TRAINING

- A. Bentley Systems, Inc. will provide training consisting of a 2-hour web-based seminar in conjunction with a conference call. The seminar will accommodate multiple participants. Supplier shall determine how many seminars it requires.
- B. Supplier shall arrange and pay for the facilities and hardware/software required to facilitate the Supplier's own training.
- C. Supplier shall be responsible for purchasing training from Bentley Systems, Inc. for its personnel and its subSuppliers' personnel.
- D. Allow \$600.00 for each 2-hour web based seminar.

PART 2 - PRODUCTS

2.1 DESCRIPTION

- 1. EADOC project management application (no substitutions) provided by Bentley Systems, Inc.

PART 3 - EXECUTION

3.1 EADOC UTILIZATION

- A. EADOC 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 MicroStation or AutoCAD format files and PDF attachments to the EADOC submittal work flow 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 Supplier
 - 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 EADOC submittal work flow 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, Supplier shall enter submittal data information into EADOC 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 EADOC. Examples include, but are not limited to:
 - a) Requests for Information (RFI)
 - b) SupplierPlant Inspection Requests
 - c) Requests for Meetings
- e. Compliance Submittals
 - 1) Test reports, certificates, and manufacture field report submittals shall be submitted on EADOC 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 on EADOC 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 EADOC). 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.

SUPPLIERSUPPLIERSUPPLIEREND 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 approval 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.
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.
7. Section 01 31 23.10 – Web-based Construction Document Management
8. Section 01 61 00 – Common Product Requirements

1.2 PRODUCT HANDLING

- A. Submittals shall be accompanied by a letter of transmittal and shall be in strict accordance with the provisions of this section.
- B. Compact disks or DVDs shall be packaged in a hard plastic case. The case and media shall be labeled as to content.
- C. Submit priority of processing when appropriate.
- D. 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.
- E. Proposals for “or equal” substitutions made prior to bid opening, pursuant to PCC Section 3400 (see Instructions To Bidders, Article 3), shall be delivered after coordinating the delivery with the District. Supplier shall coordinate with the District’s Purchasing Division at the following telephone numbers: (510) 287-0355, (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 Supplier, 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 Supplier 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 Supplier shall, at his own expense, reconstruct all work affected by the later rejection of a contract deviation that was not specifically called and explained for review and acceptance by the District as detailed above.

PART 2 - PRODUCTS

2.1 SCHEDULE OF SUBMITTALS

- A. Schedule of Submittals shall be in the form of a submittal log similar to that shown in Appendix A.
 - 1. Schedules of Submittals shall be submitted to District within 10 days after Notice to Proceed.
- B. Complete columns (a) through (e) showing all submittals required by the specifications.
 - 1. Dates in column (e) shall be coordinated with the construction progress schedule to ensure sufficient time is allowed for processing of submittals and procurement of material prior to start of a construction activity.
- C. A Schedule of Submittals is not required for proposals for “or equal” substitutions made prior to bid opening pursuant to PCC Section 3400 (see Instructions To Bidders, Article 3).

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.

2.4 MANUFACTURERS' LITERATURE

- A. Where contents of submitted literature from manufacturers includes 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 Supplier-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, Supplier 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 Supplier 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 Supplier 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 Supplier shall, at his 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. Supplier shall provide complete and separate O&M Manuals per site. Supplier shall not combine multiple site O&M Manuals and O&M Manual Review Checklist.
- 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 approved. 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 per site (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 Supplier along with comments identifying necessary corrections or additions to the manuals. The District reserves the right to keep possession all of the O&M manuals, and have the Supplier 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 for each site:
 - a. The manuals shall not be considered final until the submittal has received an "Approved" review status. Provide the number of identical manuals shown in Table 1 after approval. All manuals listed in the table below shall be combined into one manual.

Table 1: O&M Manual Summary		Number of Hard Copies Desired, per site
Section	System / Equipment, or Facility	
41 35 60	Motors	5
	Variable Frequency Drives	5
	Pumps	5
	Control Panels	5
	Flow Meters	5
	Carbon Dioxide Feed and pH Control System	5

K. Electronic Files:

1. After the District has approved each O&M Manual, two copies of 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 2013. The security features 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 supplied to the Engineer on CD +/-R 700 MB CD or DVD +/-R4.7 GB DVD if the file is larger than 700 MB along with the approved O&M manuals.

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 must be in accordance with the supplied form. The Maintenance Summary Forms will be provided in electronic format (MS Word) upon request.

2.7 AS-BUILT DRAWINGS

A. Marked-up as-built drawings:

1. The Supplier shall record dimensions and changes during fabrication and construction.
 - a. Red pencil shall be used to indicate additions and/or modifications to the drawings.
 - b. Green pencil shall be used to indicate deletions to the drawings.
 - c. Yellow highlighter or yellow pencil shall be used to indicate portions of the drawing that have been field verified to confirm portions installed as designed and to show construction progress.
 - d. All marks on drawings shall be dark and legible. Text shall be legibly printed in block style letters
 - e. Only symbols and abbreviations shown on District Standard Drawings included in the contract reference drawings shall be used. Where no District symbol or abbreviation is available, industry association standards such as ISA, IEEE, ANSI, etc. shall be applicable.

B. Record as-built shop and vendor drawings shall be created as described below:

1. Submit record as-built shop and vendor drawings to document any and all design work developed for this project by the Supplier, subSuppliers, equipment manufacturer's, vendors, or suppliers.
2. Create record as-built shop drawings utilizing MicroStation or AutoCAD software. Drawings shall be sized 22-inch by 34-inch. Other drawing sizes are

not acceptable. Manually drafted shop drawings in pencil or ink are not acceptable.

- a. Provide one set of record as-built shop drawings in addition to the number and type of shop drawings specified in Article "SUBMITTAL QUANTITIES" below. Drawings shall be sized 22-inch by 34-inch on vellum.
- b. Record as-built shop drawings shall also be submitted on EADOC in:
 - 1) MicroStation or AutoCAD format and
 - 2) Searchable PDF (compatible with Adobe Acrobat version XI or later).
3. Text size used on drawings shall have a minimum height of 1/10 inch, if computer generated or typed, and 1/8" if printed by hand.
4. Drawings shall contain a 2-1/2" wide by 3/4" high blank box for the District's use, which shall be placed directly against the margin at the bottom right corner of the drawing.
5. Drawings shall also contain the manufacturer's title block at the bottom right side in a boxed area with a maximum size of 8" wide by 4" high. The manufacturer's title block shall contain the manufacturer's name, address, and telephone number, the name of the project as it appears on the cover of the project specifications, the District specification number, a descriptive title for the drawing, the date the drawing was approved, the total number of drawings included in the set of drawings, and the manufacturer's drawing number.

C. As-Built Log

1. The Supplier shall develop and maintain a spreadsheet or database type log recording all construction correspondence documents that identify modifications to the as-built drawings. The construction correspondence documents shall include RFIs, clarifications, change orders, field directives, submittals, letters, and any other construction correspondence that identifies modifications to the as-built drawings. At a minimum, the as-built log shall contain separate fields for the following information:
 - a. Log Number: sequential integer numbering system
 - b. Correspondence type (e.g. RFI, change order, letter, etc.)
 - c. Correspondence number (if available)
 - d. Title correspondence (if available)
 - e. Correspondence date

- f. Contract drawing referenced in correspondence
 2. Each as-built log entry (row) shall contain only one as-built drawing reference. For instance, if the response to a change order results in modifications to three as-built drawings, then three separate as-built log entries are required, one for each as-built drawing referenced in the change order. (Similarly, if 3 change orders affect a specific drawing, then three separate as-built log entries are required).
 3. Provide an electronic file in Microsoft Excel format of the complete up-to-date as-built log at any time upon request from the Engineer.
- D. Schedule for submitting Record As-Built Drawings.
1. One final marked-up set of contract and shop drawings shall be submitted within 30 days after Ready for Integration Programming as a prerequisite for establishing that the facility is ready for service.
 2. Final electronic files and one (1) complete full-size hardcopy print shall be submitted at least 30 days prior to the beginning of the Startup Test. This submittal shall include all record as-built contract drawings and record as-built shop drawings. If there is not a Startup Test, the final electronic files and one (1) complete full-size hardcopy print on vellum shall be turned over to the Engineer upon Contract Completion.
 3. Marked-up contract drawings or record as-built contract drawings refers to those drawings originally included in the bid documents, as modified by the Supplier (via hand-markup and electronic update, respectively) to reflect as-built conditions.

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 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).
- C. 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, 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. Results shall be clearly identified. Summary tables shall be used for large amounts of data (especially if a software application is used).
 7. Final design details, ready for transmittal to design drawings or shop drawings.
 8. Professional Engineer's Seal or signature, as appropriate, of the individual(s) who prepared the calculations/reports.
 9. 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.
- D. 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.
- E. 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 SUBMITTAL QUANTITIES

- A. Submit four (4) copies of all data and drawings 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 on EADOC.
- C. Submit three (3) of each sample, unless specified otherwise.
- D. Submit five (5) copies of each manual unless specified otherwise.
- E. Submit quantity specified of materials submitted to the EBMUD Materials Testing Laboratory.

2.10 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 Supplier 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 (noted as Approved, Accepted, Approved as 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. As-built processing, per Article 2.7
 - 3. 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 Supplier 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 on EADOC or in the following manner, if required by the Engineer:

1. For files 10 MB or less, one copy via email, with the subject line matching the file name.
2. For files more than 10 MB but not larger than 700 MB, provide three copies on CD +/-R 700 MB CD.
3. For files larger than 700MB, provide three copies on DVD +/-4.7 GB DVD.

2.11 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 RFQ number
 2. *Date of submittal
 3. *"To: Design Division, MS #502
East Bay Municipal Utility District
P.O. Box 24055
Oakland, CA 94623-1055
ATTN: Office Engineer”

Or

If and only if, this submittal is a proposal for “or equal” substitutions made prior to bid opening pursuant to PCC Section 3400 (see Instructions To

Bidders, Article 3), use the following address (envelope shall be marked:
"Submittal Request for Substitution, RFQ No. 2014 "):

"To: Purchasing Division, Contract Supervisor, MS #102
East Bay Municipal Utility District
P.O. Box 24055
Oakland, CA 94623-1055

4. *"From:" Name and address of Supplier
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 Specification Number __, is in compliance with the Contract drawings and specifications, can be installed in the allocated spaces, and is submitted for District (record/approval).

Certified by _____ Date _____ "

3.2 SCHEDULE OF SUBMITTALS

- A. Submit initial Schedule of Submittals within 15 days after Notice to Proceed.
- B. Submit revised Schedule of Submittals within 15 days after date of request from the Engineer. Engineer will review Schedule of Submittals and will notify Supplier that schedule is acceptable or not acceptable within 10 days after receipt.
- C. The Schedule of Submittals shall identify Supplier "or equal" substitution proposals made prior to bid opening (see Instructions To Bidders, Article 3), which have been accepted by the Engineer.

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. Coordinate as required with all trades and with all public agencies involved.
 - c. Secure all necessary approvals from agencies having jurisdiction and signify with agency stamp, or other means, that approvals have been secured.
 - d. 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 Supplier 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 Supplier'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 will be returned to the Supplier without review. The Supplier 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 (see Instructions to Bidders, Article 3).
- 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, plus the transit time to and from the District office.
 - 3.
 4. Timing of the submittal of As-Built drawings shall conform to Article 2.7.

3.5 APPROVAL BY ENGINEER

- A. Approval 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 Supplier 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. One copy of each submittal, except manuals and as-built drawings, will be returned to the Supplier marked "Approved", "Approved as Noted", "Revise and Resubmit", or "Acknowledged Receipt", except that in some cases, all copies of a submittal may

be returned to the Supplier marked "Returned without Review". See paragraph 3.5.E. for proposals for "or equal" substitutions made prior to bid opening pursuant to PCC Section 3400 (see Instructions To Bidders, Article 3).

1. "Approved" 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. "Approved as 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 Supplier 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. Supplier shall prepare a new submittal for this item.
- C. Resubmit revised drawings or data as indicated, in seven (7) copies unless otherwise specified.
- D. Work requiring the Engineer's approval shall not begin until the submittals for that work have been returned as "Approved" or "Approved as Noted".
- E. Proposals for "or equal" substitutions made prior to bid opening pursuant to PCC Section 3400 (see Instructions To Bidders, Article 3) will be evaluated by the Engineer, and if accepted, bidders will be notified by addenda.

3.6 CHANGES TO APPROVED SUBMITTALS

- A. A resubmittal is required for any proposed change to a submittal that has been "Approved" or "Approved as 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 approved submittal may be accomplished by submitting a "Corrected Copy".

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.
2. Provide notification to the District's Plant Inspection Section and Engineer 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. Supplier shall ensure that there shall be adequate lighting, ventilation, and safety procedures in place to permit safe and thorough inspection at all times.

C. All inspection and measurement tools and equipment employed by Supplier 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 Supplier that such tools and equipment are properly calibrated and in an operable condition.

D. Supplier shall identify in writing the person responsible for the receipt and coordination of all Inspector communications. A representative from the Supplier

responsible for Quality Control shall be present and available to the Engineer at all times during the course of inspections.

- E. Supplier shall respond promptly to address and correct all fabrication and inspection processes to comply with the Contract Documents. Corrective measures undertaken by the 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 Supplier 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 Project Manager to schedule all shop inspections and testing. 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 Supplier 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 Supplier.
- 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 Supplier '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 Supplier shall include in the bid price all travel expenses for the Engineers 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 \$61 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 Supplier -requested changes to the inspection schedule after the initial notification shall be borne by the Supplier.

1.4 WITNESS SCHEDULE

- A. Equipment fabrication and testing for Orinda WTP, Lafayette WTP and Walnut Creek WTP, and Pardee Chemical Plant shall be completed within two separate time periods.
- B. One representative from the District's Plant Inspection Group will witness and approve the following processes as specified in the applicable specification sections listed below or as required elsewhere in the Section 41 35 60. Anticipate that one inspector will cover only one 8-hour of shop inspection work.

Spec. Section	Section Title and Description
05 05 24	Shop Welding
41 35 60 – 2.4.G	Coatings
41 35 60 – 3.1.D	Hydrostatic Testing

- C. Two representatives from the District will witness the following Factory Acceptance Tests over three shop visits for Pardee and two for the water treatment plants (5 shop visits total). Anticipate that one inspector will cover only one 8-hour of shop inspection work.

Site	Visit	Spec. Section	Factory Inspection and Testing	No. of Engineers
Pardee	1	41 35 60 – 3.1.E	Injection nozzle performance test	2
	2	41 35 60 – 3.1.D	Hydrostatic and Mechanical & Instrumentation Factory Acceptance Test	2

	3	41 35 60 – 3.1.D	Electrical & Controls Factory Acceptance Test	2
Water Treatment Plants	1	41 35 60 – 3.1.D	Hydrostatic and Mechanical & Instrumentation Factory Acceptance Test	2
	2	41 35 60 – 3.1.D	Electrical & Controls Factory Acceptance Test	2

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 and install the electrical control panels and instrumentation devices furnished as 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 the packaged process, and mechanical systems furnished under the detailed technical Sections of 41 35 60 – Carbonic Acid Dissolution, Feed, and pH Control Systems.
2. All electrical work performed under this Section shall conform to the electrical system requirements as specified under Section 41 35 60.
3. 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.
- B. All work shall conform to the requirements of the National Electrical Code (NFPA 70) as required, Common Work Results for Electrical.

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 Material.
 - 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. Submittal shall include copies of the final field verified shop drawings. Submit hardcopies and electronic copies on CD-ROM 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 Section 01 81 02 Seismic Design Criteria.

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. Supplier 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 25 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. 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 XHHW-2 stranded, insulated and rated for 600 volts unless specified otherwise. Wire color shall be line power - black; neutral or common - white; ac control - red; dc control - blue; equipment or chassis ground - green; specified externally powered circuits - yellow. 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 Contrologix family of processors, no substitutions, to match existing District equipment. PLCs shall conform to the requirements of Section 41 35 60.
- 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 thermal magnetic circuit breaker for 480 volt, 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.

3.2 INSTALLATION

- A. Install in conformance with manufacturer's requirements and as specified under Section 41 35 60.

3.3 FIELD QUALITY CONTROL

- A. Supplier's 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 41 35 60 and 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 field testing, and startup of installed equipment and systems, as well as other Supplier services.
- B. All field testing shall comply with the requirements of this section. Additional field testing requirements are specified in other sections.
- C. For factory testing and other testing requirements, see technical sections.
- D. District Furnished Services: The District will furnish non-potable water at Pardee and potable water at the water treatment plants, required for testing unless otherwise specified.
- E. This document only pertains to services and materials provided by the Supplier.

1.2 DEFINITIONS

- A. Commissioning: The process of testing the installation for compliance with contract requirements and demonstrating, through documented verification, that the project has successfully met the contractual requirements and the Project is ready for Operational Start-up.
- B. Factory Acceptance Testing (FAT): Quality control testing conducted at the Supplier'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 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 Supplier's assistance. The Supplier 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. Supplier'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 at the end of this specification.
- 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.
- 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 FIELD TESTING INSTRUMENTS

- A. The Supplier shall provide all instruments and materials necessary to complete the field tests unless otherwise specified. If required calibration instruments and materials are not provided on the day of test, the Engineer may postpone witnessing and sign off of instrument testing.
- B. All instruments shall be calibrated prior to the start of testing. Certificates of calibration for all instruments used for testing shall be current, and shall be at the job site during testing. If an uncalibrated instrument was used in a test, the entire test shall be redone with calibrated instruments at the Supplier's sole expense including labor costs and other expenses incurred by District staff to witness the retest.

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 Supplier without District approved test submittals. The Supplier shall provide a minimum of 5 work days' written notice confirming testing dates to the Engineer to enable witnessing of the testing.

1.5 SUBMITTALS

- A. Submit the following within 90 days of NTP
 - 1. Comprehensive Testing Schedule
- B. Submit the following at least 60 calendar days prior to field testing for approval:
 - 1. Test procedures for all field tests including field functional test data forms at the end of this Section.

2. Supplier's representative's resume demonstrating their qualifications and ability to perform the specified services
- C. Prior to field testing, submit Calibration certificates for all instruments to be used during testing.
- D. 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.
 2. Upon completion of testing for each equipment item or system, the Supplier shall submit typewritten or word processed test reports and forms for review and acceptance within 10 calendar days of completed testing. Submit test results with signed statement by Supplier e that results meet specification requirements and Supplier standards. Upon acceptance, all test reports (including all factory and field testing) shall be inserted by the Supplier into their respective O&M manuals.

1.6 SUPPLIERS' SERVICES

- A. A Supplier's authorized representative shall perform all services when Supplier'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. Supplier's representatives shall be subject to acceptance by the District. No substitute representatives will be allowed without prior written approval by the District.

1.7 TEST AND STARTUP SCHEDULE

- A. Updated test schedules shall be submitted on a monthly basis after the first test schedule submittal.
- B. List all equipment testing by specification section number and name. Include the following for each equipment/system:
 1. Specification section and paragraph number
 2. Testing pre-requisites as specified in technical specification sections
 3. Test type (functional, performance, startup)
 4. Test procedure submittal date

5. Testing and startup dates
 6. Test report submittal date
- C. Estimate dates as necessary, include actual dates when known

1.8 TEST PROCEDURES

- A. The Supplier's representative shall compose test procedures and Field Functional Test Data Forms for each required Functional and Performance test and for all equipment specified in the individual equipment specifications.
- B. Coordinate with the District to determine the operating requirements of adjacent or related systems that may be required to complete the Startup Test.
- C. Prior to submitting for District review, the Supplier shall review all test procedures to verify completeness and compliance with the specifications.
- D. All test procedures shall be comprehensive, neatly organized, and word-processed. Test procedures shall include the following:
1. Detailed test methods including sample calculations as required.
 2. Test setup procedures including details of all necessary adjustments, balancing, required equipment isolations or configurations, testing equipment, and testing instruments.
 3. Step-by-step testing procedures (number each step). Specifically identify each test instrument (including tag numbers) used during testing.
 4. Acceptance Criteria: For each test phase, specifically indicate what is considered an acceptable test result.
 5. 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 Supplier's representative, and District witness.
 6. Field Functional Test Data Form: A template for a field functional test data form is included at the end of this Section. The Supplier may use this template as a starting point when developing specific field functional test data forms, or the Supplier 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.

7. Test Procedures: Testing procedures and Supplier representative's resumes shall be approved by the District prior to performing any tests.

1.9 FUNCTIONAL TESTS

- A. Functional tests shall not proceed until the District has received, reviewed and approved the items listed below. The Supplier shall ensure that copies of these materials are on-site during testing.
 1. Interconnection diagrams
 2. As-builts
 3. Supplier 's Certificate of Proper Installation (when required)
 4. Approved equipment or system technical submittal
 5. Approved draft O&M Manuals with all factory test results and certificates excluding field functional testing and as-builts
 6. All factory test reports
 7. Calibration certificates (for all instruments used during testing)
 8. Functional Test Procedures and Field Functional Test Data Forms
- B. Field Commissioning of Instruments:
 1. All instruments, which will be used as part of a functional test shall be properly commissioned prior to the start of the test
 2. Field Commissioning:
 - a. Commissioning shall be performed by an ISA Certified Control Systems Technician (CCST).
 - b. Before commissioning can commence, the technician shall present their ISA certification for verification.
 - c. All instruments shall have the calibration verified, settings adjusted and visual checks performed as required below in conformance to this specification and the P&IDs. Pressure calibration verifications and setting adjustments shall be performed "dry". The liquid must be drained from the instrument. "Wet" calibration verifications are not acceptable.
 - 1) Calibration Verification: A single-point verification at 50% of the range shall be performed. Out of tolerance shall be considered to be a reading that varies from the test kit instrument by greater than the accuracy of the test kit instrument. Instruments found to be out of

tolerance shall be recalibrated at the factory. Field calibration is not acceptable. The transmitters and switches also require settings adjustment.

- c) Instruments included: Flow and level (DP) transmitters, flow (DP) gauges, pressure and DP transmitters, pressure and DP gauges, altitude gauges, and temperature transmitters.
- 2) Setting Adjustments: Adjustment of zero, span, deadband, setpoint, and elevation offset, as applicable. Additional setting adjustments may be required by the Supplier's instructions.
- c) Instruments included: Magnetic flowmeters, sonic transit-time flowmeters, thermal massflow transmitters, flow switches, capacitance level transmitters, ultrasonic level transmitters, capacitance level transmitters, ultrasonic level transmitters, radar level transmitters, level switches, pressure and DP switches, temperature switches, position transmitters, position switches.
 - c) Valves included: Pilot valves and adjustable relief valves.
- 3) Visual Check: Verify that the instrument is properly installed and not damaged, the readout indicator position appears appropriate for the system conditions (is not beyond full scale and returns to zero when expected), and the readout movement is smooth.
- c) Instruments included: Rotameter, flow indicator, thermometers.
- 4) Calibration Verification and Set Point Adjustment:
- c) Prior to field verifications, the Supplier shall submit information on the calibration equipment that will be used for field verification of instruments and devices.
 - c) Flow Devices: A portable sonic transit-time flowmeter such as GE TransPort PT878 shall be used. The test kit shall have an accuracy of +/-2% of reading or better. Switches may be verified with the installed flow transmitter if available.
 - c) Level (DP) and Pressure Devices: A pneumatic calibration kit such as Fluke 718 shall be used. The calibration kit shall consist of a high accuracy test gauge, a hand or electric pump and the related manifold for venting. The kit shall have a resolution of 0.01 psi or better and a measurement accuracy of 0.015% or better..
 - c) Temperature Devices: A contact digital thermometer such as Fluke 51 II with 80PK-22 immersion temperature probe shall

be used. The instrument sensor shall be immersed in a water bath together with the test kit and the water heated to the specified temperature. The kit instrument shall have an accuracy of +/-0.2% of reading or better.

- c) Vibration Devices: A portable vibration analyzer utilizing an acceleration pickup magnetically attached to the machine such as SKF MicroVibe P or SKF Microlog MX shall be used.
 - d. The verified settings shall be recorded on the EBMUD Field Calibration Tag per section 41 35 60. All relevant fields shall be completed:
 - 1) Equipment Tag ID
 - 2) Transmitters:
 - d) Input: Lower & Upper Range Value with units
 - d) Output: Lower & Upper Range Value with units
 - d) Offset: For pressure transmitters, any programmed pressure offset for transmitter elevation relative to the piping.
 - 3) Switches: Setpoint(s) with units for each contact, notated "INC" for increasing or "DEC" for decreasing. If the deadband is adjustable, the deadband setpoint with units.
 - 4) Gauges: Enter "Calibration Verified" into the Remarks.
 - 5) Pilot valves (controlling larger valves) and adjustable relief valves: Setpoint with units, notated "INC" for increasing or "DEC" for decreasing, as applicable.
 - e. Initials of the technician, the inspector, and the date of calibration.
3. EBMUD "Field Calibration Tags" shall be properly completed and hung on all instruments in a system and in any related sub-system prior to functional testing of any equipment or other device in that system. Refer to Section 41 35 60 for tag details.

C. Equipment ID Tags:

- 1. All ID tags and labels on equipment, piping, valves, instruments, conduit and other devices or systems directly or indirectly related to the functional test shall be installed by the Supplier and verified by the Engineer prior to conducting the functional test.

- D. Installation witness check of control systems wiring and devices with District staff shall not proceed until the following has been completed:

1. The Supplier has completed an initial un-witnessed loop or point-to-point test prior to requesting District staff to witness functional testing.
2. All field cables and wires are properly pulled, terminated, and labeled per contract requirements and match the latest drawings and interconnects.
3. All piping, conduit, equipment, and systems have been properly tagged and labeled.

E. Functional tests include:

1. Electrical, Communications, and Control Systems 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 Supplier.
7. The individual technical specifications or the Supplier 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.

1.10 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.

1.11 CONTROL SYSTEMS FUNCTIONAL TESTS

- A. The CSFTs shall demonstrate the proper function each process systems' control modes (local manual/automatic, remote manual/automatic) from all interface locations (local and remote).
- B. The District will not begin control systems functional testing until the Supplier has satisfied all prerequisites below:
 - 1. 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.
 - 2. All District training has been satisfactorily provided as described in Section 01 79 00.
- C. CSFTs will be completed by District staff with the primary assistance of a qualified representative of the Supplier . The Supplier representative shall assist District staff in resolving potential conflicts between the control systems and other equipment or systems installed under the contract. The Supplier representative shall be on-site during CSFTs and shall be dedicated only to those activities identified by the Engineer.

1.12 OPERATIONAL STARTUP TEST

- A. The facilities 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
 - 2. All other required tests have been completed and accepted by the District. At the District's discretion, selected performance tests may be conducted during the Startup Test period.
 - 3. All District training has been satisfactorily provided as described in Section 01 79 00.
 - 4. 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. All equipment/systems required by these specifications shall be included in the Startup Test.

- C. The Installer will coordinate with District staff to startup the facility equipment and systems. The District will conduct a seven (7) day Operational Startup test with support of the Installer, Subcontractors and Supplier Representatives as required by the Engineer to demonstrate to the District's satisfaction that all equipment and systems required by these specifications operate together as intended
- D. The Supplier 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 Supplier-trained operating personnel for the duration of the Startup Test. The District's operating personnel shall be monitored by the Supplier's representatives to assure 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 Supplier. In case of a system interruption, the Supplier 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 District for a continuous seven (7) day period. All costs for corrective work and retesting shall be borne by the Supplier.
- 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 Supplier 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 Supplier shall maintain the qualified staff (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 Supplier shall provide a list of qualified staff 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 District will maintain a log of equipment or system deficiencies along with the date and time when the Supplier was notified of the deficiency and the date and time

when the Supplier notifies the District that the deficiency has been corrected. All corrected deficiencies must be inspected and approved by the District.

- K. The Supplier shall maintain a log of equipment or system deficiencies along with a description of the required repairs necessary to correct the problem. The Supplier shall furnish up-to-date copies of this log to the District upon request.
- L. If the Operational Startup Test is interrupted through no fault of the Supplier, 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 Supplier shall perform all functional and performance testing of installed equipment unless otherwise specified. The Supplier shall be present during all testing, even if the specific functional or performance test is performed by its equipment Supplier representative.
 - B. The Supplier shall complete all testing in accordance with the District approved test procedures.
 - C. The Supplier, at a minimum, shall maintain and provide to the District, the following records:
 - 1. Daily logs indicating all equipment testing and startup activities and activities of all Supplier 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 Supplier 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 Supplier shall comply with directions given by the Engineer.
-

3.2 CONTROL SYSTEMS FUNCTIONAL TESTS

- A. All systems designed for control through PLC or SCADA will require testing. The Supplier shall make scheduling allowances for these tests and incorporate this information into the construction schedule. If the Engineer identifies deficiencies in workmanship, installation, materials, products, or anything else associated with the Contract 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 Supplier shall prepare materials for and attend periodic testing coordination meetings. During periods when field testing occurs regularly, the District will schedule weekly or biweekly field testing coordination meetings. The Supplier's Testing Coordinator shall attend all meetings

END OF SECTION

SUPPLIER'S CERTIFICATE OF PROPER INSTALLATION

OWNER: _____ EQPT SERIAL NO.: _____
EQPT TAG NO.: _____ EQPT/SYSTEM: _____
PROJECT NO.: _____ SPEC. & SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

- | Complete | Not Applicable | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Installed in accordance with Supplier's recommendations. |
| <input type="checkbox"/> | <input type="checkbox"/> | Inspected, checked, and adjusted. |
| <input type="checkbox"/> | <input type="checkbox"/> | Serviced with proper initial lubricants. |
| <input type="checkbox"/> | <input type="checkbox"/> | Electrical and mechanical connections meet quality and safety standards. |
| <input type="checkbox"/> | <input type="checkbox"/> | All system instruments are calibrated. |
| <input type="checkbox"/> | <input type="checkbox"/> | All applicable safety equipment has been properly installed. |

Comments: _____

I, the undersigned Supplier's Representative, hereby certify that I am (i) a duly authorized representative of the Supplier, (ii) empowered by the Supplier to inspect, approve, and operate the equipment and (iii) authorized to make recommendations required to assure that the equipment furnished by the Supplier is complete and ready for startup and operations. I further certify that all information contained herein is true and accurate.

Date: _____

Supplier: _____

By Supplier's Authorized Representative: _____
(Authorized Signature)

FIELD FUNCTIONAL TEST DATA FORM

EBMUD Project Title: _____ Test Date(s): _____
 Equipment Name: _____ Section No.: _____
 Tag No.: _____ P&ID No. _____

<u>I. Pretest Documentation/Setup</u>				
Documents:	<u>Yes</u>	<u>No</u>	<u>NA</u>	Comments:
a) Interconnection & Loop diagrams provided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
b) Mfr Cert of Proper Installation provided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
c) Technical Submittal complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
d) Spare Parts provided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
e) Final O&Ms provided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
f) Pipe pressure tests completed for adjacent piping.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Field Test Setup (Identify any test instrument, special setups like tanks, hoses, etc):				

<u>II. Field Functional Test</u>				
1. Calibration/Loop/Electrical				
	<u>Yes</u>	<u>No</u>	<u>NA</u>	Comments:
1.1 Instrument commissioning complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.2 Loop Checks complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.3 Electrical commissioning complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Installation Check				
	<u>Pass</u>	<u>Fail</u>	<u>NA</u>	Comments:
2.1 Correct equipment tags have been installed (tags shall match P&IDs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.2 All fields on Asset List Spreadsheet completed for system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

FIELD FUNCTIONAL TEST DATA FORM

EBMUD Project Title: _____ Test Date(s): _____
 Equipment Name: _____ Section No.: _____
 Tag No.: _____ P&ID No. _____

2.1	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
3. Operations Check	<u>Pass</u> <u>Fail</u> <u>NA</u>	Comments:
3.1	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
3.2	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
4. Controls Check	<u>Pass</u> <u>Fail</u> <u>NA</u>	Comments:
4.1	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
4.2	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
5. Alarms Check	<u>Pass</u> <u>Fail</u> <u>NA</u>	Comments:
5.1	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
5.2	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
6. Run Check	<u>Pass</u> <u>Fail</u> <u>NA</u>	Comments:
6.1 Operate the system for _____ . System operated as expected, without unexpected noise, or vibration.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
7. Other Tests and Checks	<u>Pass</u> <u>Fail</u> <u>NA</u>	Comments:
7.1	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
7.2	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

<Spec Date>
 <Spec No.>

FIELD FUNCTIONAL TEST DATA FORM

EBMUD Project Title: _____ Test Date(s): _____
Equipment Name: _____ Section No.: _____
Tag No.: _____ P&ID No. _____

III. Participants/Witness

Test conducted:

By (signature): _____ Date: _____
Title: _____ Company Name: _____

By (signature): _____ Date: _____
Title: _____ Company Name: _____

EBMUD Witness:

By (signature): _____ Date: _____
Title: _____

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. Supplier 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. Supplier 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 Supplier.

- ###### D. Supplier shall arrange for and secure a videographer to digitally record and professionally edit one session of required training for each installed equipment, system, and facility. Finalized videos shall be provided in MP4 format on a USB flash drive or DVD, or by electronic transfer.

1. The District uses recordings to remind or familiarize employees with equipment installed on this project and the recommended maintenance procedures. Recordings are not shared outside the District nor made public unless as required by a Freedom of Information Act request.
2. The Supplier is responsible to negotiate as necessary with subcontractors and vendors and sign any agreement required by them (such as non-disclosure or indemnification agreements) in order to satisfy the District's requirement to video record the training. District representatives will not sign any other vendor agreement, waiver, or non-disclosure agreement.
3. The Supplier is responsible for ensuring that all equipment vendors and their representatives are aware of and agree to the requirement to video record the training.

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

F. Related Sections:

1. Section 01 75 17 – Field Testing and Startup
2. Section 41 35 60 – Carbon Dioxide Feed System

1.2 SUBMITTALS

A. Supplier shall submit the following items for review and approval to the District.

1. The name and contact information of the Supplier's 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.
6. The name and contact information of the videographer.
7. Transmittal sheet confirming that the video has shipped or been submitted to the Engineer.

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 District.

Supplier Training Coordinator shall initiate contact with and arrange to meet with the Engineer to review training requirements, plans, schedules, and other details as determined by the Supplier or District. 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 respective site of installation per Section 41 35 60, 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 Supplier shall be present at the training meeting; however if unable to attend, the Supplier shall make an effort to include them via teleconference. The Supplier shall submit Operations & Maintenance (O&M) Manuals for District 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 District (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 Supplier 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 Supplier 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. Supplier 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. Supplier 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. Arrange for digital video-recording of one session of a repeated training session and submit the final product in MP4 format to the Engineer in a timely manner. Coordinator shall submit a notice of transmittal to The District to notify Engineer of shipment of the video. Video recordings are intended solely for District use. Coordinator may engage a vendor of their own choosing. Engineer can provide a list of professional videographers upon request.
5. Arrange refreshments:
 - a. For training session durations of four hours or less: provide a continental breakfast or refreshments for all attendees, videographer, and trainers.
 - b. For training session durations of more than four hours: provide a continental breakfast and lunch for all attendees, videographer, and trainers.
6. 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. Supplier 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 Supplier'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.

Table 1: Training Summary (Additional Training may be required in other Sections)	
Specification Section & Paragraph	System / Equipment, or Facility
41 35 60	Carbon Dioxide Feed System

END OF SECTION

SECTION 01 81 02

SEISMIC DESIGN CRITERIA

PART 1 - GENERAL

1.1 REFERENCES:

- A. ASCE 7-16, American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures.
- B. CBC 2019, California Building Code
- C. Related Sections:
 - 1. Section 41 35 60 – Carbon Dioxide Feed System

1.2 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:

Parameter	Orinda Water Treatment Plant	Lafayette Water Treatment Plant	Walnut Creek Water Treatment Plant	Pardee Chemical Plant
Design spectral acceleration at short periods, S_{DS}	1.62	1.2	1.39	0.377
Component importance Factor, I_p	1.5	1.5	1.5	1.5

- a. Component amplification factor, a_p : In accordance with ASCE 7, Tables 13.5-1 and 13.6-1.
- b. Component response modification factor, R_p : In accordance with ASCE 7, Tables 13.5-1 and 13.6-1.
- c. Overstrength Factor, Ω : In accordance with ASCE 7, Tables 13.5-1 and 13.6-1 for anchorage in concrete.

- d. See ASCE 7 for seismic design parameters not listed here.
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. Do not use more than 60 percent of the weight of the tanks for resisting overturning due to seismic forces.
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.
 - 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.

1.3 SUBMITTALS

- A. Shop drawings and calculations: Complete shop drawings and seismic calculations.
- B. Supplier 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 05 05 24

SHOP WELDING

PART 1 - GENERAL

1.1 SUMMARY

A. General:

1. 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 of steel pipe, structural steel, pump barrels and metals fabrication
2. Third-party independent inspection and examination of welds

C. Related Sections:

1. Section 01 45 27 – Shop Inspection
2. Section 41 35 60 – Carbonic Acid Dissolution, Feed, and pH Control Systems

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. AWWA D100 – Welded Carbon Steel Tanks for Water Storage, latest edition
- E. AWS D1.1, Structural Welding Code – Steel, latest edition
- F. AWS D1.2, Structural Welding Code – Aluminum, latest edition
- G. AWS D1.6, Structural Welding Code – Stainless Steel, latest edition
- H. AWS 3.0, Standard Welding Terms and Definitions, latest edition

- I. 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 qualified 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. WPS's 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.
- 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 Sections 01 33 00 and 41 35 60 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 Supplier may use a prequalified WPS conforming to the provisions of AWS D1.1 – Clause 3 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 4
 - 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 4, 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 4, 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

1. The Supplier shall qualify all welders and welding procedures in accordance with the latest edition of AWS D1.1, Clause 4; 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 3.2 for details.
5. Low hydrogen electrode storage shall be in accordance with AWS D1.1, Clause 5, Fabrication, 5.3.2.1, Low Hydrogen Electrode Storage Conditions.

D. Metal Fabrication Welding

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 1.4.D above.

E. Testing and Inspection:

1. The Supplier shall provide independent inspection of all structural steel framing welds and nondestructive examination (NDE) as indicated on applicable Contract Drawings. 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 qualified 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 6 for the related inspection and test method.
5. The costs of all inspections and tests, including retests after repair, shall be borne by the Supplier.

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 Supplier's 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 Supplier's 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 6, 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 6, Part C

B. Nondestructive Examination of Production Welds:

1. In addition to any NDE required by the Contract Documents, 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 Supplier perform or subcontract these examinations.
2. Cost of Examinations:
 - a. The cost of NDE identified in the Contract Documents for specific welded connections shall be borne by the Supplier.
 - 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 Supplier 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 Supplier.

1.8 VERIFICATION

A. General Requirements:

1. All welds shall be visually inspected and accepted 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. In-process and final inspections shall be documented on Welding Inspection Form, and available for review by the Engineer. At a minimum, all applicable elements listed on the form are required.
3. All visual inspections and nondestructive examinations shall be completed and confirmed as acceptable by the District prior to further processing that could interfere with access to the welded joint for repairs.

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 indicated in Section 3.9.A with a minimum of the EBMUD Spec Number, date, cylinder 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 the responsibility 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 Supplier's 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. Supplier 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 the responsibility 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.

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. Film viewers shall be Industrial Nuclear Company Model 23P or equal as approved by the District.

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 Supplier 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 District 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 District 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.

1.9 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. 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 4, Part D, Requirements for CVN Testing.
 3. The number of CVN test specimens shall be per AWS D1.1 – 4.27.1, Option A - 3 specimens.
 4. As required to be specified by AWS D1.1 – 4.27.6, the CVN test temperature shall be 40-degF unless otherwise specifically called out on the drawings.
 5. The CVN test requirements for the minimum absorbed energy values, the minimum average percent shear area value, and the minimum average lateral expansion value shall be per AWS D1.1 – 4.28.

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

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 and where shown on the drawings.
- 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 Supplier's expense.

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) Standards:
 - 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 Specification for Quenched and Tempered Steel Bolts and Studs
 - 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) Standards:
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) Standards:
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 Supplier's literature and application schedule for all bolting to demonstrate conformance with these specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Standard bolting:

Stainless Steel, High Strength	Bolts:	ASTM A193 Class 2, B8 (Type 304) or B8N (Type 304N), Carbide solution treated and strain hardened.	
	Nuts:	1/4" to 1-1/2"	ASTM A194, Grade 1 standard hex or Grade 8-S1 (Type 304) Heavy Hex and Strain Hardened
	Washers:	Type 304 to match bolts and nuts	
1. Refer to standard drawing 324-EA or 325-EA for the specific bolt grade that corresponds to the pipe pressure of the application. 2.			

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 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. Stainless Steel: B8 (type 304)

2.4 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.

2.5 THREADS

- A. Coarse thread series – Class 2 Fit ANSI B1.1

2.6 BOLT THREAD ANTI-SEIZE COMPOUND

- A. Compound shall be food grade meeting USDA 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[®]
 - 3. Or equal as approved by the Engineer

2.7 FLANGE GASKETS

- A. Service Water:
 - 1. General Requirements: See Section 41 35 60, Article 2.1.A.1. NSF-61 certified: required.
 - 2. Service Water Service Conditions: Suitable for chloraminated water and in accordance with Standard Drawings 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-. 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 ≥ 2000 psi; ASTM F38 creep relaxation $\leq 40\%$; and a ASTM F586 design “m” factor ≥ 2.0 , and a design “y” factor ≥ 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: Premium peroxide-cured EPDM rubber per 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.

2.8 FLANGE INSULATION SETS

- A. General Requirements: See Section 41 35 60, Article 2.1.A.1.
- B. Insulating Gasket: 1/8" full face, NEMA grade G10 glass reinforced epoxy, 200 deg F (minimum) at rated pressure, with NEMA grade G10 insulating sleeves and washers. Backup washers shall match the bolting schedule.
- C. Acceptable products:
 1. Advance Products & Systems, Inc., APS Voltaccept™ Trojan G-10
 2. GPT LineBacker® 61
 3. Calpico
 4. Or equal as approved by the Engineer.

PART 3 - EXECUTION

3.1 FLANGE BOLTING PROCEDURES

- A. Flange torque methods:
 1. For flanges with bolt torque requirements greater than 250 ft-lb, torque shall be applied using the Hytorc reactionless torque system with z-washers as specified hereinbefore. The Hytorc lithium series battery powered torque gun with LCD torque control panel shall be used with the Hytorc washer driver socket.
 2. For flanges with bolt torque requirements less than or equal to 250 ft-lb, standard bolts and washers (as specified in the standard bolting table hereinbefore) with a standard calibrated torque wrench is acceptable. These flanges are not listed on the table above. For speed of flange bolting

production, the Supplier may optionally use the reactionless washer system for all flanges.

- B. Refer to Drawings 324-EA, and 325-EA for torque procedure details. Install the appropriate gasket.
- C. Install washers under both bolt heads and nuts. Verify that the OD of the washers does not extend past the OD of the flange.
- D. Coat bolt threads with anti-seize compound.

END OF SECTION

SECTION 26 29 23

LOW-VOLTAGE VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work includes:

1. Provide labor, equipment, supervision and materials for the installation, testing and start-up of the variable frequency drive(s) (VFD) as shown on the drawings and as specified herein.
2. Where VFD's are provided as part of a packaged system, the system supplier shall indicate that the motor is suitable for operation with a VFD.
3. The variable frequency drives specified hereinafter will become part of a complete system as specified in Section 41 35 60. The variable frequency drive manufacturer shall coordinate with the manufacturer of the Section 41 35 60 equipment to ensure the compatibility of the equipment.
4. The variable frequency drives will operate motors as specified in Section 41 35 60. The drives furnished shall be certified compatible and certified for operation with the motors to be supplied.
5. Refer to the driven equipment specifications in Section 41 35 60 for description of system operation.
6. As a minimum, provide input line reactors for all drives furnished under this Section as specified in Part 2.

B. Related Sections:

1. Section 41 35 60 – Carbonic Acid Dissolution, Feed, and pH Control Systems

1.2 QUALITY ASSURANCE

- A. Variable frequency drives shall utilize a field proven design. The VFD manufacturer shall demonstrate at least three years of continuous field operating experience with equipment of similar size and design.
- B. A factory authorized service and parts organization shall be located within 100 miles of the project location. Provide the name and address of the factory authorized service and parts organization nearest to the project location at the time of the bid.

C. Equipment shall be UL or ETL labeled.

1.3 SUBMITTALS

A. Submit shop drawings and product data, in accordance with Section 41 35 60, as follows:

1. Equipment outline drawings showing elevation, plan and interior views, front panel arrangement, dimensions, and weight.
2. Indicate all options, special features, ratings and deviations from the specifications.
3. Power and control schematics including external connections. Show wire and terminal numbers and color coding.
4. Drive performance specifications.
5. Instruction and replacement parts books.
6. Certified shop test reports.
7. Field test and inspection reports.
8. Submit details of any trap filters, reactors, isolation transformers, or other devices determined to be necessary to achieve the specified harmonic limits. Details shall include catalog cuts, dimensional information, and mounting requirements, conduit and wire sizing, and interconnection details.
9. Submit information demonstrating the drive output will not harm the motors through dV/dt reflected waves. Indicate specifically if output reactors will be required to protect the motors.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Package the equipment for maximum protection during delivery and storage.
- B. Store the equipment indoors in a clean, dry, heated storage facility until ready for installation. Do not install the equipment in its final location until the facilities are permanently weather tight. Furnish, install and wire temporary electric space heaters in the equipment until the permanent heating equipment is operational. Protect the equipment at all times from exposure to moisture and chemicals.

1.5 REFERENCE STANDARDS

- A. IEEE Standard 519 (latest revision) - "IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems."
- B. National Electrical Code (NFPA 70) latest edition.

- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.6 PROJECT/SITE REQUIREMENTS

- A. The VFD shall not produce motor noise in excess of the manufacturers published noise standards for 60-Hz operation.
- B. The VFD shall be capable of continuous operation in an average ambient temperature between 0 degrees C and 40 degrees C.

1.7 SPARE PARTS

- A. Provide the following spare parts for each size drive in the quantities specified:
 - 1. One of each type printed circuit board.
 - 2. Two power diodes.
 - 3. One pair power transistors.
 - 4. 50 percent replacement fuses, all types and sizes.
 - 5. One operator interface module.
 - 6. Ten replacement lamps for pilot lights.
- B. Spare parts shall be boxed or packaged for long term storage. Identify each item with manufacturers name, description and part number on the exterior of the package.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURES

- A. Manufactures: Subject to compliance with these specifications, the typical equipment, systems and accessories installed shall be manufactured by:
 - 1. General Electric, AF-600FP
 - 2. Toshiba, G7 Series
 - 3. ABB, Model ACH550
 - 4. Or equal as approved by the Engineer.

2.2 RATING

- A. Service Conditions

1. Input power: 460 VAC, ± 10 percent, 3 phase, 60 Hz.
 2. Input frequency: 57 to 63 Hz.
 3. Ambient temperature: 0 degrees C to 40 degrees C.
 4. Elevation: Up to 3300 feet above mean sea level.
 5. Relative humidity: Up to 90 percent non-condensing.
- B. Minimum drive efficiency: 97 percent or better at 4/4 motor base speed and rated torque.
- C. Displacement power factor: 95 percent or higher throughout the entire speed range, measured at drive input terminals.
- D. Drive output: 100 percent rated current continuous, suitable for operation of the driven equipment over the required speed range without overloading. Drives shall be capable of a continuous overload up to 110 percent rated current for variable torque loads and 150 percent rated current for constant torque loads. Starting torque shall be matched to the load.
- E. Output frequency drift: No more than plus or minus 0.5 percent from setpoint.
- F. Drives shall withstand five cycle transient voltage dips of up to 15 percent of rated voltage without an undervoltage trip or fault shutdown, while operating a variable torque load.

2.3 CONSTRUCTION

A. General

1. The VFDs shall utilize a digital pulse width modulated (PWM) design to convert the fixed AC input to a variable voltage, variable frequency AC output. Construction shall be modular, using plug-in type component mounting or keyed ribbon cable connections wherever possible to minimize downtime during repair.
2. The VFD shall operate satisfactorily when connected to a bus supplying other solid state power conversion equipment which may be causing up to 10 percent total harmonic voltage distortion and commutation notches up to 36,500 volt microseconds, or when other VFD's are operating from the same bus. The drive shall include transient voltage suppression to allow reliable operation on a typical commercial power distribution system.
3. The VFD shall consist of a full-wave diode bridge converter to convert incoming fixed voltage/frequency to a fixed DC voltage. Provide a DC link choke smoothing reactor to limit fault throughput.

4. The output shall be generated by power transistors or GTOs which shall be controlled by six identical, optically isolated base driver circuits. The VFD shall have an output voltage regulator to maintain correct output Volt/Hertz despite incoming voltage variations. The VFD shall have a continuous output current rating equal to or greater than the motor full load nameplate current.

B. Operator interface

1. Provide a door-mounted digital keypad/display, capable of controlling the drive and setting drive parameters. The digital display shall normally display:
 - a. Speed demand in percent
 - b. Output current in amperes
 - c. Frequency in Hertz
 - d. Control mode - manual or automatic
2. The digital keypad shall allow operators to enter exact numerical settings in English engineering units. A user menu shall be provided as a guide to parameter settings. Coded messages on keypad will not be acceptable. Parameters are to be factory set in EEPROM and resettable in the field. Parameters shall be password protected. The EEPROM stored variables shall be transferable to new and spare boards.
3. The keypad/display module shall have a key switch to control operation of the keypad. The key shall be removable in either the "Enabled" or "Disabled" positions. The keypad module shall contain a "self-test" software program that can be activated to verify proper keypad operation. The keypad display shall contain a full alphanumeric character set.
4. The drive shall have a graphic back-lit liquid crystal display which can be configured to display frequency, current, function code set points, drive status, and fault codes. At a minimum, the display shall display 4 lines with 13 characters of text.
5. At a minimum the following controls and indicators shall be provided, either separately or as part of the keypad/display:
 - a. POWER ON, RUN AND FAULT indication.
 - b. FAULT RESET control.
 - c. LOCAL-OFF-REMOTE control mode selector.
 - d. Manual START/STOP controls.

- e. Manual speed adjust capability.
- C. Auxiliary Contacts
 - 1. Provide two set(s) of Form C auxiliary dry contacts for remote indication of VFD running status.
 - 2. Provide two set(s) of Form C auxiliary dry contacts for remote indication of VFD fault.
- D. Auxiliary Power: Provide 120 VAC auxiliary power on drive terminal strips for use in powering auxiliary control devices.

2.4 PROTECTIVE AND OPERATIONAL FEATURES

- A. Make provisions for field adjustment of the following parameters through the keypad/display:
 - 1. Current limit and boost.
 - 2. Voltage (Volts/Hertz.)
 - 3. Frequency (Minimum and Maximum)
 - 4. Independently adjustable acceleration and deceleration rates.
 - 5. Auto restart delay.
 - 6. Up to five critical bands where drive operation is inhibited.
- B. Make provisions to accept a remote dry contact closure to start and stop the drive(s) with the drive control system in the AUTO mode.
- C. Make provisions to accept a 4-20 mA DC input signal for remote speed control. Input shall be isolated at the drive and active with the drive control system in the AUTO mode. Zero and span adjustability shall be provided.
- D. Provide a 4-20 mA DC isolated output signal proportional to speed for remote speed indication.
- E. Provide the following short circuit and input protective features.
 - 1. Input circuit breaker.
 - 2. Solid state instantaneous overcurrent trip.
 - 3. Undervoltage protection with automatic restart.
 - 4. Ground fault protection.

- F. Provide the following internal protective features.
 - 1. Transient surge protection.
 - 2. Overcurrent protection.
 - 3. Current limit, inverse time type.
 - 4. DC bus fuse protection and discharge circuit.
 - 5. DC bus overvoltage trip.
- G. Provide the following output protective features.
 - 1. Inverse time motor overload protection.
- H. Harmonic and Radio Noise Mitigation
 - 1. At a minimum input line reactors shall be provided with all drives. Reactors shall be 2-1/2 percent minimum, rated for 150 percent overload for one minute, and have a saturation rating no less than 3.5 times the rated continuous current. Reactors shall be UL, ETL, or CSA approved.
 - 2. Provide EMI/RFI filters to limit radio frequency noise in excess of the limits specified by FCC Docket 20780 (Part 15, Subpart J) or if the drives create noise in a frequency range which will interfere with other sensitive equipment at the installation (such as lighting systems, telecommunications systems, instrumentation and monitoring equipment).

2.5 DIAGNOSTIC AND FAULT CAPABILITY

- A. The following conditions shall cause an orderly drive shutdown and lockout.
 - 1. Incorrect phase sequence.
 - 2. Blown input fuse or single phasing of supply.
 - 3. Control power supply failure.
 - 4. Instantaneous overcurrent.
 - 5. Sustained overload.
 - 6. Transistor overcurrent.
- B. Provide complete built-in diagnostic and test capability to enable maintenance personnel to rapidly and accurately identify the cause of equipment failure.

2.6 SURFACE PREPARATION AND SHOP COATINGS

- A. All non-current carrying metal parts of the equipment cabinet shall be cleaned of all weld spatter and other foreign material and given a heat cured, phosphatized chemical pre-treatment to inhibit rust.
- B. Unpainted non-current carrying parts shall receive a protective zinc plating to prevent corrosion. Printed circuit boards shall be coated with a protective conformal epoxy. All device contacts shall be silver cadmium plated.

2.7 FACTORY TESTING

- A. Perform manufacturers standard production testing and inspection.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install the equipment in accordance with the manufacturer's instructions.

3.2 FACTORY QUALITY CONTROL

- A. Provide manufactures standard factory test.

3.3 FIELD QUALITY CONTROL

- A. The Supplier shall provide acceptance testing of the VFD's per NETA guidelines for VFD's and per the requirements of Section 41 35 60.
- B. Where VFD's are part of a mechanical system package, the manufacture's representative shall coordinate the acceptance test with the Supplier.

3.4 ADJUSTMENT

- A. Make all VFD internal adjustments and all adjustments necessary for manual and automatic operation of the entire system of driven equipment.

3.5 CLEANING

- A. Remove all rubbish and debris from inside and around the equipment. 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.

END OF SECTION

SECTION 40 41 13.13

PROCESS PIPING ELECTRICAL RESISTANCE HEAT TRACING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Furnish and install self regulated pipe heating systems as shown on the drawings and specified herein. The heating system shall include but not be limited to; heating cables, pipe insulation material, adapters, thermostat and mounting equipment.
- B. Related sections:
 - 1. Section 41 35 60 – Carbon Dioxide Feed System
 - 2. Section 01 33 00 – Submittal Procedures
 - 3. Section 01 75 17 – Field Testing and Startup
- C. Calculations shall be provided to provide a basis for sizing the piping heating system. The following criteria for the calculations shall be provided:
 - 1. Length and diameter size of piping as shown on the drawings.
 - 2. Maintained temperature: At 40 degrees F at an ambient temperature of 20 degrees F
 - 3. Pipe insulation and jacket: Type 1 insulation with type 3 jacket per section 40 42 13.10.

1.2 SUBMITTALS

- A. Submittals shall be made in accordance with Section 01 33 00 Submittal Procedures.
- B. Submit the following prior to installation:
 - 1. Product Data and technical specifications
 - 2. Warranty
 - 3. Bill of Materials
 - 4. Heat system sizing calculations
 - 5. Schematic (elementary) diagrams and wiring diagrams

6. Interconnection wiring diagrams
 7. Field test procedures
- B. Submit the following prior to field testing:
1. O&M Manuals: in accordance with Section 01 33 00
- C. Submit the following prior to startup:
1. Field test results

1.3 REFERENCES

- A. California Electrical Code (CEC).
1. NFPA 70
- B. National Electrical Manufacturer Association (NEMA).
- C. American National Standards Institute (ANSI).
- D. Underwriters Laboratory (UL).
1. UL 746B
 2. UL 508
- E. International Electrical Testing Association (NETA).
- F. National Electrical Safety Code (NESC)
- G. Factory Mutual (FM)

PART 2 - PRODUCTS

2.1 PIPING HEATING SYSTEM

- A. Heating Cable
1. The heating cable shall consist of two 16 AWG or larger nickel-plated copper bus wires, embedded in a self-regulating polymeric core that controls power output so that the cable can be used directly on plastic or metallic pipes. Cables shall have a temperature identifier-number (T-rating) of T6 (185 degrees F or 85 degrees C) without use of thermostats.
 2. A ground-fault protection device set at 30 mA, with a nominal 100-ms response time, shall be used to protect each circuit.

3. The heating cable shall have a tinned copper braid with a resistance less than the heating cable bus wire resistance as determined in type test (ASTM, B193, Sec. 5). The braid shall be protected from chemical attack and mechanical abuse by a modified polyolefin or fluoropolymer outer jacket.
4. In order to provide rapid heat-up, to conserve energy, and to prevent overheating of fluids and plastic pipe, the heating cable shall have the following minimum self-regulating indices: The self-regulating index is the rate of change of power output in watts per degree Fahrenheit or watts per degree Celsius, as measured between the temperatures of 50 degrees F (10 degrees C) and 100 degrees F (38 degrees C) and confirmed by the type test and published data sheets.

Table A		
Minimum Self-Regulating Indices		
Heating cable	S.R. index (W/°F)	S.R. Index (W/°C)
3 W/ft	0.038	0.068
5 W/ft	0.060	0.108
8 W/ft	0.074	0.133
10 W/ft	0.100	0.180

5. In order to ensure that the self-regulating heating cable does not increase power output when accidentally exposed to high temperatures, resulting in thermal runaway and self ignition, the cable shall produce less than 0.5 watts per foot (1.64 watts per meter) when energized and heated to 350 degrees F (177 degrees C) for 30 minutes. After this test, if the cable is reenergized, it shall not have an increasing power output leading to thermal runaway.
6. Power source shall be 120VAC.
7. Acceptable Manufacturer:
 - a. Raychem, BTV.
 - b. Or equal as approved by the Engineer.

B. Combination Power Connection Box and Digital Electric Controller

1. The combination power connection and electronic controller assembly shall be rated for the expected amperage load.
2. The assembly shall be pipe mountable and rated TYPE 4X. The assembly includes a window and digital display that shows the monitored actual/set point temperatures and alarm conditions (RTD failure, high or low temperature) if detected. Alarm conditions can be remotely indicated via a form C dry contact. Status LEDs indicate whether the digital display is showing the set point or actual temperature.

3. Programming the set point temperature, deadband, and high and low alarms shall be accomplished using a built-in digital display and push buttons.
4. The assembly shall be programmable to maintain temperature of between 32 and 425 degrees F with 2 to 10 degrees F deadband. The assembly, can be used with voltages from 100 to 277 Vac, and is capable of switching current up to 30 Amps.
5. A 100-ohm platinum RTD shall provide feedback for either pipe maintenance or ambient sensing freeze protection.
6. Acceptable Manufacturer:
 - a. Raychem, JBS-100-ECP-A.
 - b. Or equal as approved by the Engineer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Ground the heating system as required by the manufacturer's instructions and the CEC.
- C. When a cable type leak detection system is installed on the same pipe as the heat tracing, coordinate installation of heating cable with leak detection cable and double containment system.

3.2 FIELD TESTING

- A. Functional Test: test in accordance with Section 01 75 17. The system shall be tested to confirm it maintains the specified temperature.

END OF SECTION

SECTION 40 95 13

PROCESS CONTROL PANELS AND HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Work includes:

1. Furnish and install control panel as shown on the drawings and specified herein.

B. Related sections:

1. Section 01 45 27 – Shop Inspection
2. Section 01 81 02 – Seismic Design Criteria
3. Section 41 35 60 – Carbonic Acid Dissolution, Feed, and pH Control Systems

1.2 SUBMITTALS

A. The Supplier shall furnish submittals for approval as outlined below:

1. Product data for panel and all components contained within panel
2. Warranty
3. Bill of materials
4. Plan, front, and side view drawing including overall dimensions, weights, and anchoring details
5. Assembly drawing
6. All design drawings, panel drawings, wiring diagrams, loop diagrams, and interconnection diagrams shall be drafted using the latest version of MicroStation or AutoCAD. Drawings shall be developed in accordance with the District's procedures and standards, copies of which are available on request.
7. Catalog material for all control panels and enclosures. Provide control panels sized as shown on the drawings. Where control panel dimensions have not been shown, size panels with a minimum of 30 percent spare usable space horizontally and vertically on all internal and external panel surfaces and mounting panels. Drawings shall be to scale and shall show the location of all panel mounted devices (such as terminal blocks, relays, wire ducts, power supplies, color coding of terminal strips, nameplates, etc.) as well as doors,

louvers, and subpanels. Drawings shall include a panel legend and a bill of materials. The panel legend shall list and identify all front of panel devices by their assigned tag numbers, all nameplate inscriptions, service legends, and annunciator inscriptions. The bill of materials shall list all devices mounted within the panel that are not listed in the panel legend, and shall include the tag number, description, manufacturer, and model number for each

8. Catalog cuts of all application software being provided
9. Internal schematics (elementary diagrams), wiring diagrams, and point-to-point interconnection diagrams for all components internal and external connections
10. Detailed panel elementary diagrams of all pre-wired panels. Diagrams shall be similar to those typical diagrams shown on the drawings, but with the addition of all the auxiliary devices such as relays, alarms, fuses, circuit breakers, lights, fans, heaters, etc. Provide panel control diagrams for all discrete control and power circuits. Diagrams shall be ladder type schematic diagrams similar to the typical diagrams shown in the drawings, but shall include all devices requiring electrical connections. Panel control diagrams shall identify all wire numbers and types, terminal numbers, tag numbers and PLC input/output I/O identification (rack and slot) numbers. Control diagrams shall show all circuits individually; no common diagrams will be allowed. Line numbers and sheet numbers shall reference relay contacts. Where multiple relays are required, their coils shall be wired parallel. All discrete devices shall be labeled to define their switching action (close on rising or close on falling process variable).
11. Shop drawings and catalog material for all control and field panels, instrument racks, and enclosures. Drawings shall be to scale and shall show the location of all panel mounted devices as well as doors, louvers, and sub-panels. Drawings shall include a panel legend and a bill of materials. The panel legend shall list and identify all front of panel devices by their assigned tag numbers, all nameplate inscriptions, service legends, and annunciator inscriptions. The bill of materials shall list all devices mounted within the panel that are not listed in the panel legend, and shall include the tag number, description, manufacturer, and model number for each.
12. Drawings showing any modifications or additional details as may be required to supplement the Contract Documents and adequately define the installation of the PCS elements
13. Interconnecting wiring diagrams that follow the format shown on the drawings, showing all component and panel terminal board identification numbers and external wire numbers in the same format as shown on the drawings. Wiring tables or wire lists will not be considered as a suitable substitute for these drawings unless approved by the District. These diagrams

shall include all intermediate terminations between field elements and panels (e.g., terminal junction boxes, motor control centers, etc.). These diagrams shall be coordinated with the electrical subcontractor and shall bear a statement that this has been done. Reference the drawings for a typical interconnecting wiring diagram showing the format to be used. These drawings shall be provided to the electrical subcontractor for wiring system coordination and shall be used to provide wire numbers on the field wiring that is identical to the panel wire number. When wire numbers are not shown on the drawings, the Supplier shall contact the District to obtain wire numbers.

14. Loop diagrams that shall consist of an individual wiring diagram for each analog loop showing all devices in the loop, wire and terminal numbers, the location of the DC power supply, instrument tag numbers and descriptions, scale ranges, calibration data, and the location of any common dropping resistors, fuses, shield grounds, etc. The loop diagrams shall be in the format as shown on the drawings. The loop diagrams shall meet the minimum requirements of ISA S5.4 plus the following requirements:
15. Physical drawings showing equipment arrangement and terminal block locations.
16. A listing of all the panels, racks, instruments, RTUs, modems, radio, PLCs, servers, OIUs, and equipment supplied as a part of the Process Control Panel. All components shall be grouped by component type. The list shall be submitted in electronic format in a Microsoft Access document.
17. Catalog information, descriptive literature, wiring diagrams (showing internal wiring and external connections for power and signal), and shop drawings for all recorders, indicators, transmitters, primary elements, flowmeters, PLCs, I/O modules, networking equipment and appurtenances, and all other components of the Process Control Panel. Also, provide catalog information on all electrical devices furnished under this Division (for example: uninterruptible power supplies (UPS), power supplies, relays, surge suppressors, terminal blocks, circuit breakers, heaters, thermostats, fans, louver kits, batteries, etc.).
18. Equipment seismic qualifications, seismic calculations, and anchorage details as specified in this section, and Section 01 81 02
19. Thermal load calculations
20. Battery sizing calculations
21. Complete installation and field assembly instruction manuals
22. As-built documents and Operation and Maintenance (O&M) manuals
23. Spare parts list, expendables, and test equipment list

24. Certified factory test reports
25. Test procedures including: factory demonstration test, functional test, performance test, and commissioning
26. Test documentation including: factory demonstration test, functional test, performance test, and commissioning

1.3 DELIVERY, STORAGE AND HANDLING

- A. Control panels shall be shipped directly to the site from the factory. Before the control panels are shipped, remove all case-mounted instruments from the face of the panels, and repack in their original shipping cartons for shipment to the site with the control panel.
- B. Throughout this contract, the Supplier shall provide protection for materials and equipment against loss or damage and from the effects of weather. Prior to installation, store items indoors in a dry location and follow all manufacturers' storage instructions. Provide heating in storage areas for items subject to corrosion under damp conditions. Provide covers for panels and other elements that may be exposed to dusty construction environments. Specific storage requirements shall be in accordance with the manufacturer's recommendations of the equipment being provided.

1.4 REFERENCES

- A. Codes and Standards: Unless otherwise specified herein, or shown on the drawings, work under this specification shall be performed in accordance with the following codes, standards and publications to the extent indicated by the references herein. Any conflict among these standards shall be brought to the attention of the District for clarification and final ruling. The date of issue or version shall be the current version at time of bid.
 1. NFPA Standard 70 – National Electrical Code
 2. IEEE Standard 472 – Electrical Surge Protection
 3. EIA Standard RS-232-C – Interface between data terminal equipment and data communication equipment employing serial binary data interchange
 4. EIA Standard RS-422-A – Electrical characteristics of balanced voltage digital interface circuits
 5. NEMA ICS6 – Enclosures for Industrial Controls and Systems
 6. SAMA PMC-33.1 – Electromagnetic Susceptibility of Process Control Instrumentation

7. IEEE 519 – Recommended Practices and Requirements for Harmonic Control in Electric Power Systems
8. ISA S5.1 – Instrumentation Symbols and Identification
9. ISA S20 – Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves

1.5 JOB CONDITIONS

A. Environmental

1. Ambient temperature range: 0 to +47 degrees Celsius
2. Ambient humidity range: 5 percent to 95 percent relative humidity (RH), non-condensing
3. Atmosphere: No corrosive gases

PART 2 - PRODUCTS

2.1 GENERAL

- A. Unless otherwise approved by the Engineer, the control panels shall be constructed with external dimensions as shown on the drawings. The panel construction and all interior wiring shall be in strict accordance with the standards listed in Article 1.4, Instrument arrangement shall be as shown, with minor modifications as may be required for the particular equipment furnished. Modifications shall be subject to the approval of the Engineer
- B. The construction of the control panels shall be by a UL listed Industrial Control Panels Fabricator. The panel shall be completely fabricated, instruments installed, wired, and plumbed at the Fabricator's factory. Where more than one control panel is provided, all control panels shall be fabricated by a single Control Panel Fabricator. Unless otherwise indicated, provide all new materials and equipment, free from any defects, and suitable for the space provided. Provide materials and equipment listed by UL wherever standards have been established by that agency.
- C. The control panels shall conform to UL listing 508A and bear a UL 508A label stating "suitable for use as an industrial control panel", or built by an UL listed shop.
- D. Where two or more units of the same class of materials or equipment are required, provide products of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer.

- E. Standard products: Unless otherwise indicated, provide material and equipment that is the standard product of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturer's latest standard design that conforms to the specifications.

2.2 TYPICAL EQUIPMENT

A. Construction:

1. For cabinets located indoors, cabinet shall be NEMA Type 12, manufactured with 12-gauge steel, with ANSI 61 gray polyester powder paint external finish. Cabinet dimensions are as shown on the design drawings. Include back panels and side panels as shown on the drawings.
2. For cabinets located outdoors, cabinet shall be NEMA Type 4X, manufactured with 14-gauge Type 316L stainless steel, complete with back panel. Cabinet dimensions are as shown on the design drawings. Include back panels and side panels as shown on the drawings. Cabinets located outdoors shall be supported by a unistrut metal frame and mounted at the height shown on the design drawings.
3. Seams shall be continuously welded and ground smooth without holes or knockouts.
4. The enclosure shall have a single hinged door. When facing the front of the enclosure, the hinge shall be on the left-hand side and the door latch on the right-hand side.
 - a. Door shall have heavy-duty continuous hinges, with lockable three-point latch.
 - b. Door gaskets shall be of oil resistant material and shall be attached with oil-resistant adhesive.
5. Each enclosure shall be provided with a print pocket 12" wide x 12" high x 2" deep provided on door.
6. Acceptable products: For wall mounted enclosures, Hoffman Concept wall-mount enclosure, with Hoffman Concept back panel, or equal as approved by the Engineer.
7. Acceptable products: For pad mounted enclosures, Hoffman free standing type 12 enclosure, with Hoffman side and back panels, or equal as approved by the Engineer.

B. Wiring:

1. Single conductor wiring inside Control Panel shall be No. 14 AWG stranded copper with 600 volt Type MTW insulation unless otherwise specified.

Color Coding:

<u>Function</u>	<u>Gauge</u>	<u>Color</u>	<u>Remarks</u>
Instrument DC Power (+)	14	Light Blue	
Instrument DC Power (-)	14	Gray	
HVAC DC Power (+)	12	Dark Blue	
HVAC DC Power (-)	12	Gray	
DC Control	18	Violet	
AC Control	16	Red	
AC Common	14	White	
AC Power	14	Black	
AC Ground	14	Green	

2. No more than 2 wires shall be connected to one terminal.
3. Wires carrying instrument and control DC signals shall be physically separated a minimum of 6" from wires carrying AC (120 VAC)
4. All wiring shall be neatly routed in wiring ducts and labeled with their assigned wire numbers. Wire labels shall be machine printed, permanent type heat shrinkable polyolefin labels, Brady Permasleeve printable wire markers, or equal as approved by the Engineer.
5. Instruments with grounding terminals shall be grounded to the panel steel. Provide grounding lug for grounding the console to earth ground.
6. 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.

Ferrule Color Coding

AC, Power and Controls	Gray
------------------------	------

DC, Controls and Instruments	Red
DC Power	Black

Use only manufacturer approved crimping tool designed specifically for the type of ferrule provided.

7. 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. Wiring duct sizes shown on the drawings are minimum sizes; wiring duct fill shall not exceed 50 percent.
8. Whenever there is any discrepancy between wiring drawings and the control schematic, the control schematics shall take precedence.

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. Heavy Duty Terminal Block shall be designed to accept wires up to No. 10 AWG. Terminal blocks shall be gray colored and rated for 30 amperes, 600 VAC/VDC. Acceptable products: Allen Bradley 1492 W6, Phoenix Contact Universal “UK” Terminal Blocks, or equal as approved by the Engineer.
3. 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.
4. Molded case circuit breakers shall be panel mountable, energy limiting type rated 250VAC or 120VDC, with current ratings as shown on the drawings. The molded case circuit breaker shall have an integral padlockable handle which will allow the circuit breaker to be locked in the off position. The manufacturer of the locking device shall be the same manufacturer of the molded case circuit breaker.
5. 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), Allen-Bradley 800H-W500J (white/black jumbo legend plates), Allen-Bradley 800H-W797A (yellow E-stop legend plates),
 - b) Or equal as approved by the Engineer
6. 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
 - i) Control Relay: Phoenix Contact No. 2967620
 - ii) Plug-In Jumper: Phoenix Contact No. 2966838 (length as required)
 - iii) Separation Plate: Phoenix Contact No. 2966841
 - c) Or equal as approved by the Engineer

7. Blocking Diode

- a. Blocking diode to provide battery isolation from power supplies shall be rated for a minimum $I_f = 30A$, minimum $V_{rrm} = 200 V$, maximum $V_f = 1.3 V$.
- b. Acceptable products: International Rectifier, input rectifier diode or equal as approved by the Engineer

8. 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

9. Cabinet Door Switch:

- a. Cabinet door switch shall be rated for 15 amperes at 120 VAC and 0.5 amperes at 24 VDC, plunger-type door switch, SPST.
- b. Acceptable products: Honeywell Microswitch Model 1AC2, or equal as approved by the Engineer

10. Cabinet Light:
 - a. The cabinet light shall be a LED light that is UL listed for damp locations. The LED light shall be capable of being mounted to the top interior surface of a control panel using screws. The operating voltage shall be 90VAC to 260VAC and produce 900 lm of light.
 - b. The light shall turn on and off via the integral plunger switch.
 - c. Acceptable products: Hoffman model LEDA2S35, or equal as approved by the Engineer
11. Convenience Receptacle:
 - a. Fully enclosed, DIN-rail mounted, GFI duplex utility receptacle, suitable for either vertical or horizontal mounting, rated 15A at 120VAC.
 - b. Acceptable products: Phoenix Contact Model EM-DUO-120/15/GFI, or equal as approved by the Engineer
12. Ethernet Switches
 - a. Reference Section 41 35 60
13. Programmable Logic Controllers (PLCs)
 - 1) Reference Section and 41 35 60.
14. Instrument Power Supply (120VAC to 24VDC):
 - a. Single-phase DIN-rail-mounted, switched-mode power supply with 120VAC input, 24VDC nominal output. Output shall be adjustable and regulated over the range 22.5 to 28.5 VDC. Output current capability of 12 A at 60 Deg C.
 - b. The power supply shall have an efficiency greater than 87 percent with maximum peak-to-peak voltage ripple of less than 100mV.
 - c. Where shown on the design drawing schematic, the power supply shall be provided in a redundant configuration with two identical power supplies connected in parallel with blocking diodes on the 24VDC (+) terminals.
 - d. Power supply shall have the following status signals:
 - 1) DC “OK” LED which remains lit during normal power supply operation, flashes when the output voltage has dropped by more than 10%, and is off when no input voltage is present
 - 2) A “sourced” DC “OK” contact rated 24VDC and up to 40mA

- 3) An isolated DC “OK” relay contact rated 1A at 30V
 - e. Acceptable products: Sola SFL12-24-100RED, or equal as approved by the Engineer
15. Instrument Power Supply, DC to DC Converter (120VDC to 24VDC):
 - a. DIN-rail mounted, switched-mode DC to DC converter, power supply with 90VDC to 350VDC input, 24VDC nominal output. Output shall be adjustable and regulated over the range 22.5 to 28.5 VDC. Output current capability of 10 A at 60 Deg C
 - b. The power supply shall have an efficiency greater than 87 percent with maximum peak-to-peak voltage ripple of less than 100mV.
 - c. Where shown on the design drawing schematic, the power supply shall be provided in a redundant configuration with two identical power supplies connected in parallel with blocking diodes on the 24VDC (+) terminals.
 - d. Power supply shall have the following status signals:
 - 1) DC “OK” LED which remains lit during normal power supply operation, flashes when the output voltage has dropped by more than 10 percent, and is off when no input voltage is present
 - 2) A “sourced” DC “OK” contact rated 24VDC and up to 40mA
 - 3) An isolated DC “OK” relay contact rated 1A at 30V
 - e. Acceptable products: Phoenix Contact 2938604 QUINT-PS-100-240AC/24DC/10, or equal as approved by the Engineer.
16. PLC Power Supply System (120VAC to 24VDC):
 - a. Acceptable products:
 - 1) Phoenix Contact QUINT-PS-100-240AC/24DC/20
 - 2) Or equal as approved by the Engineer
17. DC Uninterruptible Power Supply:
 - a. The DC uninterruptible power supply (UPS) shall include a 24VDC power supply unit, UPS control unit, and batteries
 - 1) The 24VDC power supply shall satisfy the following requirements:
 - a) Nominal input voltage shall be 100 to 240VAC

- b) Nominal output voltage shall be 24VDC with an adjustable range of 22.5 to 28.5VDC that can be adjusted via a potentiometer mounted on the front of the power supply.
 - c) The available output current shall be 10A @ 24VDC with a short circuit current limit of 15A
 - d) The power supply shall have a DC OK status indicator mount on the front of the unit and a DC OK isolated relay output contact rated at a minimum of 1A at 30VDC
 - e) The power supply shall be DIN rail mountable
 - f) The power supply shall be UL listed
 - g) Acceptable products: Phoenix Contact QUINT or equal as approved by the Engineer
- 2) The UPS control unit shall satisfy the following requirements:
- a) Input voltage range of 22.5 to 30VDC
 - b) Nominal output voltage of 24VDC with a minimum output current of 20A with a short circuit current limit of 27A
 - c) Integral battery charger able to charge two 12VDC 38AH lead acid batteries connected in parallel
 - d) The UPS control unit shall have the following status indicators mounted on the front of the unit:
 - i) POWER IN OK
 - ii) ALARM
 - iii) BATTERY MODE
 - iv) BATTERY CHARGE
 - e) The UPS control unit shall have the following isolated output relay contacts rated at 1A at 30VDC:
 - i) ALARM
 - ii) BATTERY MODE
 - iii) BATTERY CHARGE
 - f) The UPS control unit shall be DIN rail mountable

- g) The UPS control unit shall be UL list
 - h) Acceptable products: Phoenix Contract QUINT DC UPS or equal as approved by the Engineer
- 3) The battery shall be a rechargeable sealed lead acid battery that shall satisfy the following requirements:
- a) Nominal output voltage of 12VDC
 - b) Minimum nominal capacity of 35AH
 - c) UL recognized
 - d) Valve regulated with spill proof constructions that allows safe operation in any position
 - e) Rugged impact resistant ABS case
 - f) Acceptable products:
 - i) Power Sonic PS PS-12330
 - ii) Dynasty DCS-33H
 - iii) Phoenix Contact UPS-BAT
 - iv) Or equal as approved by the Engineer

18. Battery Box

- a. Battery box shall be a lockable NEMA 4X enclosure, with a minimum dimension of 12" x 12" x 12".
- b. Acceptable products: Hoffman NEMA 4X enclosure, or equal as approved by the Engineer.

19. Battery Charger

- a. Battery charger shall be UL listed, Single-phase DIN-rail mounted, switched-mode battery charger 120VAC input, with the capability to charge 24VDC sealed lead-acid, absorbent glass mat battery.
- b. Minimum output current 4 Amps, automatic float charge upon completion of battery charging.
- c. Acceptable products: Curtis model 1604CS-AVS/24/04, or equal as approved by the Engineer.

20. Backup Battery

- a. Back up batteries shall be 12 VDC, 18 Amp Hrs capacity, sealed lead-acid battery. Provide sufficient quantity of batteries to obtain a backup voltage of 24VDC.
- b. Absorbent glass mat (AGM) technology.
- c. Valve regulated, spill proof and can be operated in any position.
- d. Acceptable products: Power Sonic PS-12180, or equal as approved by the Engineer.

21. Signal Isolators (4-20 mA loop Isolators)

- a. Signal Isolators shall be UL listed and powered from 24VDC. Terminals to accept wire sizes from No. 20 AWG to No. 12 AWG. Units shall be DIN-rail mounted. Single 4-20 mA input and two isolated 4-20 mA outputs. Outputs shall track input current.
- b. Acceptable products: Phoenix Contact MINI Analog Model No. MINI MCR-SL-UI-21

22. Surge Suppressor:

- a. Surge suppressors shall be UL listed and consist of a removable plug with visual status indicator and a hardwired base element that allows the surge arresting elements to be replaced without interrupting the power circuit being protected. Units shall be DIN-rail mounted.
- b. Units shall be rated for 120 VAC nominal, 150 VAC maximum and 15kA nominal, 40kA maximum surge current (8/20us).
- c. Acceptable products: Phoenix Contact Valvetrab or equal as approved by the Engineer. Valvetrab system part numbers are listed below:
 - 1) Line-Neutral: 120VAC to neutral plug VAL-MS 120 ST Model 2807586; Base element VAL-MS-BE Model 2817741
 - 2) Neutral-Ground Base and Plug: F-MS 12/FM Model 2817974

23. Fuses

- a. Time delay glass tube construction with nickel plated brass endcaps, 1/4" x 1-1/4" 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

24. Ground Bar

- a. Ground bars shall be UL listed and have suitable number and size of terminals necessary for terminating stranded copper ground wires.

- 1) Acceptable products:

- a) Phoenix Contact:

- i) Bus bar base: Phoenix Contact Model No. 0404428

- ii) Bus bar terminal blocks: green/yellow color, rated for 76A, Phoenix Contact Model No. 0423027

- iii) Copper bus bar: 1/8" x 3/8" tin-plated, Phoenix Contact Model No. 0402174

- b) Or equal as approved by the Engineer

25. Panel Exhaust Fan and Fan Thermostat

- a. Panel exhaust fan shall be UL listed and powered from 120VAC.
- b. Shall have integrated cover grill and removable filter
- c. Shall include external thermostat with an adjustable range from 30°F to 140°F
- d. Panel exhaust fan shall be sized according to panel cooling requirements.
- e. Acceptable products (Fan): Hoffman Series SF-05 filter fan package, catalog No. SF0516002, or equal as approved by the Engineer
- f. Acceptable products (Thermostat): Hoffman Temperature Control Switch. Hoffman catalog No. ATEMNO, or equal as approved by the Engineer

26. Panel Heater

- a. Panel heater shall be UL listed and powered from 120VAC.
- b. Integrated thermostat adjustable from 0°F to 100°F
- c. 200 watt heating capacity

- d. Acceptable products: Hoffman electric heater, catalog No. DAH2001A, or equal as approved by the Engineer

27. Nameplates

- a. Nameplates shall be provided.

28. EMI/RFI Filter

- a. Main incoming interference filter, DIN-rail mounted, rated 10A at 264VAC maximum voltage, for use on a 120VAC system
- b. Differential mode (symmetrical) (DM) and common mode (asymmetrical) (CM) input attenuation shall be no less than:
 - 1) 100kHz: 20dB DM, 20dB CM
 - 2) 500kHz: 70dB DM, 40dB CM
 - 3) 1MHz: 90dB DM, 40dB CM
 - 4) 5MHz: 60dB DM, 40dB CM
 - 5) 10MHz: 40dB DM, 50dB CM
- c. Acceptable products: Phoenix Contact Model 2788977, or equal as approved by the Engineer

29. Control Net T-Taps at connection points for Control Net modules. Rockwell Automation catalog number 9904-TPYS, or equal as approved by the Engineer.

2.3 JUNCTION TERMINAL BOXES

- A. Refer to Section 41 35 60.

2.4 FIBER OPTIC CABLE PATCH PANELS

- A. Refer to Section 41 35 60.

2.5 SPARES AND EXPENDABLES

- A. General:

- 1. In addition to the items noted below and in the other specification sections, the PCSS shall provide suitable spare parts and expendable items in sufficient quantities to sustain ICPS for a period of 1 year after acceptance. All spare parts shall be delivered to the site before testing begins.

2. The following tabulation of spare parts and maintenance equipment is presented as a minimum of suitable types and quantities to be provided. The PCSS shall review the actual ICPS provided and submit to the District for approval a specific list. The District's decision as to both types and quantities to be provided shall be final:
 - a. Provide the following spares:
 - 1) Fuses: 20 percent spares of each size and type used, but no less than 10 of each size and type
 - 2) Relays: 20 percent spares of each type used, but no less than five of each type
 - 3) Indicating Light Bulb: 20 percent spares of each size and type used, but no less than 10 of each size and type
 - 4) Power Supplies: 20 percent spares of each size and type used, but no less than three of each size and type
 - 5) PLC Modules: PLC spare parts shall be provided as listed in Section 40 94 43.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install equipment specified above as shown on the drawings. Follow all manufacturers' instructions when installing PLCs, networks, and accessories.

3.2 FACTORY QUALITY CONTROL

- A. All factory testing shall be in accordance with Sections 01 75 17 and 41 35 60.

3.3 FIELD QUALITY CONTROL

- A. All field testing shall be in accordance with Sections 01 75 17 and 41 35 60.

END OF SECTION

SECTION 41 35 60

CARBON DIOXIDE FEED AND PH CONTROL SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Supplier shall design, manufacture, and provide field services for eleven complete carbonic acid feed and pH control systems (skids) for the injection of carbonic acid at four separate District facilities. The injection of carbonic acid at Pardee Chemical Plant (Site 1) will be discharged into a pressurized pipeline; and injection at the three in-line water treatment plants: Orinda Water Treatment Plant (Site 2), Lafayette Water Treatment Plant (Site 3) and Walnut Creek Water Treatment Plant (Site 4) will be into open channels. The carbonic acid feed systems are required to control pH within acceptable ranges defined by the operators. Example P&ID's and site plans are provided reference material attached. The number of systems and configuration for each site are stated below:
1. Pardee Chemical Plant: 3535 Sandretto Rd., Valley Springs, CA 95252 (Quantity: 2, 1+1 configuration)
 2. Orinda Water Treatment Plant: 190 Camino Pablo, Orinda, CA 94563 (Quantity: 3, 2 dose points, 2+1 configuration)
 3. Lafayette Water Treatment Plant: 3848 Mt Diablo Blvd., Lafayette, CA 94549 (Quantity: 2, 1 dose point (1+1 configuration))
 4. Walnut Creek Water Treatment Plant: 2201 Larkey Ln., Walnut Creek, CA 94597 (Quantity: 4, 2 dose points (1+1 configuration each))
- B. Provide spare parts recommendations, lubrication schedule, and preventive maintenance schedule.
- C. Package, test and ship complete skidded equipment to designated locations.
- D. Furnish all documentation required to complete skid procurement; engineer interfaces; safely receive, install, commission, and test the skid; and operate and maintain the skid. Documentation shall include seismic calculations for the complete module for the location where the equipment will be installed, as well as erection drawings, each stamped by a registered professional engineer licensed in California.
- E. Commissioning and startup support at each location.
- F. Related Sections:
1. 01 31 23.10 Web-Based Construction Documentation
 2. 01 33 00 Submittal Procedures

3. 01 45 27 – Shop Inspection
4. 01 61 01 – Electrical Requirements for Mechanical Package Systems
5. 01 75 17 – Field Testing and Startup
6. 01 79 00 – Demonstration and Training
7. 01 81 02 – Seismic Design Criteria
8. 05 05 24 –Shop Welding
9. 05 05 26 – Flange Bolting
10. 26 29 23 – Low Voltage Variable Frequency Drives
11. 40 95 13 – Process Control Panels and Hardware
12. 40 41 13.13 – Process Piping Elect Resistance Heat Tracing

1.2 REFERENCES

The latest edition of the following listed codes and standards, as applicable, shall govern design, manufacture, and quality assurance of equipment and material to be supplied:

- A. National Sanitation Foundation (NSF) - 60/61 - Drinking Water System Components – Health Effects
- B. American Water Works Association (AWWA)
- C. ASCE 7 - 2016, American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
- D. ASME Boiler and Pressure Vessel Code Section II – Materials
- E. ASME Boiler and Pressure Vessel Code Section V – Nondestructive Examination
- F. ASME Boiler and Pressure Vessel Code Section VIII Division 1 – Rules for Construction of Pressure Vessels
- G. ASME B31.3 – Process Piping
- H. ASME B16.34 – Valves – Flanged, Threaded, and Welding End
- I. ASME B16.5 – Pipe Flanges & Flanged Fittings

1.3 DEFINITIONS

- A. Supplier: Shall be synonymous with Carbon Dioxide System Supplier and Manufacturer.

- B. Installer: “Installer” or “Installing contractor is the individual, partnership, corporation, or joint-venture, or other legal entity under separate contract with the Owner who installs, tests, and starts up the product(s) furnished under this Contract.
- C. The District: The East Bay Municipal Utility District.
- D. 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.

1.4 QUALITY ASSURANCE / MANUFACTURER REQUIREMENTS

- A. Unit Responsibility: The carbonic acid feed system shall be furnished complete, skid mounted, factory tested, with all accessories and appurtenances as described in the drawings and specifications herein. All parts shall have nominal strength, stability and stiffness and shall be especially adapted for the intended service per applicable codes. Under no circumstances shall field welding be performed on the skid without engineer approval. All welds will be shop welded and inspected per Section 05 05 24. Ample room and facilities shall be provided for inspection, repairs, and adjustments. All products provided shall be warranted by the Manufacturer. The Manufacturer shall provide a ‘letter of compliance’ on Company letterhead certifying compliance with the sole responsibility requirement.
- B. Qualifications:
 - 1. The Manufacturer has successfully designed and manufactured similar equipment for the proposed application for at least 5 years. The Manufacturer shall provide a ‘letter of compliance’ on company letterhead certifying compliance with the 5-year experience requirement.
 - 2. The Manufacturer provides a list of at least ten water or wastewater installations who are current successful users of similar water treatment systems designed, assembled and furnished by the Manufacturer at similar carbonic acid concentrations. The list shall also include phone numbers and contact information for each user.
 - 3. All factory authorized spare parts shall be available from at least one location within the USA.
 - 4. The manufacturer shall have its own local service organization or representative to ensure good overall service support during start-up throughout the warranty period.
- C. Coordination with VFD Manufacturer:
 - 1. The Supplier shall coordinate with the VFD manufacturer regarding all factory acceptance and field testing requirements.

1.5 SUBMITTALS

See Section 01 33 00 for procedures.

A. Submit the following prior to system fabrication for approval:

1. Fabrication Drawings: Provide fabrication drawings showing the locations, dimensions and weights of the internal major components of the skid package, including connection locations & sizes, and any piping connection load limits. Also, indication of the package center of gravity, and maintenance removal distances.
 - a. Provide detail drawings of Pardee CO2 nozzle.
 - b. Pressure Vessels:
 - 1) All weld procedure specifications that will be used in the manufacture of the vessel together with supporting procedure qualification records.
 - 2) The type of documented quality program being used and a copy of the registration certificate.
 - 3) Detailed inspection and testing plan
 - 4) U-stamped drawings, including but not limited to, a drawing of the pressure vessel nozzle configuration and schedule; material numbers and traceability numbers; bill of materials; and heat treatment condition.
 - 5) Vessel detailed calculations.
2. Manufacturer's catalog data of components listed herein.
3. Calculations confirming system hydraulics for the Pardee Chemical Plant system.
4. Calculations for total thrust load of the Pardee CO2 nozzle.
5. Calculations demonstrating compliance with the natural frequency separation requirements in Article 2.4.D.4 hereinafter.
 - a. Calculations by a California Licensed Professional Mechanical or Civil Engineer shall be submitted to the Engineer to verify compliance with the above Natural Frequency separation requirements.
6. Submit for approval complete design calculations for seismic anchorage of equipment certified by a Civil or Structural Engineer registered in the State of California. All equipment anchorage to concrete shall meet requirements of Chapter 17 of ACI 318. See Specification Section 01 81 02 for seismic design requirements.

7. Piping and Instrumentation Diagrams (P&IDs), including Legend, Process Schematic, Instrumentation with alarms and shutdowns, setpoints and interlocks shown using blocks in ISA format.
 8. If the manufacturer is supplying any loose accessory equipment, then outline drawings of the loose shipped accessories shall be provided.
 9. Electrical Drawings:
 - a. Provide elementary and interconnection wiring drawings for all control systems designed to show a complete loop of each circuit with termination points included, three wire diagram of the power distribution system, diagram for instrumentation etc.
 - b. Wiring diagram designed to show the detailed electrical arrangement drawings for electrical equipment furnished.
 10. Control Strategy Flowchart: A control strategy flowchart shall be submitted for review prior to commencing any programming.
 11. Complete Motor Data Sheet. Information on the Motor Data Sheet shall include, at a minimum: type and frame number, rpm, service factor, motor efficiency, full load amperes, no load amperes, locked rotor current, insulation system designation, NEMA design letter, guaranteed noise level at 1 meter, weight in lbs.
 12. Recommended shipping, off-loading and storage procedures
- B. Submit the following six weeks (minimum) prior to Factory Acceptance Testing:
1. Detailed factory test procedures
 - a. Tests procedures at a minimum shall include: general schedule, test setup and preparation, mechanical test run, performance test run with test conditions, documentation, acceptance criteria for test run, visual inspection.
 - b. Detailed sketch of test installation including locations of all instruments, pressures, pumps, piping, etc.
 2. Completed P&ID's.
 3. HMI screen examples and ladder logic.
 4. Equipment warranty certificate
 5. Pressure Vessel:
 - a. A report containing the following information and correlated to each vessel by the material number and traceability number shall be supplied:

- 1) Material test reports for all pressure-containing components of the vessel including, chemical composition of the material; tensile test results; methods of heat treatment; and notch toughness test results.
- 2) For solid hex plugs NPS 2 and smaller, and for all other pressure-containing parts smaller than NPS 2, a Certificate of Compliance may be supplied in lieu of a material test report. The Certificate of Compliance shall certify the specification to which the material was manufactured and may be issued by the pressure vessel manufacturer or the part supplier.
- 3) A written record of all nondestructive inspection results required shall be prepared and certified by the vessel manufacturer for submission to The District. These records shall identify the name of the inspection company, procedure number and revision level used.
- 4) Hydrostatic test records
- 5) Certificate of Compliance in accordance with the ASME Code, Para UG-120, Form U-1A.
- 6) Photocopy of the vessel nameplate
- 7) As Built drawings

C. Submit the following prior to shipping:

1. Certified and District approved factory test report
2. Operations and Maintenance (O&M) Manuals
3. Field test procedures
4. Detailed lessons plans for the on-site training classes
5. Resumé of the Manufacturer's field representative

D. Submit the following prior to Startup and Commissioning milestone:

1. Statement of Conformance: The Manufacturer of the carbonic acid feed system shall inspect the completed installation and provide written certification that the system will operate as designed and specified herein.
2. Manufacturer's Certificate of Proper Installation
3. Field test results- final documentation for both the factory acceptance test and the field tests.

E. Pre-Startup Control System PLC Program: The following files shall be submitted a minimum of 4 weeks prior to the start of field testing.

1. Studio 5000 programming software for the Rockwell Automation CompactLogix or ControlLogix PLC
 2. Operator Interface Program: The operator interface program software shall be submitted in its native format.
- F. Supplier shall provide one copy of each of the following at startup:
1. Installed PLC program
 2. Installed OIT program
- G. Post-Startup Control System Electronic Files: The following files shall be submitted after the system startup and field testing.
1. Installed PLC program
 2. Installed OIT program

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Materials: Materials and equipment shall be the standard products of manufacturers regularly engaged in the fabrication of such products, with the following requirements. All welded materials shall be type 304L stainless steel and non-welded materials shall be type 304 stainless steel to the extent possible or unless otherwise stated in this specification. All piping and fittings will be type 304L stainless steel with welded connections and type 304 stainless steel for non-welded connections. The piping shall be flanged to match the end connections of the inline equipment and valves. The injection skid water supply inlet and solution outlet shall be flanged. The injection skid carbon dioxide inlet shall be flanged.
1. All materials in contact with service 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 service water is "SVW" – Service Water System.
 2. All materials in contact with service water shall be tested and certified as "lead-free" per California Health and Safety Code Section 116875..
 3. Any dissimilar metal connections in contact with water shall be isolated with dielectric materials or insulation sets. All piping and equipment shall be sized and specified by the supplier, those shown in the P&ID's are for reference only.
- B. Low point drains shall be added to drain the skid when not in operation.
- C. Any piping or components in contact with water for the Pardee system shall be heat traced and insulated for freeze protection.

1. Pipe insulation and jacket: Type 1 insulation, per Section 2.4.B.12, with type 3 jacket per Section 2.4.B.13
- D. Size Limits: The skids shall fit within the area shown in the drawings at the end of this section. The skid dimensions shown in the drawings are maximum sizes. The maximum height of the WTP skids is 10'-0".
- E. Nameplates: Engraved or stamped on Type 304 or 316 stainless steel and fastened to equipment at factory in an accessible and visible location.
 1. Indicate following information as applicable:
 - a. Manufacturer's name
 - b. Equipment model number and serial number
 - c. Maximum and Normal rotating speed
 - d. Horsepower
 - e. Rated capacity
 - f. Service class per applicable standards
 2. Nameplates for Pumps: Include:
 - a. Rated total dynamic head in feet of fluid
 - b. Rated flow in gallons per minute
 - c. Impeller, gear, screw, diaphragm, or piston size
- F. Safety Devices: The completed work shall include all necessary permanent safety devices, such as machinery guards, relief valves, emergency stops and similar items required by OSHA, and other federal, state, and local health and safety regulations.
 1. Guard Requirements:
 - a. Allow visual inspection of moving parts without removal.
 - b. Allow access to lubrication fittings.
 - c. Prevent entrance of rain or dripping water for outdoor locations.
 - d. Size belt and sheave guards to allow for installation of sheaves 15 percent larger and addition of one belt.
 2. Materials:
 - a. Sheet Metal: Stainless steel, 12-gauge minimum thickness

- b. Fasteners: Stainless steel per Section 05 05 26

2.2 SERVICE CONDITIONS

- A. The carbon dioxide feed system will be located outdoors and mounted to concrete, under a canopy with walls as necessary for shade. Care shall be taken to ensure electrical enclosure have the required cooling, heating, and ventilations systems that are properly sized to ensure proper operation at ambient temperatures of 11°F to 111°F.
- B. Service Water 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.

2.3 PERFORMANCE REQUIREMENTS

- A. The carbon dioxide feed system shall be capable of dissolving high concentrations of carbon dioxide into water and delivering the supersaturated water 24 hours a day, 365 days a year, with one startup/shutdown cycle per day.
- B. Each skid requires a 2nd, full size, flow control device (pump or control valve) for the supply water.
- C. All equipment shall be designed for a minimum 50 year design life. All equipment shall be designed for optimum efficiency and low maintenance. All equipment shall be designed for continuous unattended service while operating within the limits of the operating range.
- D. The system shall be designed to automatically control the raw water pH via feedback control loops. The system shall be capable of receiving a desired CO₂ dose rate or desired pH, and adjust the carbonic acid pH to desired levels set by the operator.
- E. The carbon dioxide feed system and associated components shall be designed and provided such that they fully dissolve, into a sidestream of water prior to re-injection, the specified number of pounds of carbon dioxide per hour defined below given the assumed water temperature and gas purity indicated. The carbon dioxide transfer efficiency must be at least 98 percent at the highest carbon dioxide feed rate (lb/hr) listed below for each site.
 - 1. System Capacity: Each CO₂ solution feed system shall have the following capabilities:
 - a. Table 2: Performance requirements for Pardee Chemical Plant

Water Temp (°C)	17
Gas Purity	99.50%
Minimum CO ₂ feed rate	302 lb. per hour
Average CO ₂ feed rate	1323 lb per hour
Maximum CO ₂ feed rate	2397 lb. per hour
Number of Solution Feed Skids	2 (1 + 1)
Maximum Carrier Water Required	375 gpm
Water Pressure @ Skid Inlet	45 – 90 psig
Pardee Nozzle Elevation	El. 399.4'
Pardee Skid Elevation	EL. 648' (proposed)
Pardee Reservoir Elevation	520' to 567'
Pardee Tunnel Flow (Min)	41 MGD
Pardee Tunnel Flow (Avg)	167 MGD
Pardee Tunnel Flow (Max)	325 MGD
Pardee Tunnel Dimensions	See Drawings

b. Table 3: Performance requirements for Orinda Water Treatment Plant

Water Temp (°C)	17
Gas Purity	99.50%
Minimum CO ₂ feed rate	31 lb. per hour
Average CO ₂ feed rate	100 lb per hour
Maximum CO ₂ feed rate	306 lb. per hour
Number of Solution Feed Skids	3 (2 + 1 swing)
Maximum Carrier Water Required	65 gpm
Water Pressure @ Skid Inlet	5 psig

c. Table 4: Performance requirements for Walnut Creek Water Treatment Plant

Water Temp (°C)	17
Gas Purity	99.50%
Minimum CO ₂ feed rate	23 lb. per hour
Average CO ₂ feed rate	92 lb per hour
Maximum CO ₂ feed rate	306 lb. per hour
Number of Solution Feed Skids	4 (1 + 1, two locations)
Maximum Carrier Water Required	65 gpm
Water Pressure @ North Skid Inlet	5 psig
Water Pressure @ South Skid Inlet	5 psig

d. Table 5: Performance requirements for Lafayette Water Treatment Plant

Water Temp (°C)	17
Gas Purity	99.50%

Minimum CO ₂ feed rate	11 lb. per hour
Average CO ₂ feed rate	15 lb per hour
Maximum CO ₂ feed rate	38 lb. per hour
Number of Solution Feed Skids	2 (1 + 1)
Maximum Carrier Water Required	30 gpm
Water Pressure @ Skid Inlet	45 psig

F. The carbon dioxide feed system shall be capable of automatic control based on the following, at a minimum:

1. Operator input of desired pH at specified monitoring location. Installing Contractor shall provide a 4-20mA signal from upstream and downstream pH meters. These signals will be provided directly to the carbon dioxide skid where applicable.
2. Operator input of the desired CO₂ dose (mg/L). Installing Contractor will provide 4- 20mA signals from influent flow meters directly to the carbon dioxide skid for dosage calculations where applicable. Flowmeter outputs at the Pardee Chemical Plant shall be provided to the skid through the Plant's SCADA PLC.
3. Operator input of pounds of carbon dioxide per hour.

2.4 SYSTEM DESCRIPTION

A. Each carbon dioxide feed system shall be factory assembled, skid mounted, and located outdoors. The skid-mounted system shall be a stand-alone system. It shall be supplied with all equipment, piping, fittings, instruments, valves, and accessories necessary for operation given connection to the carrier water piping, and CO₂ feed gas piping. The skid-mounted system shall come with the proper fittings available to connect to carrier water piping and CO₂ feed gas piping as specified herein. All piping, valves, fittings, gauges, meters, and accessories shall be compatible with carbon dioxide and the specified service water (SVW). Refer to the P&ID's for more information at the end of this section.

B. Mechanical and Instrumentation Components

1. All skid interconnecting piping shall be designed, fabricated and installed in accordance with ASME B31.3 Power Piping Code.
2. Pressure vessels shall be designed, inspected and stamped in accordance with rules and regulations of the latest edition of ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.
 - a. All pressure vessels shall be constructed from 304L stainless steel in the U.S.A.
 - b. Two spare nozzles, size NPS 2 shall be provided on the top and bottom heads, one on each head.

- c. The use of olet-type fittings shall be limited to size NPS 2 or smaller.
 - d. All nozzle welds shall be full penetration.
 - e. All flanges used in the fabrication of vessels shall be weld neck raised face in accordance with ASME B16.5.
 - f. Vessel heads shall not be flanged or flat type.
 - g. Heat treatment of the vessel shall be performed as a whole unit. Local stress relief where heat treatment of the entire vessel would be detrimental to internal components may be performed subject to approval by The District.
 - h. Nozzles used with a safety relief valve, drain, bottom outlet connection and manway shall be flush with the inside surface of the vessel without sharp edges.
 - i. The edges of all brackets, lifting lugs and other appurtenances of vessels shall be rounded.
 - j. The nameplate bracket and all other attachments to a vessel shall be fillet welded along the full length of the attachment.
 - k. Hydrostatic tests of the completed vessels shall be tested in accordance with the requirements of Para. UG-99 of the ASME Code. Test duration shall be not less than four hours. The test pressure shall be at least 1.5 times the maximum allowable working pressure. The test pressure shall not exceed specified minimum yield strength.
 - l. Continuous recording charts showing the pressure, temperature and duration shall be made during the test. The test charts shall be certified by the manufacturer and submitted to The District, together with the manufacturer's final reports.
 - m. After the test, the vessel shall be drained of the test fluid and dried to prevent corrosion and freezing damage.
3. Off-skid piping connections shall be anchored to the skid frame to withstand off-skid piping loads.
 4. All carbon dioxide gas piping, valves and fittings shall be Schedule 40s, type 304L, welded, stainless steel.
 5. The water and carbon dioxide solution piping, valves and fittings shall be Schedule 40s, welded, type 304L stainless steel.
 6. Pipe 2" NPS and smaller shall be socket welded, Pipe 2" NPS and greater shall be butt welded. All welding shall comply with Section 05 05 24.

7. Pressure Transmitter
 - a. Low Range (up to 36 psig): Rosemount model 3051CD3A02A1AM5BADOH2L4
 - b. High Range (up to 300 psig): Rosemount model 3051CD4A02A1AM5BADOH2L4

8. Pressure Gauge
 - a. Ashcroft Series 251009, 3-1/2" Dia., 316SST, Liquid Filled, Polycarbonate Window
 - 1) Gauges shall be capable of pressures 50% higher than the gauge full scale without damage.

9. Reactor Level Transmitter
 - a. Rosemount Model 3051CD, 316 SST, TFE Gasket/O ring, 4-20 mA, NEMA 4X, HART protocol, 2 wire/30 VDC, Adjustable Damping, LCD display w/ engineering units, Integral JB Signal Termination

10. Liquid Supply Pumps:
 - a. Type: Inline Vertical Multistage Centrifugal (Goulds eSV or equal as approved by the Engineer).

b. Quantity:

Location	Quantity
Pardee Chemical Plant	4 (1 duty, 1 standby per skid)
Orinda WTP	6 (1 duty, 1 standby, per skid)
Walnut Creek WTP	8 (1 duty, 1 standby, per skid)
Lafayette WTP	4 (1 duty, 1 standby, per skid)
Total	22

11. Flow Control Orifice and Nozzle
 - a. Chemical Injection at Pardee Chemical Plant
 - 1) Provide two flow control devices (one spare) for each skid, for discharge into the Pardee Tunnel (four total).
 - 2) Discharge of carbonic acid into Pardee Chemical Plant shall be completed via a 4-inch Type 304L stainless steel pipe that extends approximately 260 feet deep into the pressurized Pardee Tunnel (65-

80 psi). Pardee Tunnel is 8 feet in diameter with concrete lining. Injection nozzle velocity and/or direction should be designed not to impinge on the cement liner. The nozzle shall have a 2 ½" FNPT connection. Supplier shall coordinate nozzle fabrication and installation onto the carrier pipe to be performed by Others (Pardee Shaft installer).

- 3) Supply hydraulic calculations of the system demonstrating coordination with this constraint.
- b. Orinda WTP/Walnut Creek WTP/ Lafayette WTP:
- 1) Supply flow control devices needed to provide adequate backpressure.
 - 2) Provide two flow control devices (one spare) for each skid, for discharge into open channel flow.
 - 3) Drawings showing the injection location at each WTP are shown at the end of this section.
 - 4) At Lafayette WTP, the injection point is located at the old rapid mix concrete basin. This basin is open to atmosphere and a nozzle or sparger will be required for carbonic acid injection. The piping in the basin will need to be supported off the basin walls or floor.
 - 5) At Orinda WTP, the injection point is located at the north end of the raw water channel where there is an existing chemical injection system. The raw water channel is open to atmosphere and a nozzle or sparger will be required for carbonic acid injection. The piping in the basin will need to be supported off the basin walls or floor.
 - 6) At Walnut Creek WTP, the injection points are located at the north and south raw water control valve vaults. These vaults are identical for carbonic acid injection. Downstream of the control valve there are two, 2-inch taps off 54-inch pipe, and one is currently being used for sodium hypochlorite injection. The other has a blind flange, which will be tapped for carbonic acid injection. The injection assembly shall be designed for minimal intrusion into the 54" pipe. The pressure inside the 54" pipe is approximately 30 psig for the north vault and 10 psig for the south vault.

12. Insulation, Type 1:

- a. Insulation Material: Closed cell elastomeric insulation. Tubular form for pipe sizes 6-inch and under and sheet form for pipe sizes 8-inch and larger.
- b. Temperature Range: Minus 70 degrees Fahrenheit to plus 220 degrees Fahrenheit.
- c. Thermal conductivity, K Factor at 75 Degrees Fahrenheit: 0.27 or better.

- d. Water Vapor Permeability: 0.10 perm-inch or better.
- e. ASTM E84 Fire Ratings: 25 or less flame spread index, 50 or less smoke developed index.
- f. Meets or exceeds: UL181 Mold growth.
- g. Maximum Moisture Absorption: 0.2 percent by volume.
- h. Joints: Seal with adhesive to form continuous water barrier.
- i. Acceptable Products: Armacell AP Armaflex, Nomaco K-flex Flex-Therm, or equal as approved by the Engineer.

13. Jacket, Type 3:

- a. Material: Ultraviolet resistant polyvinyl chloride jacketing, 20 mil minimum thickness.
- b. System temperature range: 45 deg F to 150 deg F.
- c. ASTM E84 Fire Ratings: 25 or less flame spread index, 50 or less smoke developed index.
- d. Color: White.
- e. Overlap: One inch minimum at joints and fittings.
- f. Joint Seal: PVC solvent welded or adhesive as recommended by the manufacturer.
- g. Fitting Covers: Factory made with full thickness insulation.
 - 1) Acceptable Products: Johns Manville Zeston 2000 PVC, or equal as approved by the Engineer.

C. Control Panel:

- 1. The control panel shall be designed per Section 40 95 13.
 - a. The supplier of this control system shall be responsible for the system integration of the entire carbonic acid feed control system, including design, construction, and fabrication of the entire control system panel.
 - b. Each skid-mounted carbon dioxide feed system, including all pumps, motors, gauges, and meters, shall be operated from (1) single air conditioned control panel. The control panel shall provide manual and automatic control for the unit and provide one set of dry contacts for gas supply unit safety interlocks. The control panel shall have the following components:

1) Control Panel Enclosure

(1) Type: NEMA 4X, complete with back panel, constructed following UL-508A and installed following NEC 409 standards.

b) Accessories:

i) Air-conditioning cooling unit

ii) Heating unit, as necessary to meet requirements in Section 2.2.

iii) Operator Interface (OIT)

c) Type: Allen Bradley PanelView Plus Graphic Terminal

d) Qty: 1 per skid

e) Accessories: The OIT screen shall be provided with a suitable sun shield.

f) Operating Control Mode selection shall be available to the Operator from the OIT.

2) PLC

a) Type: Rockwell Automation CompactLogix or ControlLogix with Gigabit Ethernet Communication card

b) Qty: 1 per skid

c) Remote Communication Access:

i) ST Fiber Optic cable and RJ45 CAT 6 enabled Ethernet Switch.

2. Lockable Power Disconnect, Run and Fail indicating Lights, Common Alarm Light, System Stop and Start Push Button, Reset Button, and Alarm Test Button.
3. One (1) on/off switch and power light will be provided on the control panel door. The switch will provide 120 Volt AC power to the electronics in the panel and on the skid. All PLC cabinets will have UPS or battery backup and all PLC power shall be provided by UPS. Switch and light module shall be NEMA 4X rated.
4. All necessary I/O modules, switches, media converter, software and operating interface to make a complete control system.

5. All necessary signal modules for analog and digital I/O required to communicate as described below.
6. The following signals will be provided directly to the supplier control panel where applicable:
 - a. Raw water pH measurement downstream of chemical feed point (4-20 mA)
 - b. Flow measurement of bulk flow at dosing point (4-20mA)
7. The system will have three modes of operation: "REMOTE-AUTO," "REMOTE-MANUAL," and "HAND". "REMOTE-AUTO," and "REMOTE-MANUAL" modes will be controlled by the supplier control panel. The normal operating mode for the control system in "REMOTE-AUTO" is predicated on a feed backward, flow pace control scheme: the system will meet a target pH set point based on an upstream pH signal set by operations personnel, and the plant water flow rate in million gallons per day (MGD), with feed-back trim based on the downstream water pH signal, as discussed above. "AUTO" operation will be available at the Local HMI and/or the plant Distributed Control System/SCADA network and will rely on signals from SCADA for operation. In the "MANUAL" mode of operation, the supplier control panel will deliver an operator-determined CO₂ flow rate (lb/hr), setpoint. "MANUAL" operation will also be available at the local HMI and/or the plant SCADA network. Should there be a problem with the gas system automation controller; plant personnel can operate the gas locally in the "HAND" mode of operation through manipulations of a bypass valve. If the gas feed control system were to fail, the system shall fail in its last setting.
8. The following signals shall be exchanged between supplier control panel and the plant DCS by way of Modbus/TCP (Orinda and Walnut Creek WTPs), or SCADA by way of DNP3 (Pardee Chemical Plant), or hardwired (Lafayette WTP):
 - a. From the plant operations to the supplier control panel:
 - 1) Start
 - 2) Stop
 - 3) Auto select
 - 4) Manual select
 - 5) Plant water flow rate (MGD)
 - 6) Treated water pH
 - 7) pH setpoint
 - 8) Auto CO₂ dosage setpoint (mg/L)

- 9) Manual flow setpoint (lbs/hr)
- 10) CO₂ feed system shutoff
 - a) This will occur in the case of any CO₂ monitor alarm (from CO₂ storage), plant shutdown, or other emergency. Shutoff to be hard wired to supplier control panel.
 - b. From the supplier control panel to the plant DCS or SCADA
 - 1) pH measurement downstream of chemical feed point
 - 2) CO₂ dose in mg/L
 - 3) CO₂ flow rate in lb/hr
 - 4) Flow rate of carrier water
 - 5) Status of all motorized equipment on the feed skid
 - 6) Status of all instrumentation on the feed skid
 - 7) CO₂ monitor alarm
 - 8) System shutdown or emergency alarm (hardwired)
 - 9) CO₂ feed system enabled
 - 10) CO₂ feed system mode of operation

D. Electrical Components and Accessories

1. General: The carbon dioxide feed system shall be provided with sufficient skid-mounted instrumentation and controls such that the entire system, including all components, can be monitored and controlled locally by the operator.
2. Junction Box: For each unit, a skid mounted junction box shall be provided for common termination of all electronic components and sensors. It shall be factory mounted to the skid frame.
 - a. Type: stainless steel, NEMA 4X
3. Motors:
 - a. 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. Complete individual forms for each type of motor on the project.

- b. The Supplier 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.
- c. Motors shall meet or exceed the requirements of IEEE 841.
 - 1) Premium efficiency
 - 2) Include thrust-bearing losses in the motor efficiency calculation.
 - 3) Corrosion resistant cast iron construction with TEFC enclosure.
 - 4) Non-wearing, non-contacting, radial-axial labyrinth bearing isolator (INPRO/SEAL) on the shaft extension end for a vertical motor.
 - 5) 1.15 service factor at 40 degrees Centigrade.
 - 6) Ground lug in conduit box.
 - 7) Ground terminal on frame.
 - 8) Class F insulation with Class B (90 deg C) rise at 1.15 Service Factor for TEFC enclosures (Resistance Method).
 - 9) Oversized main conduit box.
 - 10) NEMA Design B.
 - 11) Non-witnessed IEEE 841 enhanced no-load test.
 - 12) AFBMA bearing numbers stamped on the motor nameplate.
 - 13) 50,000 hour bearing L-10 life.
 - 14) The driven equipment supplier shall provide thrust loads to the motor supplier.
- d. Motor shall be sized such that 110% of nominal HP is not exceeded at any point of pump curve.
- e. Unless otherwise specified in the driven equipment specifications, vertical motors shall be provided in the vertical solid shaft configuration.
- f. Voltage: 460 volt, 3 phase, 60 HZ.
- g. Frame: Cast iron.
- h. Enclosure: Totally Enclosed Fan Cooled.
- i. Continuous duty.

- j. Bearings: Grease lubricated sealed ball or needle bearings.
 - k. Insulation: Class F.
 - l. Nominal Efficiency: 89.5 percent.
 - m. Provide insulation treatment of two cycles of vacuum pressure impregnation of 100% solid epoxy resins. Insulation treatment shall meet the NEMA definition for moisture-resistant winding per NEMA MG1-1.27.1
 - n. Provide 120 V single-phase space heaters for all three-phase motors.
 - o. 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.
 - p. Provide UV resistant enamel exterior finish coating
4. Drive: Variable Frequency per Section 26 29 23
- a. Polyphase motors for use with variable frequency drives shall be rated as definite-purpose inverter fed as defined under NEMA MG-1, Part 31.
 - b. Provide a shaft grounding ring for all VFD-driven motors regardless of size.
 - c. Variable frequency drives 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.
 - 1) Apply a 1.5 service factor to nameplate horsepower and torque of prime source of power and not to actual equipment loading.
 - 2) 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.
 - 3) When manufacturer recommends service factor greater than 1.5, manufacturer's recommendation takes precedence.
 - d. Vibration:
 - 1) Natural Frequency: Ensure there are no natural resonant torsional, radial, or axial frequencies within 20 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 so vibration levels measured at the pump and at the motor bearing frame/supports do not exceed a velocity of 0.08 in/sec peak to peak at any discrete frequency.

5. Alarms and Warnings:

- a. All Alarms and Warnings shall be active in both Automatic and Manual modes of operation.
- b. Alarms shall be identified for each protection monitored parameter. Alarms resulting in shutdown shall be identified for any condition that may cause damage to the equipment. When any control loop or device failure activates an alarm, it shall be displayed on an Alarm Screen of the HMI and indicate the shutdown on the control panel. All alarms and shutdowns shall be relayed to the plant DCS or SCADA as a general/generic alarm signal and a general shutdown signal. Audible alarms are not permitted.
- c. Time delays shall be provided to prevent nuisance Alarms and Warnings during operation and while starting the equipment.

6. Heat Tracing shall be per Section 40 41 13.13.

E. The above components will be factory assembled and all field connections clearly marked. The entire assembly shall be shop tested and calibrated.

F. All necessary valves, safety equipment, gauges, pipe and fittings, accessories, shall be provided for a complete and fully operational system.

G. Unless otherwise noted, exposed metal, except stainless steel, shall be primed with epoxy primer and coated with polyurethane enamel, Manufacturers' standard color. The system is as follows:

1. Surface preparation shall conform to SSPC-SP 10.

- a. Pretreat any galvanized surfaces in accordance with the manufacturer's recommendations.

2. Coatings in direct contact with potable water shall be certified by the National Sanitation Foundation in accordance with ANSI/NSF Standard 61. Any exceptions shall be specified.

- a. High Solids Epoxy/UV resistant urethane top coat (to be factory coated): Carbon steel (including piping, valve bodies, and all other carbon steel materials).

1) Thickness: 8 – 12 mil total thickness.

- b. Items not requiring coating: stainless steel, aluminum, galvanized steel, and plastics.
- 3. Acceptable Products:
 - a. High build epoxy coatings:
 - 1) Carboguard 890; Carboline Company.
 - 2) Hi-Build Epoxy V78 Series; Valspar Corporation.
 - 3) Bar-rust 235, Devoe Coatings Co, or pre-approved equal
 - b. UV resistant Urethane Top Coat:
 - 1) Tnemec Co. Series 1075 Urethane.
 - 2) Carbothane 134 VOC Aliphatic Urethane, or pre-approved equal.

PART 3 - EXECUTION

3.1 FACTORY ACCEPTANCE TESTING

- A. The District reserves the right to witness the Manufacturer's fabrication process and Factory Acceptance Testing at the Manufacturer's facility in order to monitor compliance with the specifications. All tests shall be approved by The District personnel prior to shipping.
- B. The skid mounted assembly shall bear a legal document of certification from the Supplier that it has undergone, and successfully passed, a Factory Acceptance Test at which time all systems were tested by actual operation of the unit. This includes the carbon dioxide feed system liquid flow rates, dissolved carbon dioxide delivery rates, automatic operation of the skid mounted system, simulated alarm situations to demonstrate any automatic safeties of the dissolution system, as well as hydrostatic testing, and mechanical pump, piping, and valves testing. The carbon dioxide feed system must be factory tested as a complete skid mounted package before shipment to Owner. The Owner reserves the right to witness the factory acceptance test in accordance with Section 01 45 27. This cost will be the sole responsibility of the system Supplier.
- C. Written notification of the dates for the fabrication and testing processes shall be provided to the District a minimum 15 work days prior to inspection.
- D. Tests:
 - 1. Refer to Spec 01 45 27 for shop inspection procedures. The performance test will test every component on the skid with water and dry compressed air (for the CO₂ gas system) and ensure all the proper information is being displayed on the HMI. In addition, a hydrostatic test shall be performed on the entire skid assembly in

accordance with ASME B31.3 and on the body and seat of each steel valve shall be performed in accordance with ASME B16.34.

- a. All piping shall be hydrostatically tested to a minimum of 1.5 times the maximum pressure that can occur in the system (including emergency events and device failures) or 225 psig, whichever is greater.
- b. A Mechanical & Instrumentation Factory Acceptance Test will include, but not be limited to a gas system/component test using dry, compressed air, at multiple flow rates to test the flow meter, control valves, instrumentation and relief valves; A water system/component test, testing the pump at multiple speeds, documenting the pump flow, head, hp and efficiency to compare to the pump curves; a control valve test to ensure proper cycling and flow control; and fault tests demonstrating failure states.
- c. An Electrical & Controls Factory Acceptance Test will include, but not be limited to testing every control loop to make sure they all work and information is being displayed correctly on the HMI in all modes of operation; Hipot test; I/O points; Voltage output and Amperage; Check alarms lights and switches; Proper heat tracing functionality maintaining proper temperatures and HMI display; Control panel ventilation, heat and cooling functionality.

2. Pardee CO2 Nozzle Performance Test

- a. Supplier shall demonstrate proposed injection assembly can maintain the minimum and maximum designed carbonic acid flow rates at minimum and maximum operating Pardee Tunnel conditions. The testing shall demonstrate the accuracy of hydraulic calculations given the existing field conditions.
- b. Supplier shall demonstrate through testing that the CO2 nozzle does not impinge on the cement liner when installed. Supplier shall replicate the minimum and maximum Pardee Tunnel Reynolds number and use a bench scale system to replicate the carbonic acid system discharge Reynolds number at the point of injection. Through use of dye, the Supplier shall show to the District the mixing, plume, relative velocities using a clear testing fixture. The Supplier shall ensure that the ratio of carbonic acid system flow rate to tunnel flow rate is at least as large as existing conditions.

- E. Prior to shipment, the units shall be completely assembled, wired, and functionally tested at Supplier's factory. The wiring shall be checked for proper connections and grounds.

3.2 WORK PERFORMED BY OTHERS

- A. The following work will be performed by the Installer: Installation of structural pad and anchor bolts, construction of mechanical piping from the skid to the injection

point, power connection, instrumentation integration into existing PLC, DCS panels, grounding ring, connection and supply to the carbon dioxide gas system and asset tagging.

- B. The Installer will supply all necessary bolting and joint connection materials necessary to install the skid, including those at the skid boundary.
- C. Grounding: The Installer will electrically ground the carbon dioxide tank, panel equipment, and any other required equipment to the grounding ring around the slab. Manufacturer shall provide grounding connections and connection details on equipment drawings.

3.3 FIELD TESTING AND STARTUP

- A. The Supplier shall coordinate with Installer and District on field testing and startup activities, including functional tests, performance tests, control systems functional tests, and operational startup testing as defined in Section 01 75 17.
- B. The Supplier shall test the carbon dioxide solution feed system after installation and demonstrate operation that meets the performance requirements outlined in this specification without excessive noise, vibration or overheating.
- C. The Supplier shall provide a fully working control system. When the skids arrive at the site and have been properly installed according to the installation checklist, a representative of the Manufacturer shall be available to test the system per Section 01 75 17.
- D. The Supplier shall provide a general schedule, test setup and preparation, mechanical test run, performance test run with test conditions, documentation, acceptance criteria for test run, visual inspection, and final documentation for both the factory acceptance test and the field tests.
- E. Supplier shall furnish all additional instruments and analytical sampling and testing required for field performance tests.
- F. The Installing Contractor will conduct pressure testing of the system prior to field testing.
- G. The following field testing shall be conducted with Section 01 75 17:
 - 1. Start equipment, check, and operate the equipment over its entire operating range.
 - 2. The Supplier shall demonstrate the hand, manual and automatic modes of operation to verify proper control sequences, software interlocks, proper operation of software logic and controllers, etc.
 - 3. The performance test will confirm that the installed equipment can meet the maximum CO₂ flow rate (lb/hr). This test will be performed independently of the

water treatment plants, since the carbonic acid generated by the equipment shall be discharged to a separate tank (e.g. a Baker tank).

After successful completion of the performance test, a control system functional test (CSFT) will proceed per Section 01 75 17.

The operational startup test will confirm that the installed equipment can meet a target pH setpoint and the CO₂ skids are installed as they are intended to operate on the full-scale. The gas transfer efficiency will be confirmed during these second tests based on water quality conditions, carrier water flow rates, and the rate of CO₂ consumption from the storage tank.

Functional tests shall include a pump/VFD and control valve test at multiple flow rates documenting applicable values, such as the flow, head, hp, efficiency, and percent open, to compare to manufacturer values and ensure site specific flow requirements.

- H. In the event any system component fails to meet the test requirements, it shall be modified and retested as above until it satisfies the requirement.
- I. After the system has satisfied the requirements, the Supplier shall certify in writing that it has been satisfactorily tested and that all final adjustments have been made. Certification shall include the date of the field tests, a listing of all persons present during the test, and the test date.


3.4 SUPPLIER FIELD SERVICES

- A. Supplier's Representative: the Manufacturer shall furnish the services of a factory trained field representative designated by the equipment/system Manufacturer, who shall be present at the project site to provide the services listed below. The Manufacturer's representative shall have superior knowledge of all aspects of the equipment/system being furnished in this section. The Manufacturer through their field representative shall advise the Engineer of the proper procedures for each of the services listed.
- B. The Supplier's representative shall anticipate a minimum of 20, 8 hour days, not including travel time, divided over 4 separate trips per site. This includes training services. The Supplier's representative shall be trained in PLC programming and able to make program changes in the field.
- C. Training Services: the Supplier's representative shall be present at the site and classroom designated by the Engineer. Training shall include a review of the final O&M Manual, control panel programming, general theory of operation of each system, recommended startup and shutdown procedures, emergency operating procedures, and routine and preventive maintenance.

3.5 EBMUD FIELD CALIBRATION TAGS

- A. Complete and install Field Calibration Tags on all instruments, pilot valves, relief valves, and other devices with ranges, setpoints, deadbands, and/or offsets. Record the

verified settings on the “EBMUD Field Calibration Tag” with a black extra-fine point permanent marker and affix to the instrument with an 18 lb nylon cable tie. The blank tags are furnished by the District. Below is an example of the blank tag:



Field Calibration Tag

Equipment Tag ID: _____

Input: LRV= _____ URV= _____ Units= _____

Output(scale):LRV= _____ URV= _____ Units= _____

Setpoints: 1= _____ 2= _____ Units= _____

Deadband= _____ Offset= _____

Remarks: _____

Technician: _____ Inspector: _____ Date: _____

B. Definitions:

1. Deadband: The area of a signal range where no action occurs to prevent oscillation or repeated activation-deactivation cycles (“hunting”).
2. Offset: A value entered to compensate for mounting position or other effects. For pressure transmitters, this is typically compensation for the difference in the mounted elevation of the transmitter relative to the centerline elevation of the process pipe. For tank level measurements, the offset is the difference in the mounted elevation of the transmitter relative to the elevation of the bottom of the tank.
3. LRV = Lower Range Value
4. Setpoints: The desired value specified on the P&ID for controlling a system. Dual switches will have two.
5. Units: The engineering units used, including: mA, gpm, psig, ft-H₂O, deg F, etc.
6. URV = Upper Range Value

3.6 PLC PROGRAMMING AND DOCUMENTATION

- A. The PLC shall be programmed using a structured format in which the program is separated into several subroutines which are called by main routines.
- B. The PLC documentation shall contain the following minimum components:
 1. Rung Comments
 2. Subroutine Titles

3. Tag Descriptions

3.7 SUPPLEMENTS

A. The following supplements follow END OF SECTION and are a part of this section:

1. IEEE-841 Data Sheet
2. Low Voltage Motors Storage Form
3. Manufacturer's Certificate of Proper Installation
4. Typical Maintenance Summary Form
5. O&M Manual Review Checklist
6. ISA Datasheets for Instrumentation

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: _____ Site Conditions: <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 Data Supplied by User: <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.) _____ _____ NOTES: 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	<table style="width: 100%; border: none;"> <tr> <td style="width: 33%; border: none;"><input type="checkbox"/> Buyer with Request for Quotes</td> <td style="width: 33%; border: none;"><input type="checkbox"/> Seller with Proposal</td> <td style="width: 33%; border: none;"><input type="checkbox"/> Seller After Order</td> </tr> </table> Data Supplied by Manufacturer: • 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: _____ Bearing Information: • 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: _____ Shop Inspection & Tests: <input type="checkbox"/> Shop Inspection Required: (Yes/No) _____ <input type="checkbox"/> Final Tests Witnessed by Customer: (Yes/No) _____ <input type="checkbox"/> Other Special Tests: _____ _____	<input type="checkbox"/> Buyer with Request for Quotes	<input type="checkbox"/> Seller with Proposal	<input type="checkbox"/> Seller After Order
<input type="checkbox"/> Buyer with Request for Quotes	<input type="checkbox"/> Seller with Proposal	<input type="checkbox"/> Seller After Order		

LOW VOLTAGE MOTORS STORAGE FORM

<u>I. Storage Length of Time:</u>	<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	

<u>II. Requirements:</u>	<u>Yes</u> <u>No</u> <u>NA</u>	Comments:
1. Storage		
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 equivalent.	<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"/>	

2. Bearings	<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"/>	

III. Monthly Maintenance:	<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"/>	

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: _____

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER: _____ EQPT SERIAL NO.: _____
EQPT TAG NO.: _____ EQPT/SYSTEM: _____
PROJECT NO.: _____ SPEC. & SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

Complete Not Applicable

- | | | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Installed in accordance with Manufacturer's recommendations. |
| <input type="checkbox"/> | <input type="checkbox"/> | Inspected, checked, and adjusted. |
| <input type="checkbox"/> | <input type="checkbox"/> | Electrical and mechanical connections meet quality and safety standards. |
| <input type="checkbox"/> | <input type="checkbox"/> | All system instruments are calibrated. |

Comments: _____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the Manufacturer, (ii) empowered by the Manufacturer to inspect, approve, and operate the equipment and (iii) authorized to make recommendations required to assure that the equipment furnished by the Manufacturer is complete and ready for startup and operations. I further certify that all information contained herein is true and accurate.

Date: _____

Manufacturer: _____

By Manufacturer's Authorized Representative: _____

(Authorized Signature)

TYPICAL MAINTENANCE SUMMARY FORM

(Use as many pages as necessary. This form is available in MS Word format upon request)

1. Equipment Name: _____

2. Manufacturer: _____

3. Identification Numbers:

 Tag: _____

 Model: _____

 Serial: _____

4. Nameplate Data (HP, voltage, speed, flow rate, head, etc.) _____

5. Manufacturer's Local Representative:

 Name: _____

 Telephone: _____

 Address: _____

6. LUBRICANT LIST

<u>Reference Symbol</u>	<u>Lubricant Description</u>
List symbols used in Item 7? below	List equivalent lubricants: brand name(s), type, grade, viscosity, etc.

7. SPARE PARTS (Recommendation spare parts with part numbers; if any.)

<u>OEM Part#</u>	<u>Part Name-Description</u>

8. EQUIPMENT REPLACEMENT COST [\$] _____

<u>Maintenance Task</u>	<u>Frequency</u>	<u>Task Duration</u>	<u>Lubricant</u>	<u>Task Details Location</u>
Briefly list each required preventive maintenance activity	(daily, weekly, monthly, Annual, etc.)	Time needed to complete each task (with units: hours, days, weeks, etc.)	Refer by symbol in lubricant list (Item 6)	List O&M Manual Tab and page number which provides details on the activity

9. MAINTENANCE REQUIREMENTS

I, _____ certify that the information on this form is an accurate and complete summary of all typical, routine, and preventive maintenance tasks required to ensure satisfactory performance during warranty period and the overall longevity of the equipment or systems.

 (Manufacturer’s Representatives Signature)

 (Date)

O&M MANUAL REVIEW CHECKLIST

(Manufacturer's Representative to complete one form per submittal, per site)

SPEC. SECTION TITLE & NO:				
MFR Name, Address, Phone:				
Local Rep Name, Address, Phone:				
TECHNICAL CONTENT				
DESCRIPTION	LOCATION IN O&M			COMMENTS
	TAB#	PAGES	N/A	
Specified copies provided				
Binder cover clearly labeled				
Spine Label				
System/Equipment type clearly identified				
District facility or facilities name(s) identified				
Specification number & title shown				
Title page provided				
Equipment tag numbers correctly shown				
Manufacturer's name, address, phone number provided				
Local Representative's name, address, phone number provided				
Table of contents provided				
Heavy section dividers w/ numbered or lettered plastic tabs provided				
Pages punched for 3-ring binder				
Info larger than 8-1/2 x 11 folded showing title block				
Original quality copies provided				
Equipment Descriptions				
• Equipment names, model numbers & tag numbers				
• Equipment & major component				

TECHNICAL CONTENT				
DESCRIPTION	LOCATION IN O&M			COMMENTS
	TAB#	PAGES	N/A	
functions				
• Drawings, diagrams & illustrations				
• Equipment Specification				
• Bill of materials				
Performance Information				
• Nameplate data				
• Performance test data/curves				
Installation Instructions				
• Installation procedures & drawings				
• Equipment tolerances				
• Adjustment procedures				
Operating Instructions				
• Startup procedures				
• Normal & routine operations				
• Control functions				
• Alarms description and settings				
• Shutdown procedures				
• Emergency operations				
Electrical Information				
• Nameplate data				
• Relay, control, alarm contact settings				
• Motor test data				
Electrical Drawings				
• Single-line diagrams, three-line diagrams				
• Interconnection wiring diagram				
• Schematic and elementary diagrams				
• Panel layout drawings				
Instrumentation & Control				

TECHNICAL CONTENT				
DESCRIPTION	LOCATION IN O&M			COMMENTS
	TAB#	PAGES	N/A	
• Control diagrams				
• Panel layout drawings				
• Instrument data sheets (specification forms)				
• Calibration Procedures				
• Final settings for adjustable control devices				
• Block diagrams and riser diagrams				
• Loop diagrams				
• Pneumatic/Hydraulic piping drawings				
• Hard copy printouts of control programs				
• Field calibration data sheets				
• Programming software (licensed to EBMUD) with user manuals				
Shipping and Storage Instructions				
Testing				
• Factory Test Report (procedures and results)				
• Field Test Procedures				
• Manufacturer's Certificate of Proper Installation (where specified)				
• Field Test Results				
Troubleshooting guide				
Safety				
• Safety procedures/Lockout discussion				
• CAUTION, WARNING, DANGER text				
• Material Safety Data Sheets (MSDS)				

TECHNICAL CONTENT				
DESCRIPTION	LOCATION IN O&M			COMMENTS
	TAB#	PAGES	N/A	
<ul style="list-style-type: none"> • Special safety equipment 				
Preventive Maintenance				
Maintenance Summary Forms				
Lubrication Information				
<ul style="list-style-type: none"> • Location of lube points & frequency 				
<ul style="list-style-type: none"> • Recommended type & grade, state specific MFR 				
<ul style="list-style-type: none"> • Recommended viscosity & temperature range 				
Overhaul Instructions				
<ul style="list-style-type: none"> • Detailed assembly drawings w/OEM part numbers 				
<ul style="list-style-type: none"> • Tear down/rebuild instructions 				
Spare Parts for Equipment & Components				
<ul style="list-style-type: none"> • Predicted life of parts subject to wear or aging 				
<ul style="list-style-type: none"> • Recommended spare parts list w/ part numbers 				
<ul style="list-style-type: none"> • Complete instructions for obtaining parts 				
<ul style="list-style-type: none"> • Long-term storage requirements 				
<ul style="list-style-type: none"> • Special tools 				
Long-term Shutdown/Lay-up Instructions				
Warranty/Guarantee				

INLINE WATER TREATMENT PLANT CARBONIC ACID ADDITION PROJECT

TECHNICAL DRAWINGS

RFQ 2014



EAST BAY MUNICIPAL UTILITY DISTRICT

♦

PARDEE CHEMICAL PLANT

♦

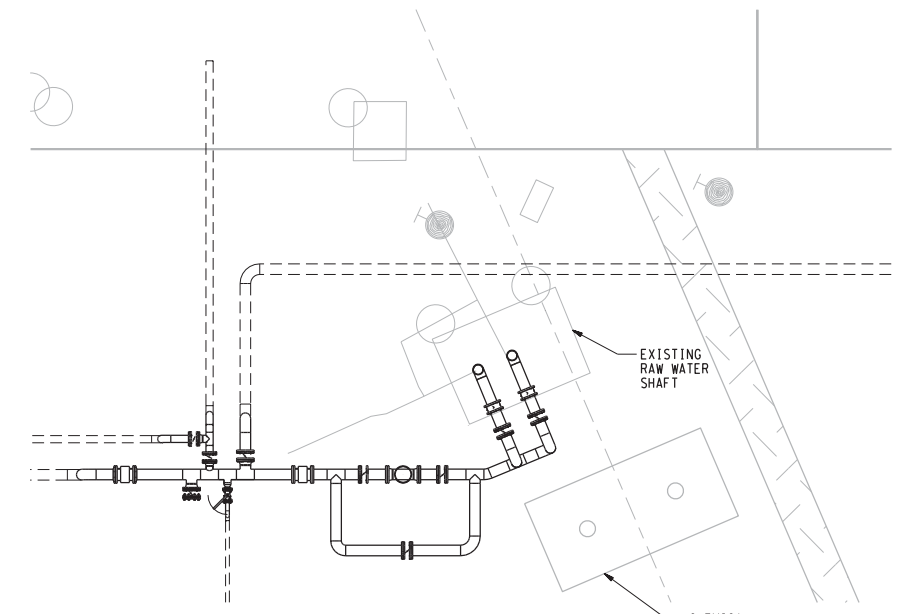
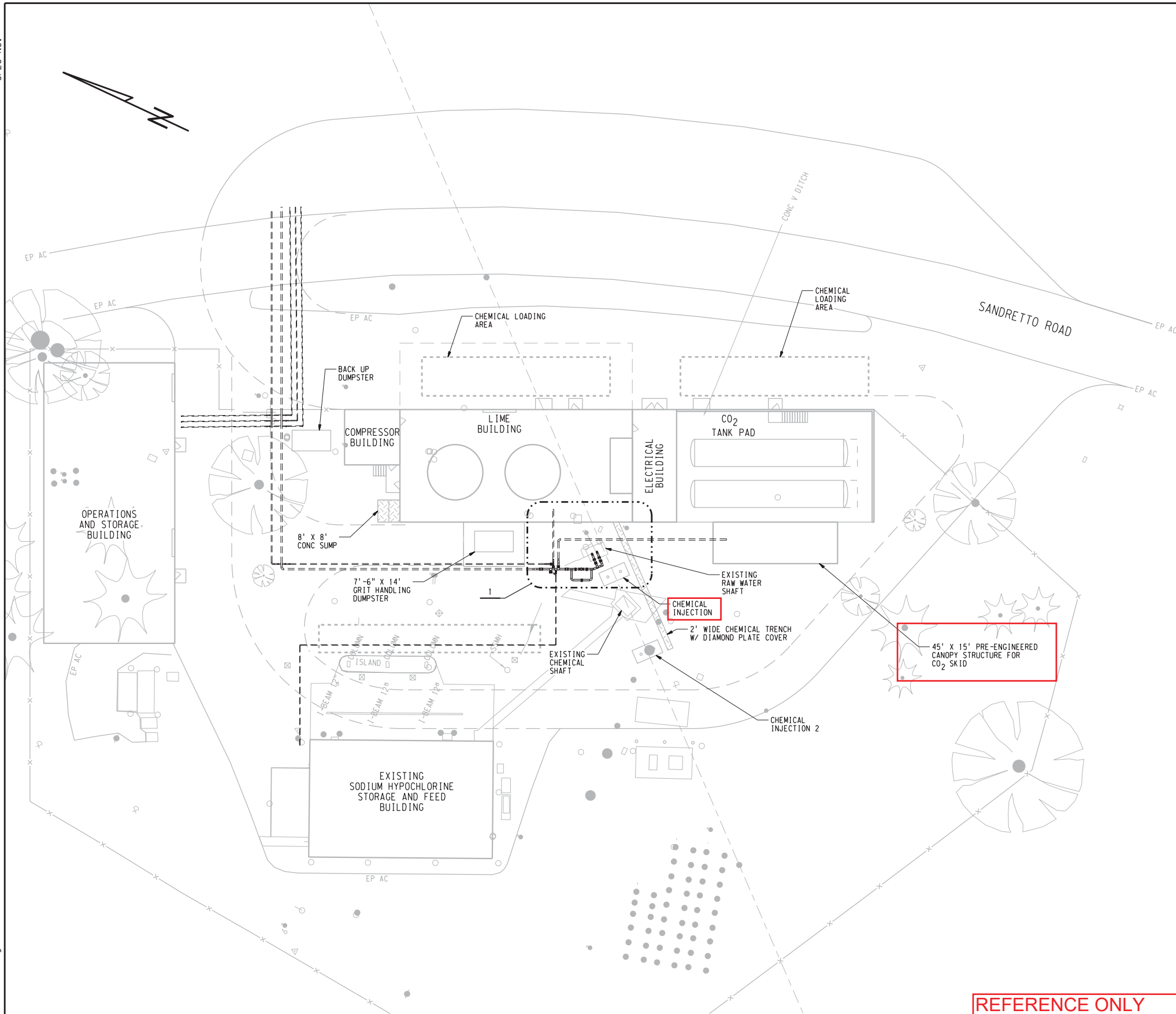
TECHNICAL DRAWINGS

RFQ 2014



EAST BAY MUNICIPAL UTILITY DISTRICT

SPEC. NO.



DETAIL 1
1"=5'

**REFERENCE ONLY
NOT FOR CONSTRUCTION**

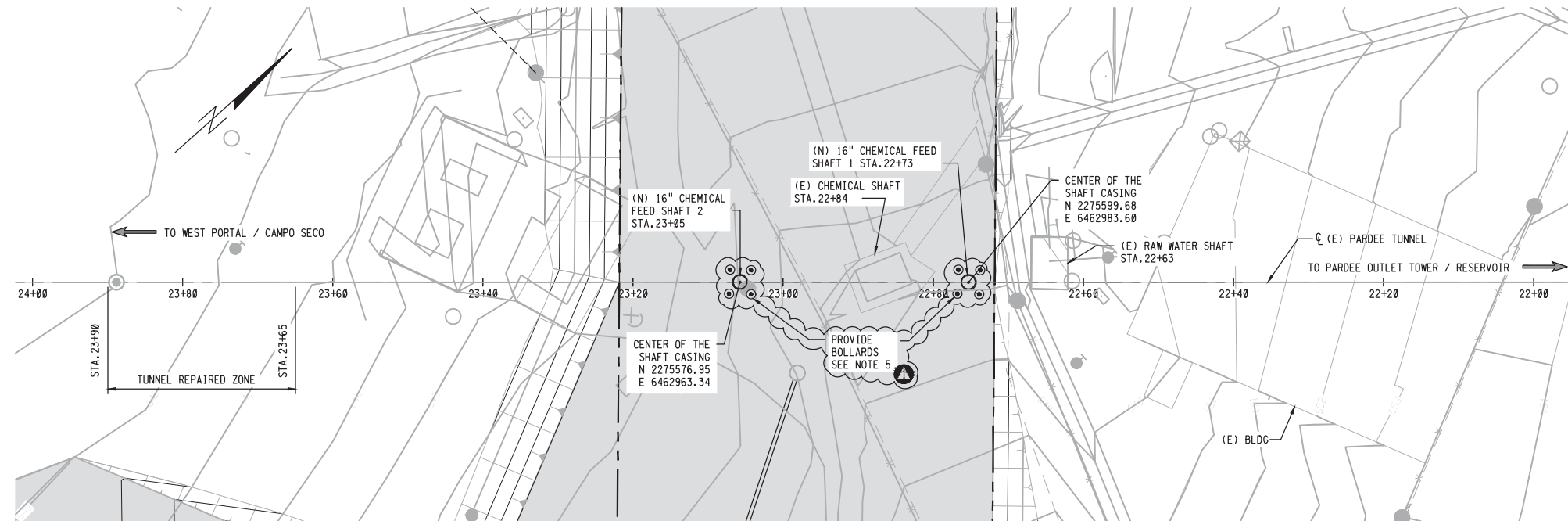
PLAN
1"=20'

3" ON ORIGINAL DOCUMENT
0 1 2 3

USER: dsjkrp01
DATE: 27-JUN-2019 15:34
FILE: H:\treatment\spardees511\sf\IG*3-5.dgn

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
DESIGN CHECKED BY	PARDEE CHEMICAL PLANT IMPROVEMENTS			
DRAWN BY	MECHANICAL			
REVIEW	YARD PIPING			
RECOMMENDED:	PROJ. NO.	FIGURE 3-5		REV.
APPROVED:	SCALE AS SHOWN	STRUCT.	DISC.	NUMBER
	DATE			

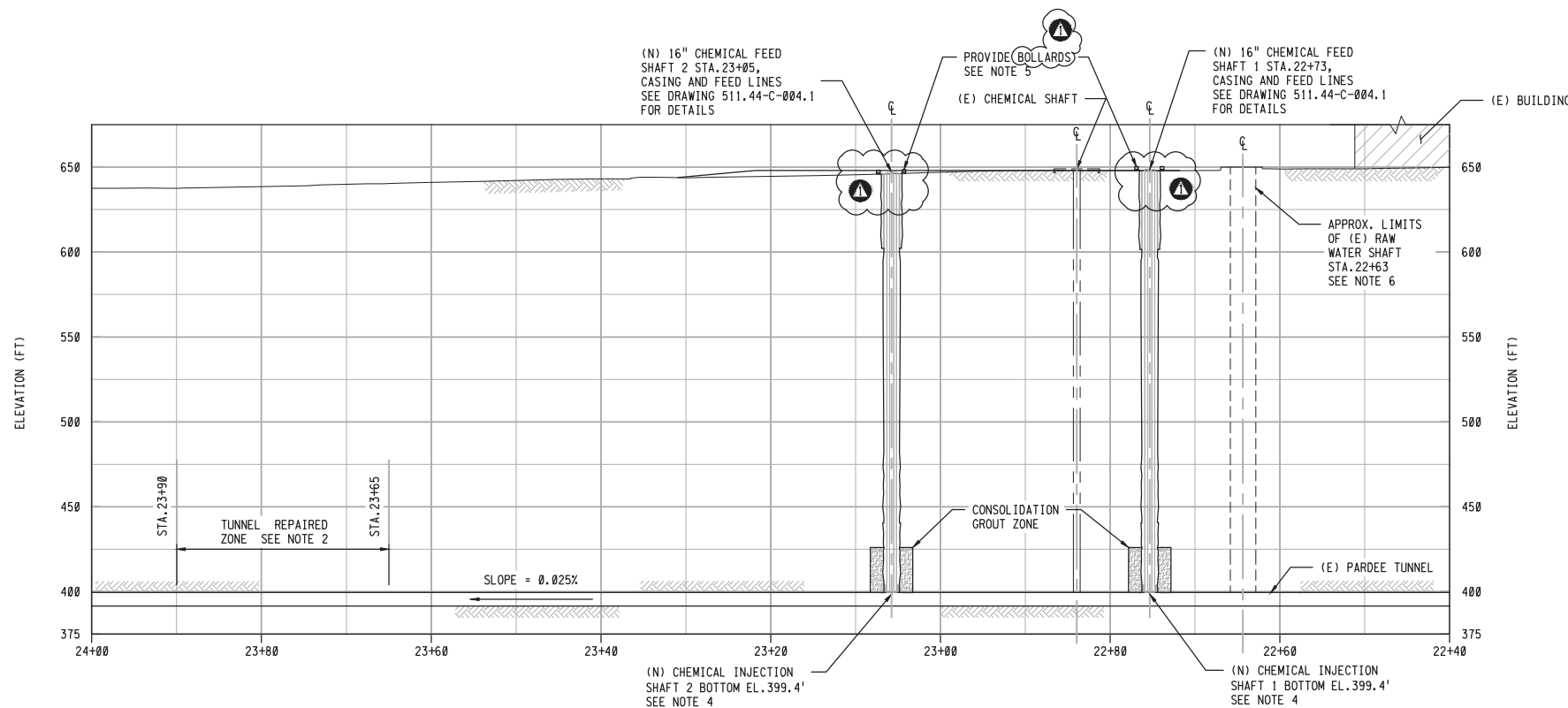


PLAN

SCALE: 1" = 10'-0"

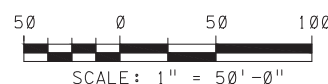
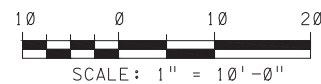
NOTES:

- CHEMICAL FEED SHAFTS TO BE CONSTRUCTED WHILE TUNNEL IS IN OPERATION. SEE DRAWINGS 511.44-C-006.1 AND 511.44-C-006.2 FOR ASSUMED CONSTRUCTION SEQUENCE. REFER TO SECTION 01 14 00 FOR WORK RESTRICTIONS.
- REPAIRED TUNNEL ZONE IS TAKEN FROM REFERENCE DRAWING DH-4359-5. REDUCED TUNNEL CROSS-SECTION NOT SHOWN FOR CLARITY.
- SEE DRAWING 511.44-C-002.0 FOR TEMPORARY SITE GRADING TO FACILITATE SHAFT CONSTRUCTION.
- THE BOTTOM OF SHAFT EL. IS BASED ON THE ESTIMATED TUNNEL CROWN ELEVATION. THE BOTTOM OF THE SHAFT CASING SHALL NOT EXTEND MORE THAN 6" INTO THE TUNNEL OPENING. SEE DRAWING NO. 511.44-C-005.1 FOR DETAILS.
- TEMPORARY BOLLARDS SHALL BE INSTALLED AFTER COMPLETION OF THE CHEMICAL FEED SHAFTS.
- SHAFT CONCRETE LINING NOT SHOWN FOR CLARITY. SEE REFERENCE DRAWING DH-4359-5 FOR DETAILS.



PROFILE

HORIZ. SCALE: 1" = 10'-0"
VERT. SCALE: 1" = 50'-0"



NO.	DATE	DESCRIPTION	BY	REC.	APP.
1	03/11/20	ADDENDUM NO. 2 PER SPEC 2158	PB	TP	KA



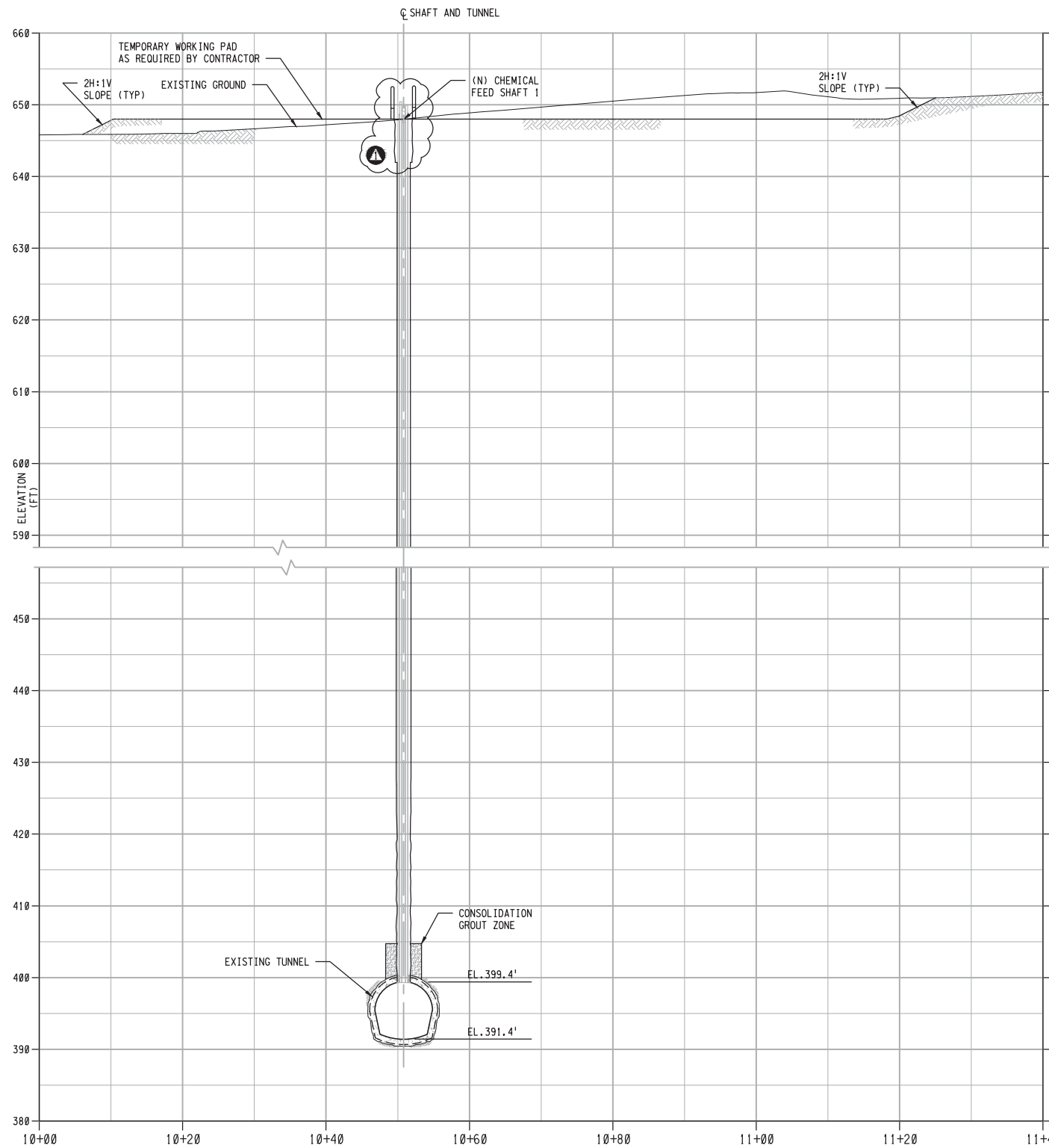
DESIGNED BY	PB
DESIGN CHECKED BY	DRC
DRAWN BY	EGB
Sr. PROJ ENGR.	TWP
R.P.E. NO.	C 84990
APPROVED	KEA
PRINCIPAL IN CHARGE, R.P.E. NO.	C 5199

PROJECT MANAGER	R.P.E. NO. C72454	<i>Emily L. King</i>
PROJECT ENGINEER	R.P.E. NO. C72454	<i>Emily L. King</i>
RECOMMENDED	R.P.E. NO. C74981	<i>Michael J. Hartlaub</i>
MOR OF DESIGN	R.P.E. NO. C48598	<i>S. Trenton</i>

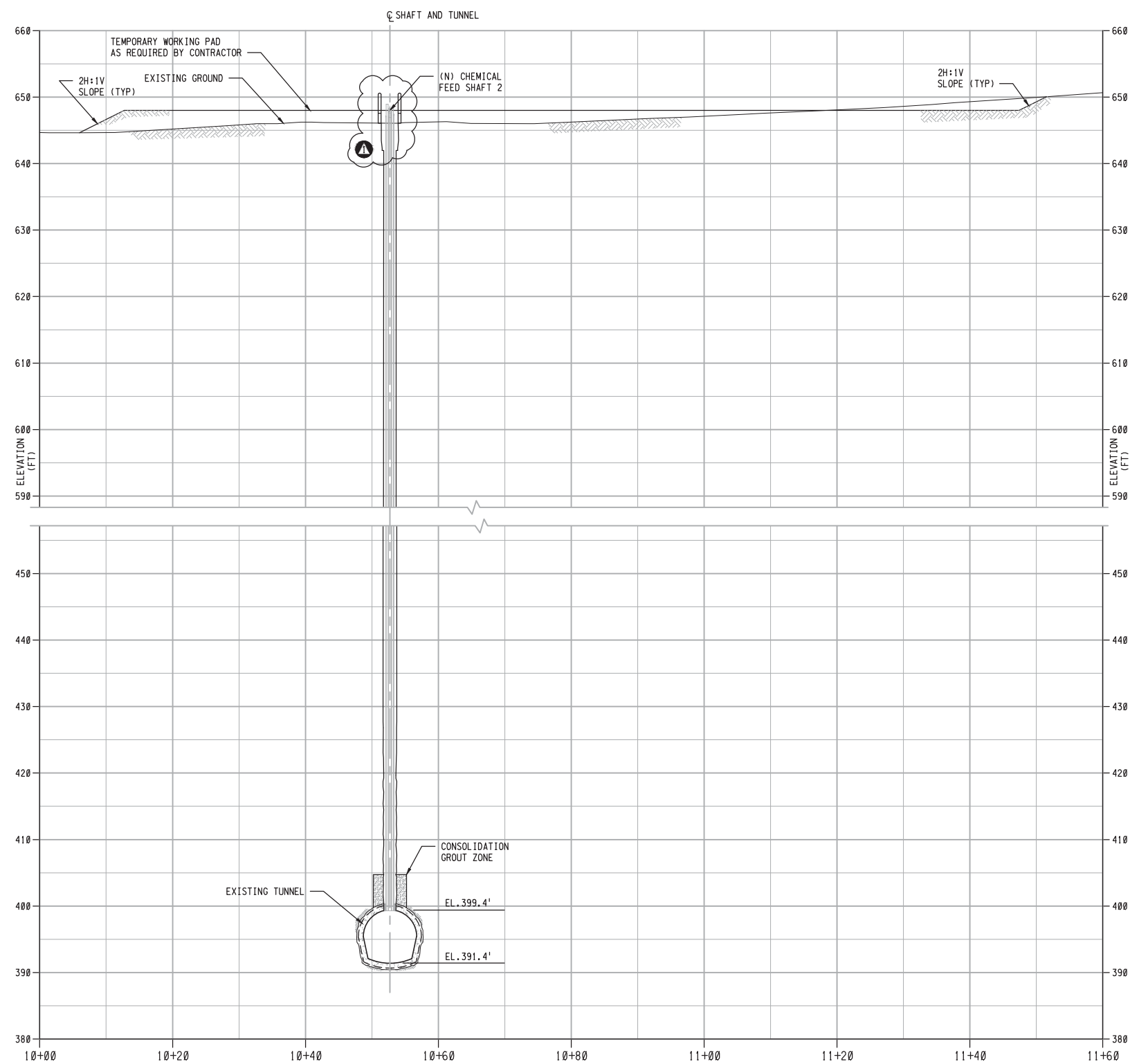
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
PARDEE CHEMICAL PLANT IMPROVEMENTS CIVIL			
PLAN AND PROFILE			
PROJ NO. SPEC 2158	511.44-C-003.1	1	
SCALE AS SHOWN	STRUCT.	DISC.	NUMBER
DATE JAN 2020			REV.



USER: E:\BALINGUSA
DATE: 11-Mar-20
FILE: C:\Users\baalingusa\box\Jobs\5982.0\pardee_chemical_feed_shaft_design\CADD\DOCUMENT\contract_docs\511.44-C-003.1.dwg



SECTION A
SCALE: 1" = 10' - 0" 511.44-C-002.0



SECTION B
SCALE: 1" = 10' - 0" 511.44-C-002.0



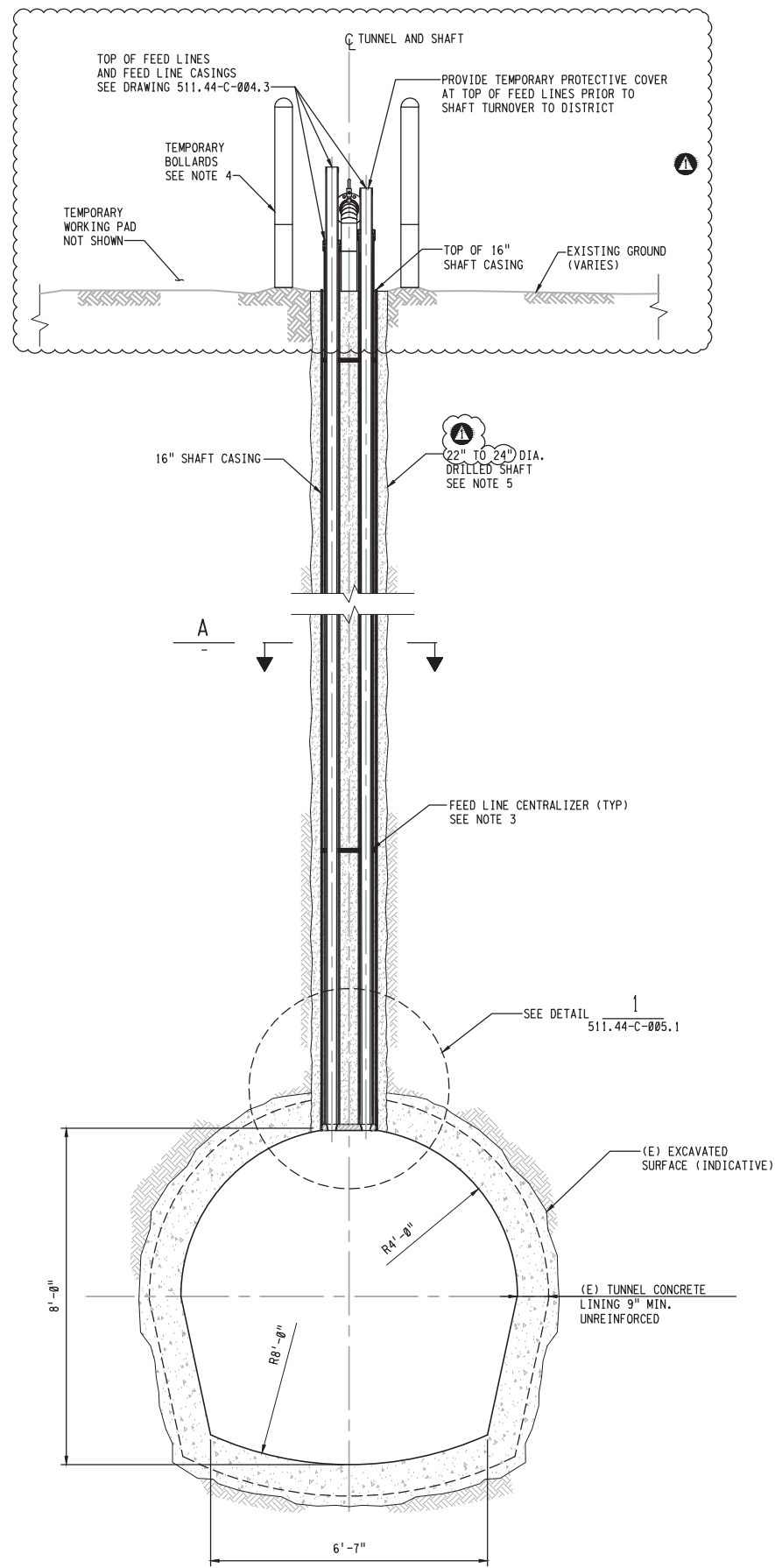
NO.	DATE	DESCRIPTION	BY	REC.	APP.
1	03/11/20	ADDENDUM NO. 2 PER SPEC 2158	PB	TP	KA



DESIGNED BY	PB
DESIGN CHECKED BY	DRC
DRAWN BY	EGB
Sr. PROJ ENGR.	TWP
R.P.E. NO.	C 84990
APPROVED	KEA
PRINCIPAL IN CHARGE, R.P.E. NO.	C 5199

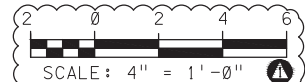
PROJECT MANAGER	R.P.E. NO. C72454	<i>Emily L. Sing</i>
PROJECT ENGINEER	R.P.E. NO. C72454	<i>Emily L. Sing</i>
RECOMMENDED:	R.P.E. NO. C74901	<i>Michael J. Hartlaub</i>
MEMORANDUM OF DESIGN	R.P.E. NO. C48598	<i>S. Trenton</i>
		SERGE V. TEBULIETI

EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
PARDEE CHEMICAL PLANT IMPROVEMENTS GENERAL			
SECTIONS			
PROJ NO. SPEC 2158	511.44-C-003.2	1	
SCALE AS SHOWN			
DATE JAN 2020	STRUCT. DISC.	NUMBER	REV.



TYPICAL SHAFT SECTION

SCALE: 1/2" = 1'-0"



NO.	DATE	DESCRIPTION	BY	REC.	APP.
1	03/11/20	ADDENDUM NO.2 PER SPEC 2158	PB	TP	KA



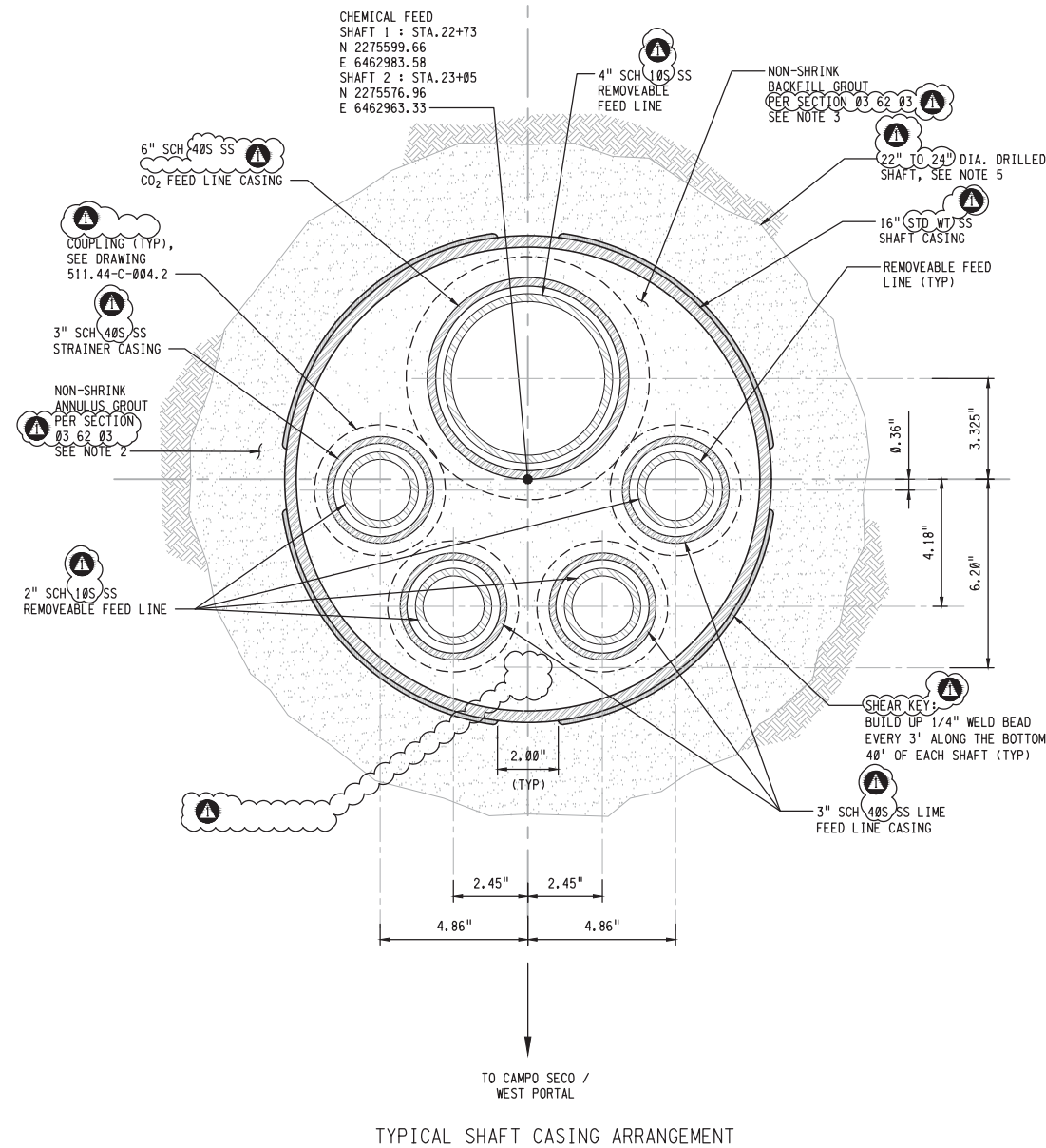
DESIGNED BY	PB
DESIGN CHECKED BY	DRC
DRAWN BY	EGB
SIC PROJ ENGR.	TWP
R.P.E. NO.	C 84990
APPROVED	KEA
PRINCIPAL IN CHARGE, R.P.E. NO.	C 5199

PROJECT MANAGER	R.P.E. NO. C72454	<i>Emily L. Sing</i>
PROJECT ENGINEER	R.P.E. NO. C72454	<i>Emily L. Sing</i>
RECOMMENDED	R.P.E. NO. C74981	<i>Robert J. Hartlaub</i>
APPROVED	R.P.E. NO. C48598	<i>S. Trenton</i>

EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
PARDEE CHEMICAL PLANT IMPROVEMENTS CIVIL			
TYPICAL SHAFT CASING DETAILS			
SHEET 1 OF 3			
PROJ NO. SPEC 2158	511.44-C-004.1	1	
SCALE AS SHOWN			
DATE JAN 2020	STRUCT.	DISC.	NUMBER
			REV.

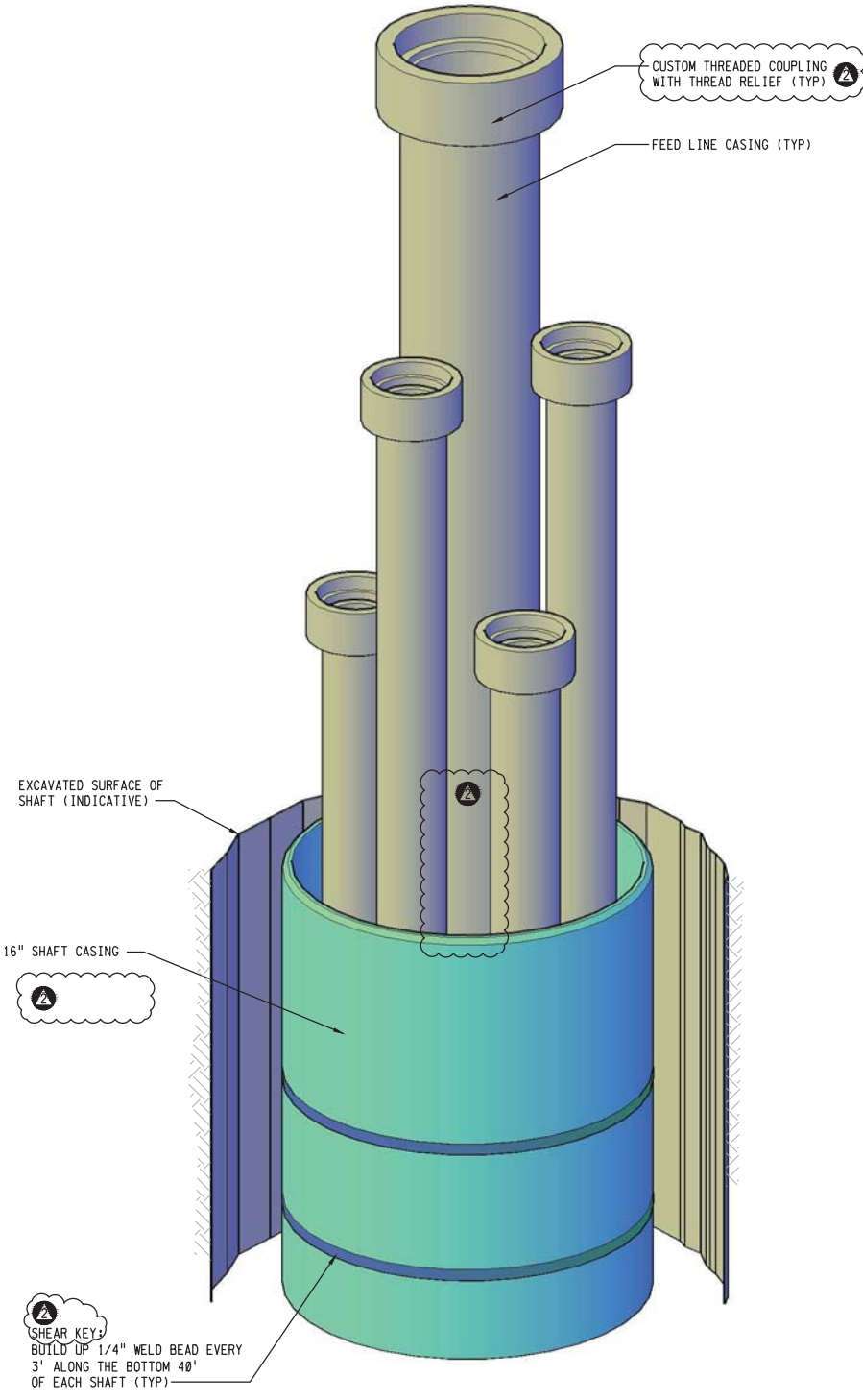
NOTES:

1. SHAFTS ARE CONSTRUCTED AND CASINGS INSTALLED AND BACKFILLED WHILE TUNNEL IS IN OPERATION. SEE DRAWINGS 511.44-C-006.1 AND 511.44-C-006.2 FOR DETAILS.
2. GROUT PIPES FOR BACKFILL AND ANNULUS GROUTING NOT SHOWN FOR CLARITY.
3. FEED LINE CASING CENTRALIZERS ARE TO BE INSTALLED EVERY 10 FT OR LESS ALONG THE SHAFT TO MAINTAIN SPACING AND VERTICALITY OF CASING DURING INSTALLATION AND BACKFILLING.
4. TEMPORARY BOLLARDS TO BE INSTALLED AFTER COMPLETION OF CHEMICAL FEED SHAFTS.
5. DRILLED SHAFT DIAMETER SHALL NOT BE LESS THAN 22" AND NO MORE THAN 24".

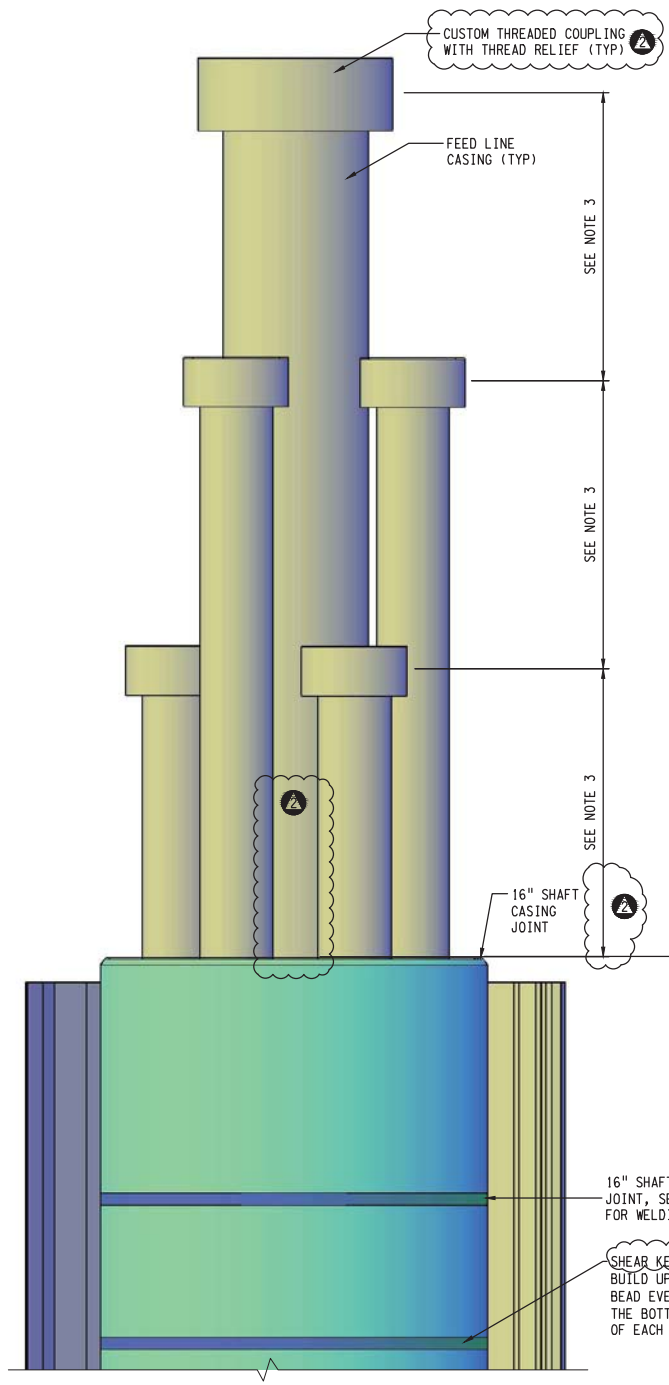


TYPICAL SHAFT CASING ARRANGEMENT

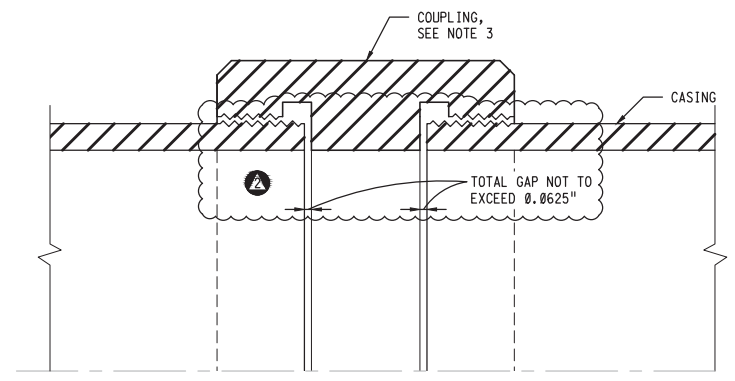
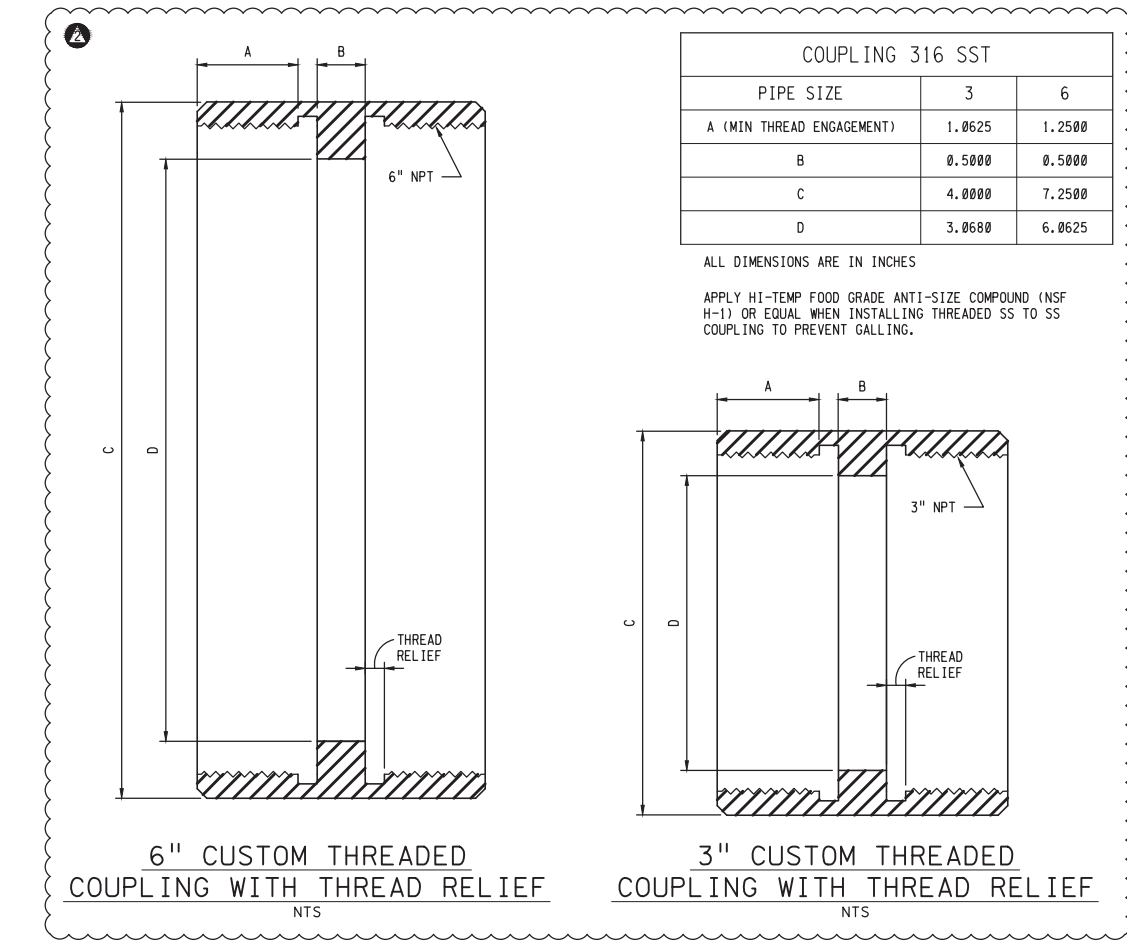
SECTION A
SCALE: 4" = 1'-0"



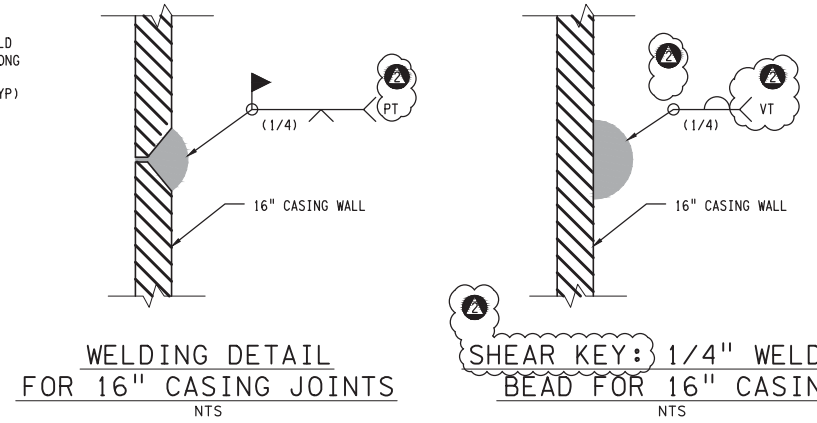
TYPICAL FEED LINE CASING ARRANGEMENT AT EACH SHAFT CASING JOINT
3D ISOMETRIC VIEW
NTS



TYPICAL FEED LINE CASING ARRANGEMENT AT EACH SHAFT CASING JOINT
FRONT VIEW
NTS



CUSTOM THREADED COUPLING
NOT TO SCALE



WELDING DETAIL FOR 16" CASING JOINTS
NTS

SHEAR KEY: 1/4" WELDING BEAD FOR 16" CASING
NTS

- NOTES:
1. PROVIDE SUFFICIENT STICK-UP OF FEED LINE CASINGS ABOVE EACH SHAFT CASING JOINT TO FACILITATE FIELD ASSEMBLY AND CONNECTION.
 2. REMOVABLE FEED LINES NOT SHOWN FOR CLARITY.
 3. ARRANGEMENT AND SPACING OF FEED LINE CASING COUPLINGS AT EACH SHAFT CASING JOINT TO BE DETERMINED BY THE CONTRACTOR. COUPLINGS SHALL BE SPACED TO FACILITATE COMPLETE CONNECTION OF EACH COUPLING AND TO AVOID CONFLICT WITH ADJACENT CASING PIPES.



NO.	DATE	DESCRIPTION	BY	REC.	APP.
1	03/11/20	ADDENDUM NO.2 PER SPEC 2158	PB	TP	KA



DESIGNED BY PB
DESIGN CHECKED BY DRC
DRAWN BY EGB
SR PROJ ENGR TWP
APPROVED KEA
PRINCIPAL IN CHARGE, R.P.E. NO. C 5199

PROJECT MANAGER Emily L. Sing
PROJECT ENGINEER Emily L. Sing
RECOMMENDED: SENIOR CIVIL ENGR. R.P.E. NO. C 74981
APPROVED: MGR OF DESIGN R.P.E. NO. C48598

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

PARDEE CHEMICAL PLANT IMPROVEMENTS
CIVIL

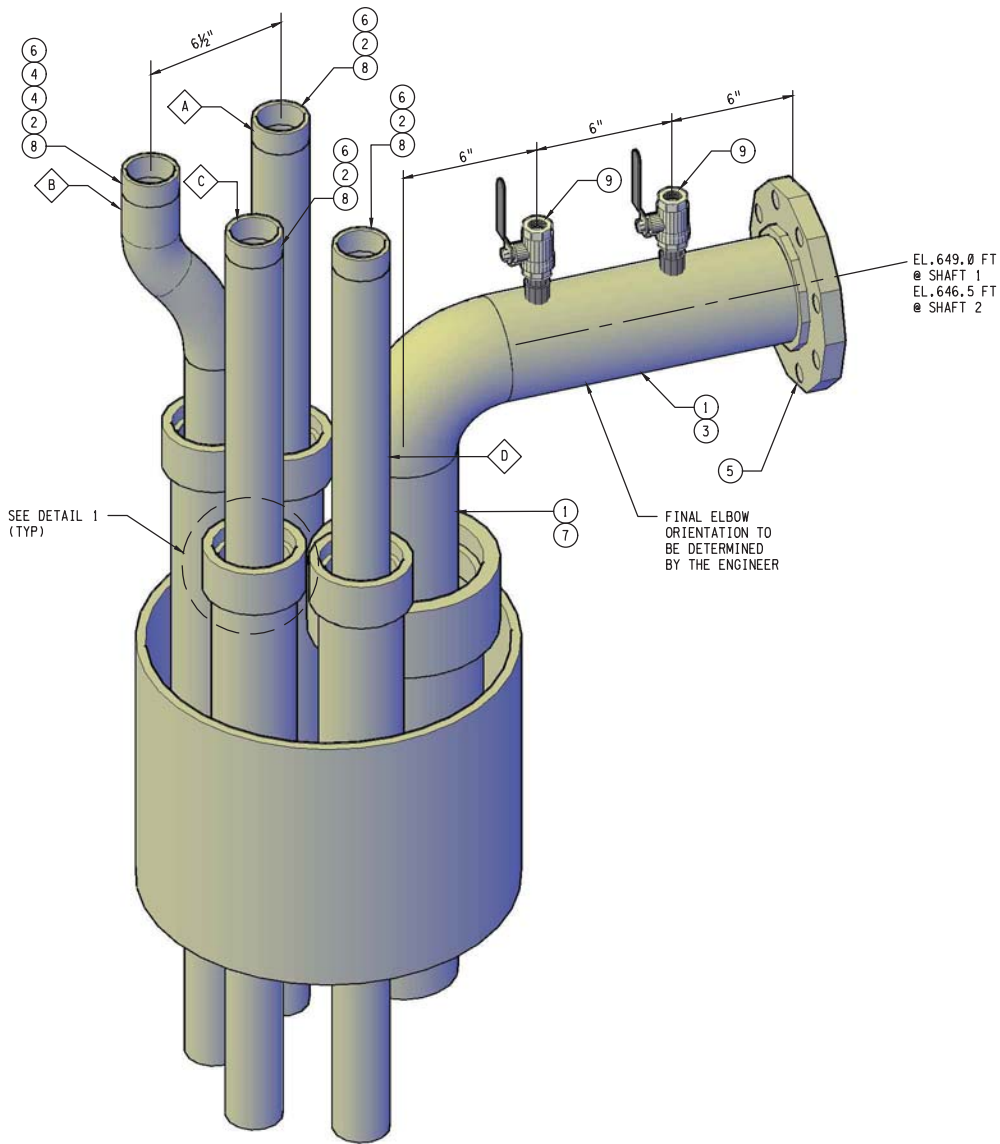
TYPICAL SHAFT CASING DETAILS

SHEET 2 OF 3

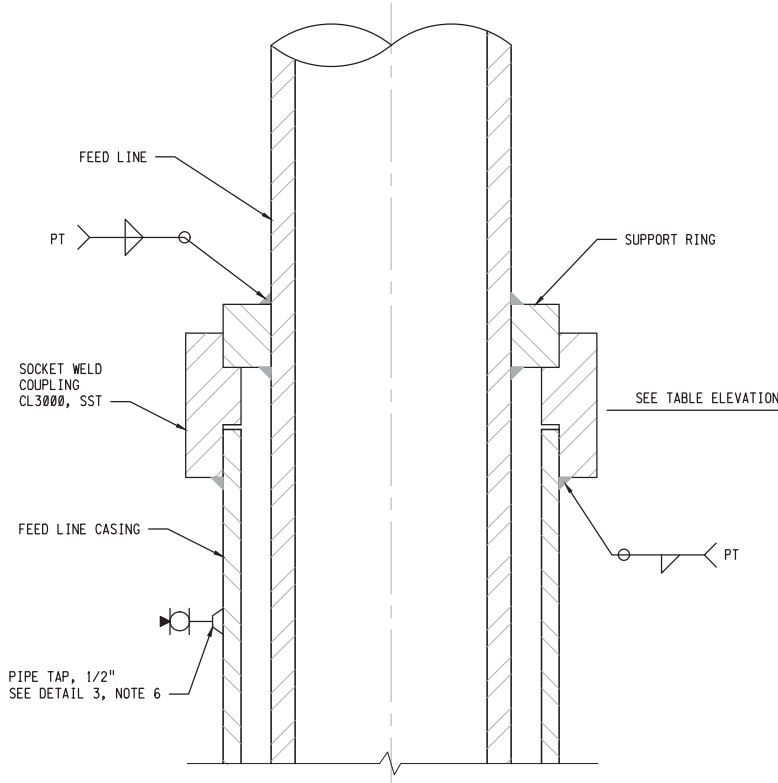
PROJ NO. SPEC 2158
SCALE AS SHOWN
DATE JAN 2020

511.44-C-004.2

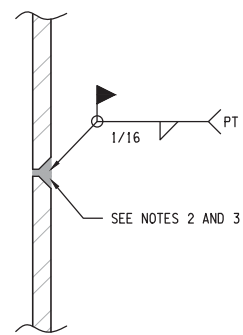
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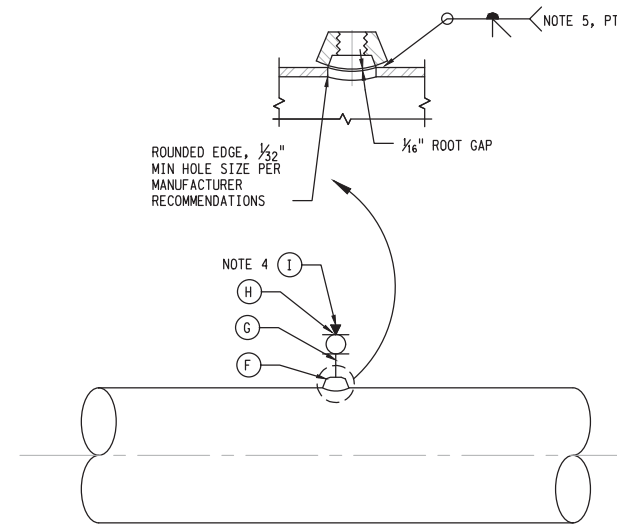
FEED LINES AND CASINGS ARRANGEMENT
AT THE TOP OF THE SHAFTS
3D ISOMETRIC VIEW
NTS



TOP OF CASINGS AND FEED LINE SUPPORT
DETAIL 1
NTS



TYPICAL FEED LINE JOINT
DETAIL 2
NTS



PIPE TAP - 2" AND SMALLER WITH VALVE
DETAIL 3
NTS

NOTES:

1. INSTALL THREADED CAPS AND BLIND FLANGE ON PIPING UPON COMPLETION (NOT SHOWN FOR CLARITY).
2. ALL CARRIER WELDS SHOULD BE FULL PEN BUTTWELDS WITH PT INSPECTION. NO OVERWELD IS ACCEPTED INSIDE THE CARRIER PIPE.
3. THE EXTERIOR SURFACE OF THE FEED LINE JOINTS SHALL BE SMOOTH AND FLUSH WITH THE PIPE.
4. PROVIDE THREADED PLUG FOR THREADED VENT AND DRAIN BALL VALVES.
5. PROVIDE A COVER FILLET WELD WITH A SMOOTH TRANSITION TO THE RUN PIPE.
6. ORIENT PIPE TAP FACING OUTWARD FROM CENTER OF SHAFT FACING.
7. "SHAFT 1" REFER TO THE SHAFT CLOSER TO THE LIME BUILDING.
8. PROVIDE 4" BLIND FLANGE (SS) WITH BOLTING (SS) AND 2" CAPS FOR ALL PIPE TO TEMPORARILY PROTECT SHAFT FROM FOREIGN DEBRIS. USE THREAD LUBRICANT PER SECTION 40 20 20.

LINE	DESCRIPTION	SHAFT 1		SHAFT 2	
		TOP OF PIPE ELEVATION	SOCKET CPLG ELEVATION	TOP OF PIPE ELEVATION	SOCKET CPLG ELEVATION
A	LIME FEED NO.1	650.00 FT	649.00 FT	647.50 FT	646.50 FT
B	LIME FEED NO.2	650.00 FT	649.25 FT	647.50 FT	646.75 FT
C	LIME FEED NO.3 / SPARE	650.00 FT	649.00 FT	647.50 FT	646.50 FT
D	STRAINER REJECT	649.50 FT	649.25 FT	647.00 FT	646.75 FT
E	CARBONIC ACID		648.65 FT		647.15 FT

ITEM	QUANTITY	DESCRIPTION	REMARKS
1	AS REQ'D	PIPE, 4", SCH10S, SST	
2	AS REQ'D	PIPE, 2", SCH10S, SST	
3	1	ELL, 4" 90 DEG, SR, STD WT, SST	
4	2	ELL, 2" 45 DEG, STD WT, SST	
5	1	FLANGE, 4" CL150, SLIP-ON, FF, SST	
6	5	HALF-NIPPLE, 2" NPT, SCH40S, SST	
7	1	SUPPORTING RING, 6.625" OD X 4.57" ID X 1" THK, SST	
8	4	SUPPORTING RING, 3.5" OD X 2.44" ID X 1" THK, SST	
9	7	PIPE TAP, 1/2"	DETAIL 3
10	1	BLIND FLANGE, 4", CL150, STL	NOTE 1
11	4	THREADED CAP 2", STL, FNPT	NOTE 1

DETAIL 3 - MATERIAL LIST	
ITEM	DESCRIPTION
F	THREADED OUTLET, 3000 LB, MATERIAL TO MATCH PIPE
G	NIPPLE, 304 SST, SCH 80 THRD
H	SST BALL VALVE WITH LOCKING HANDLE APOLLO 76F-100-A-27 OR EQUAL AS APPROVED BY ENGINEER
I	PLUG, SST, THRD, SO HEAD



NO.	DATE	DESCRIPTION	BY	REC.	APP.
1	03/11/20	ADDENDUM NO.2 PER SPEC 2158	PB	TP	KA



DESIGNED BY PB
DESIGN CHECKED BY DRC
DRAWN BY EGB
SR PROJ ENGR. R.P.E. NO. C 84990 TWP
APPROVED KEA
PRINCIPAL IN CHARGE, R.P.E. NO. C 5199

PROJECT MANAGER R.P.E. NO. C72454 Emily L. Sing
PROJECT ENGINEER R.P.E. NO. C72454 Emily L. Sing
RECOMMENDED: SENIOR CIVIL ENGR. R.P.E. NO. C74901
APPROVED: MGR OF DESIGN R.P.E. NO. C48598 S. Trenton

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

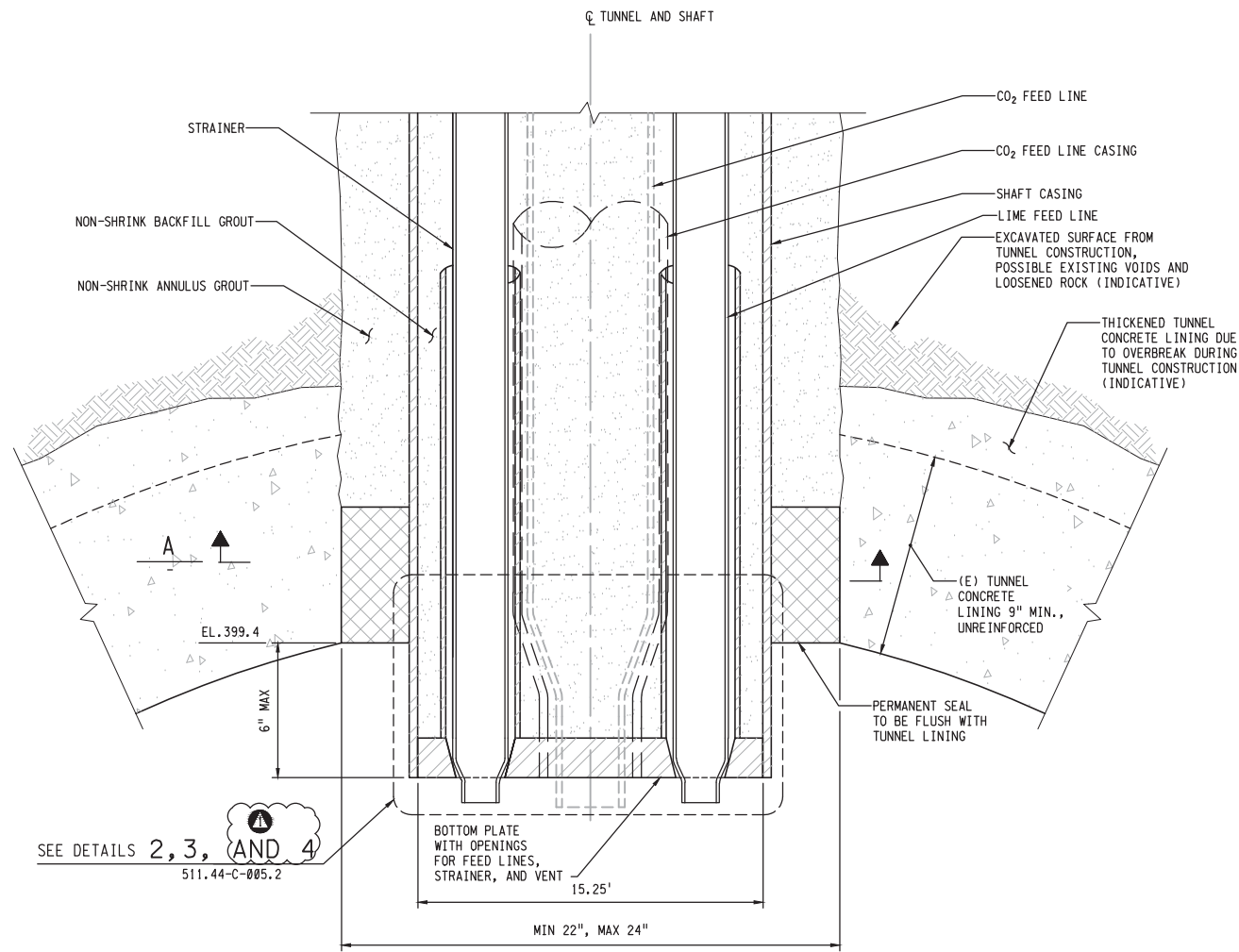
PARDEE CHEMICAL PLANT
IMPROVEMENTS
CIVIL
TYPICAL SHAFT CASING DETAILS

SHEET 3 OF 3

PROJ NO. SPEC 2158
SCALE AS SHOWN
DATE JAN 2020

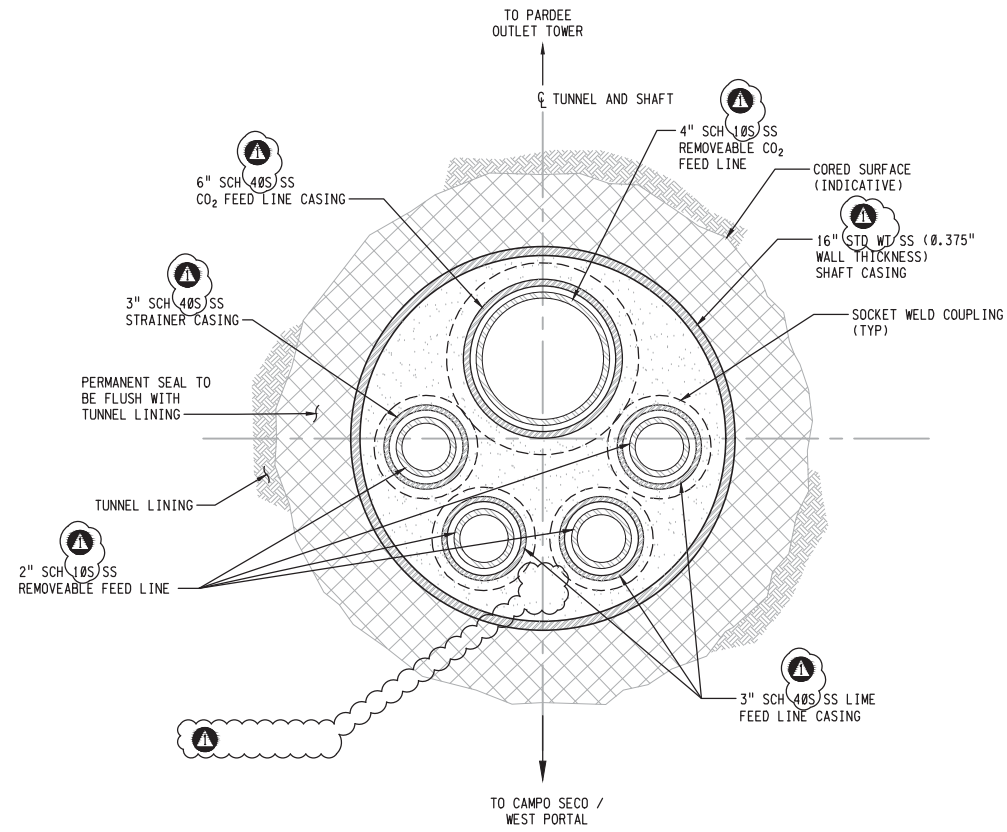
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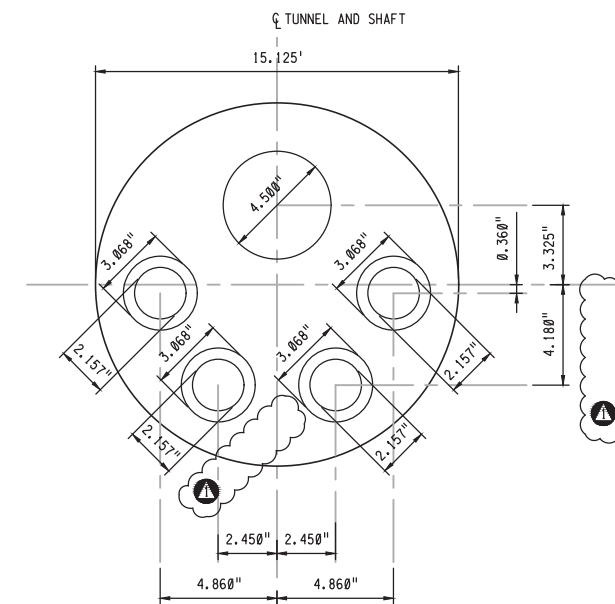


DETAIL 1
SCALE: 3" = 1'-0"

SEE DETAILS 2, 3, AND 4
511.44-C-005.2



VIEW FROM BOTTOM OF SHAFT CASING
SECTION A
SCALE: 3" = 1'-0"



BOTTOM PLATE DETAIL
DETAIL 2
SCALE: 3" = 1'-0"

NOTES:

1. SHAFTS TO BE CONSTRUCTED AND CASINGS INSTALLED AND BACKFILLED WHILE TUNNEL IS IN OPERATION. SEE DRAWINGS 511.44-C-006.1 AND 511.44-C-006.2 FOR DETAILS.
2. MAX TUNNEL INTERNAL HEAD IN TUNNEL ASSUMED TO BE 168 FT (73 PSI).
3. SEALING OF SHAFT CASING ANNULUS AT TUNNEL LEVEL TO BE FLUSH WITH TUNNEL LINING.



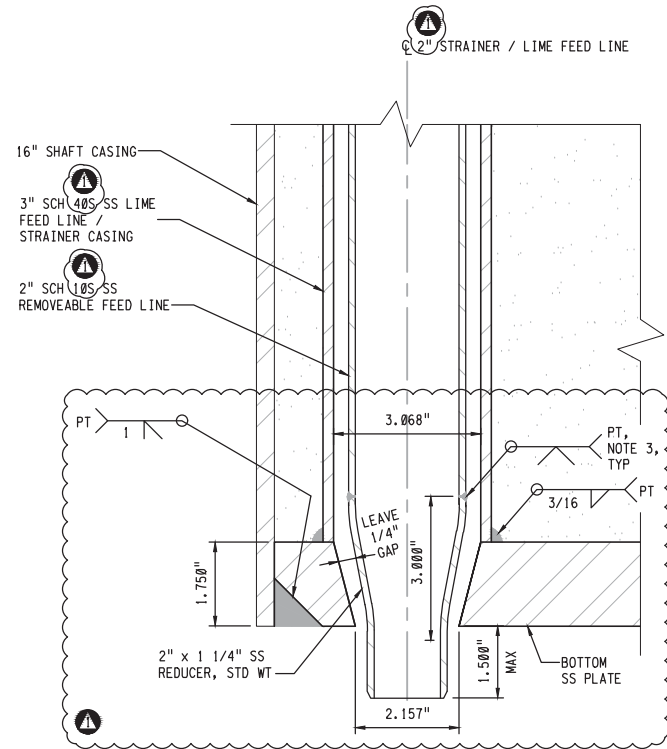
NO.	DATE	DESCRIPTION	BY	REC.	APP.
1	03/11/20	ADDENDUM NO.2 PER SPEC 2158	PB	TP	KA



DESIGNED BY	PB
DESIGN CHECKED BY	DRC
DRAWN BY	EGB
SRC. PROJ ENGR.	TWP
APPROVED	KEA
PRINCIPAL IN CHARGE, R.P.E. NO. C 5199	

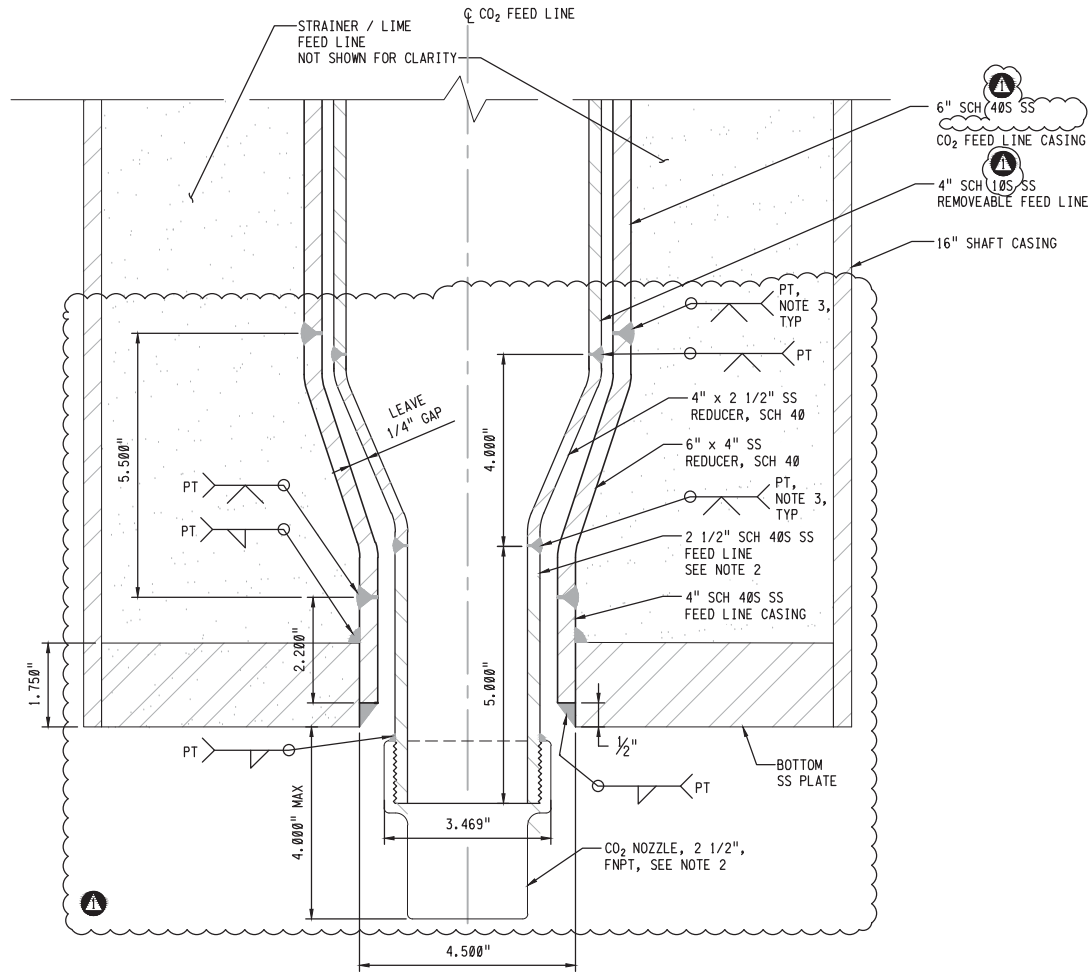
PROJECT MANAGER	R.P.E. NO. C72454	<i>Emily L. Sing</i>
PROJECT ENGINEER	R.P.E. NO. C72454	<i>Emily L. Sing</i>
RECOMMENDED BY		<i>Michael J. Hartlaub</i>
APPROVED	MOR OF DESIGN R.P.E. NO. C48598	<i>S. Trenton</i>

EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
PARDEE CHEMICAL PLANT IMPROVEMENTS CIVIL TYPICAL TUNNEL CONNECTION DETAILS SHEET 1 OF 2			
PROJ NO. SPEC 2158	511.44-C-005.1		1
SCALE AS SHOWN			
DATE JAN 2020	STRUCT. DISC. NUMBER		REV.



TYPICAL 2" LIME FEED LINE / STRAINER
 PENETRATION AT BOTTOM PLATE

DETAIL 3
 SCALE: 6" = 1'-0" 511.44-C-005.1

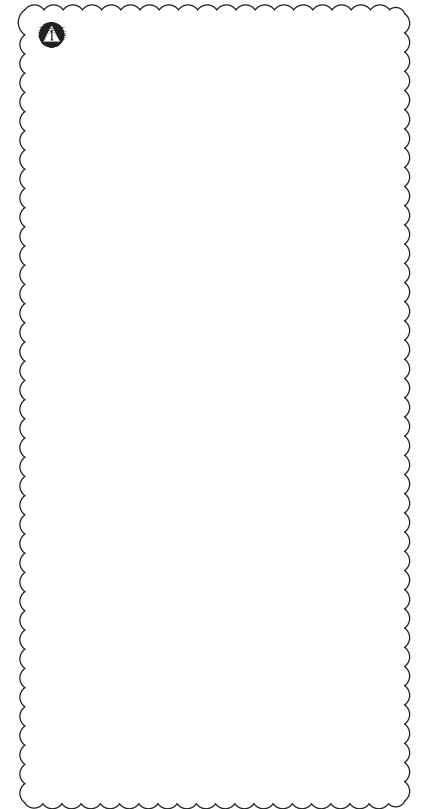


TYPICAL 4" CO₂ FEED LINE
 PENETRATION AT BOTTOM PLATE

DETAIL 4
 SCALE: 6" = 1'-0" 511.44-C-005.1

NOTES:

- PERMANENT ANNULUS SEAL NOT SHOWN FOR CLARITY. SEE DRAWING 511.44-C-006.1 FOR REQUIREMENTS.
- DISTRICT SHALL PROVIDE SS CO₂ NOZZLE (FURNISHED BY OTHERS) TO CONTRACTOR WITH 2-1/2" FNPT. CONTRACTOR SHALL PROVIDE 2-1/2" MNPT SS CONNECTION TO CO₂ NOZZLE.
- ALL FEED LINE WELDS SHOULD BE FULL PEN BUTTWELDS WITH PT INSPECTION (BOTH SHOP AND FIELD). NO OVER WELD IS ACCEPTED INSIDE THE CARRIER OF THE PIPE. VISUAL INSPECTION IS REQUIRED FOR VERIFICATION.



NO.	DATE	ADDENDUM NO. 2 PER SPEC 2158	BY	REC.	APP.
1	03/11/20		PB	TP	KA

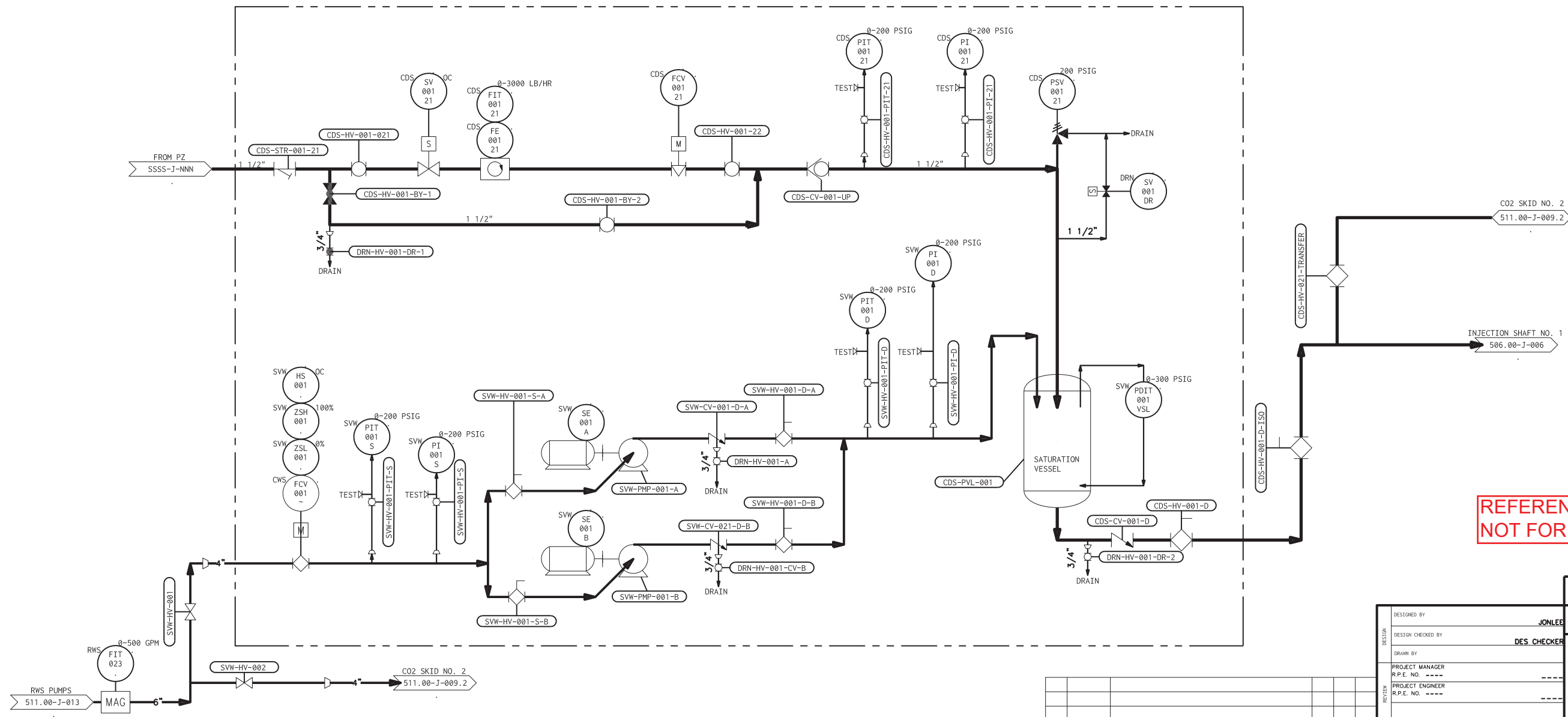


DESIGNED BY	PB
DESIGN CHECKED BY	DRC
DRAWN BY	EGB
SIC PROJ ENGR.	TWP
R.P.E. NO. C 84990	
APPROVED	KEA
PRINCIPAL IN CHARGE, R.P.E. NO. C 5199	

PROJECT MANAGER	R.P.E. NO. C 72454	<i>Emily L. King</i>
PROJECT ENGINEER	R.P.E. NO. C 72454	<i>Emily L. King</i>
RECOMMENDED:		
SENIOR CIVIL ENGR.	R.P.E. NO. C 74981	<i>Robert J. Hartlaub</i>
APPROVED:		
MGR OF DESIGN	R.P.E. NO. C 48598	<i>S. Trenton</i>
SERGE Y. TEBULI ET		

EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
PARDEE CHEMICAL PLANT IMPROVEMENTS CIVIL TYPICAL TUNNEL CONNECTION DETAILS SHEET 2 OF 2			
PROJ NO. SPEC 2158	511.44-C-005.2	1	
SCALE AS SHOWN			
DATE JAN 2020	STRUCT. DISC. NUMBER	REV.	

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REFERENCE ONLY
NOT FOR CONSTRUCTION

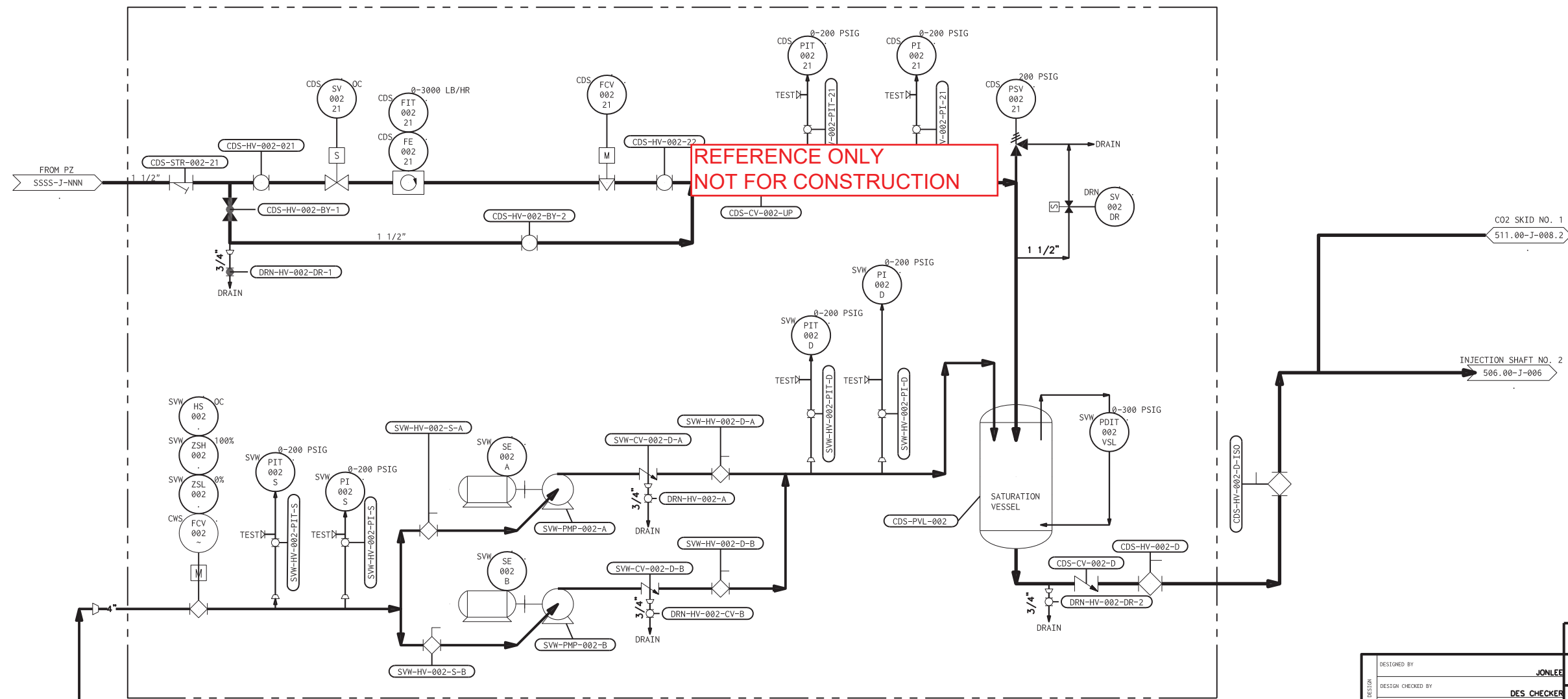
NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	JONLEE
DESIGN CHECKED BY	DES CHECKER
DRAWN BY	
PROJECT MANAGER	
R.P.E. NO. ----	
PROJECT ENGINEER	
R.P.E. NO. ----	
APPROVED	
MGR OF DESIGN	
R.P.E. NO. ----	

FACILITY NO.	234	SYSTEM CODE	CDS
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
001-51100P3D CARBONIC ACID NO. 1			
PROCESS			
PROCESS AND INSTRUMENTATION DIAGRAM			
PROJ. NO.	2142	511.00-J-008.2	#
R.P.E. NO. ----			
SCALE	NONE		
DATE	20 June 2019	STRUCT.	DISC.
		NUMBER	REV.

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RWS
511.00-J-008.2

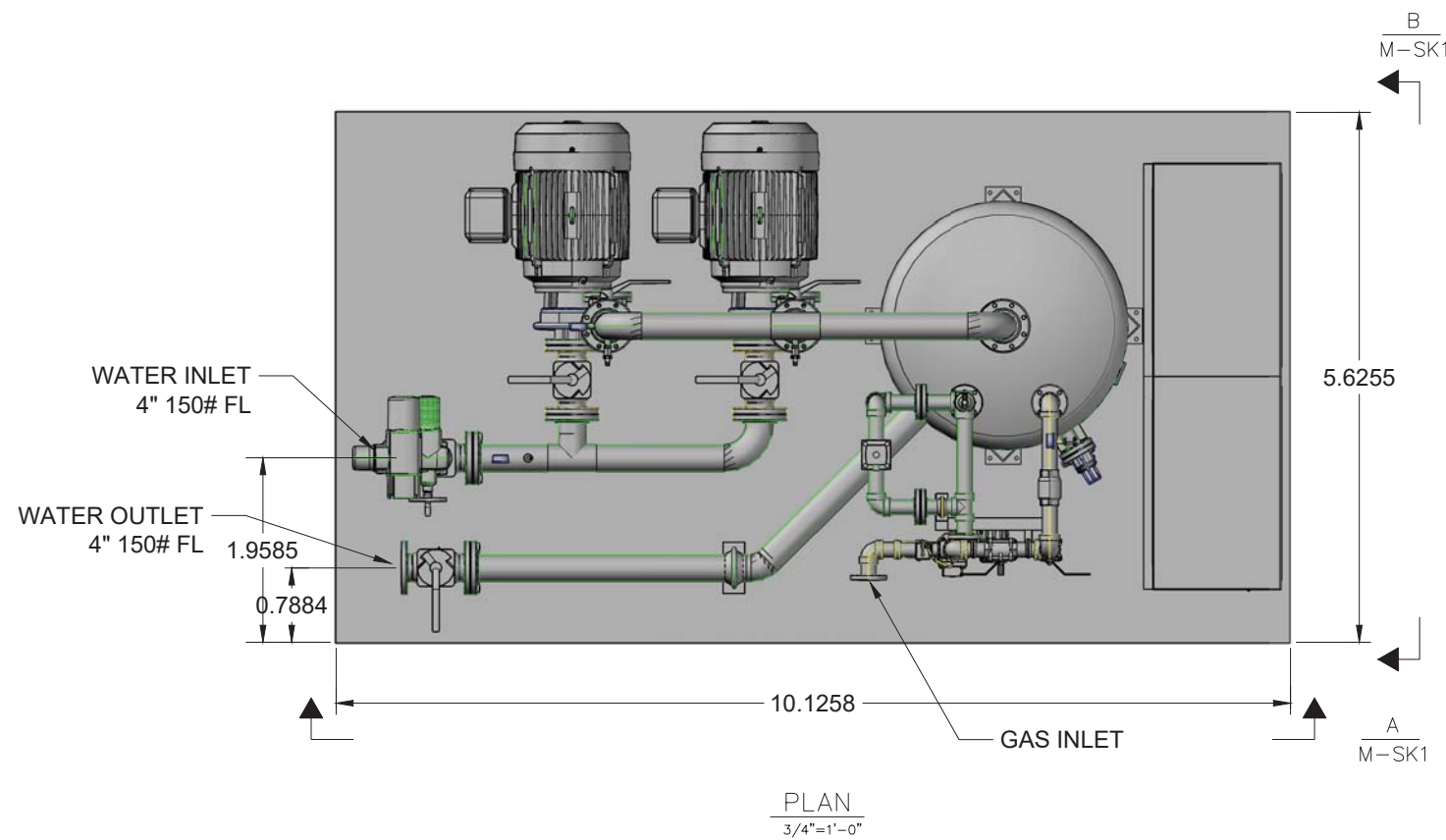


REFERENCE ONLY
NOT FOR CONSTRUCTION

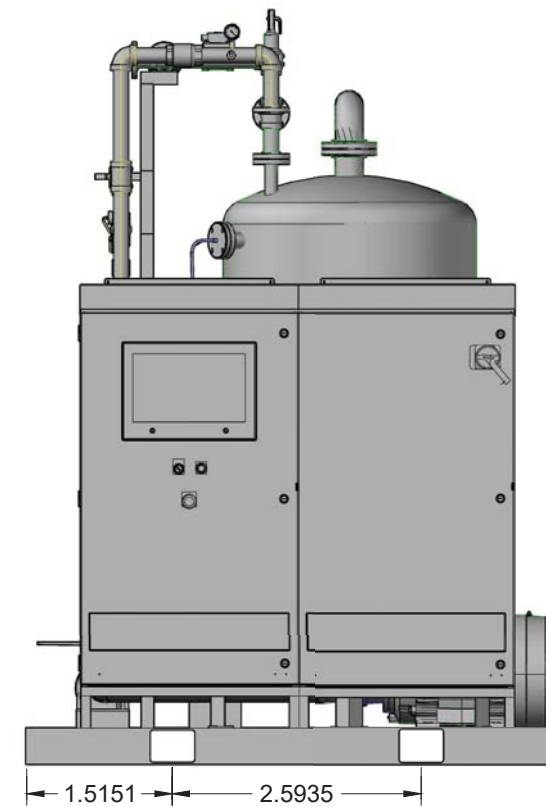
NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	JONLEE
DESIGN CHECKED BY	DES CHECKER
DRAWN BY	
PROJECT MANAGER	
R.P.E. NO.	
PROJECT ENGINEER	
R.P.E. NO.	
REVIEWED	
SENIOR MECH ENGR	
R.P.E. NO.	
APPROVED	
MGR OF DESIGN	
R.P.E. NO.	

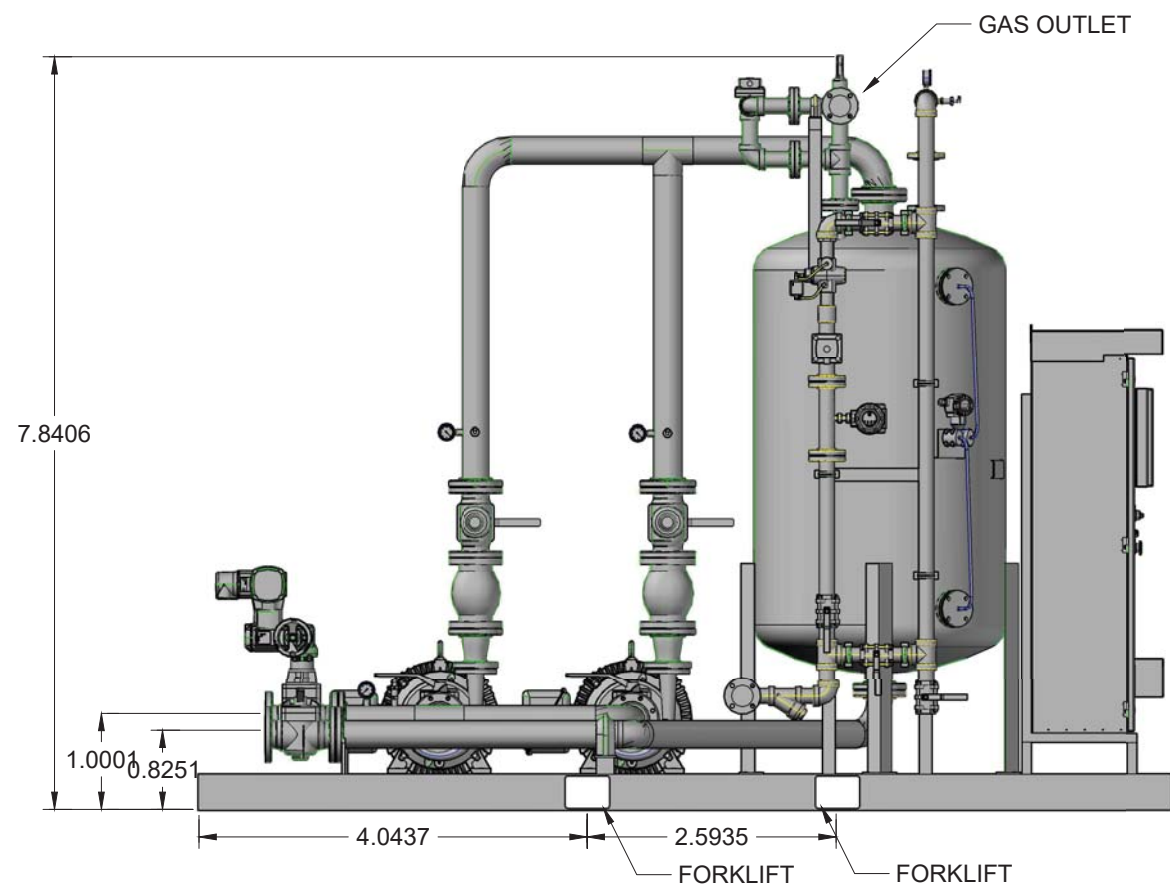
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EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
001-51100P3D CARBONIC ACID NO. 2			
PROCESS			
PROCESS AND INSTRUMENTATION DIAGRAM			
PROJ. NO.	2142	511.00-J-009.2	#
SCALE	NONE		
DATE	20 June 2019	STRUCT.	DISC.
		NUMBER	REV.



PLAN
3/4"=1'-0"



SECTION B
3/4"=1'-0" M-SK1



SECTION A
3/4"=1'-0" M-SK1

REFERENCE ONLY
NOT FOR
CONSTRUCTION

NOTES
1. DIMENSIONS ARE TYPICAL OF 2 IDENTICAL SKIDS.

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY		EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
DESIGN CHECKED BY		PARDEE CHEMICAL PLANT CARBONIC ACID FEED SYSTEM MECHANICAL CARBONIC ACID FEED SYSTEM SKID LAYOUT			
DRAWN BY	TFONG	SHEET 1 OF 1			
PROJECT MANAGER R.P.E. NO.		PROJ. NO.	2142	511.00-M-SK1	0
PROJECT ENGINEER R.P.E. NO.		SCALE			
RECOMMENDED SENIOR MECH ENGR. R.P.E. NO.		DATE	26-Mar-2020	STRUCT.	DISC.
APPROVED MGR OF DESIGN R.P.E. NO.				NUMBER	REV.

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WALNUT CREEK WATER TREATMENT PLANT

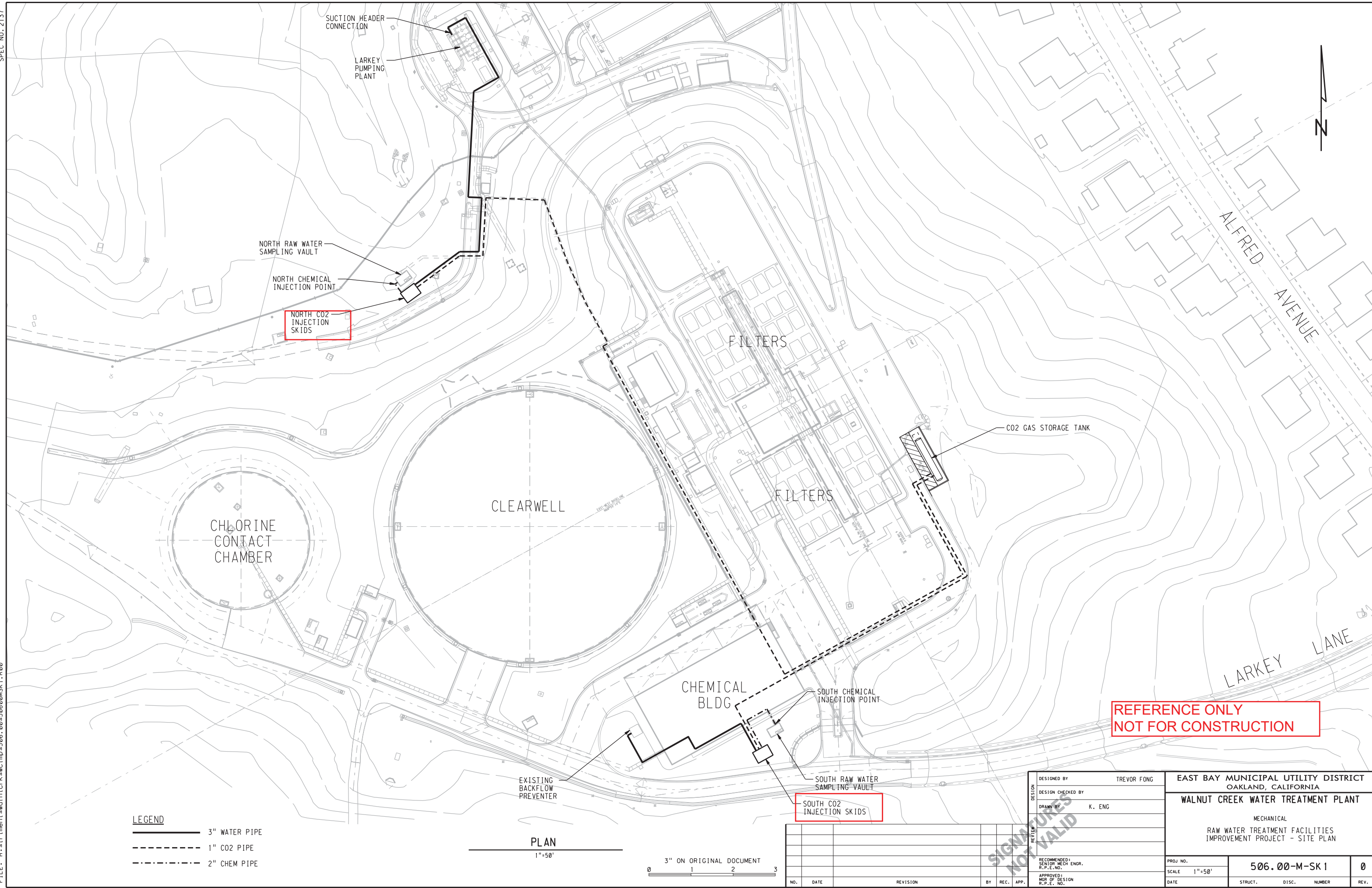
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TECHNICAL DRAWINGS

RFQ 2014



EAST BAY MUNICIPAL UTILITY DISTRICT



NORTH CO2 INJECTION SKIDS

FILTERS

FILTERS

CO2 GAS STORAGE TANK

CHLORINE CONTACT CHAMBER

CLEARWELL

CHEMICAL BLDG

SOUTH CHEMICAL INJECTION POINT

SOUTH CO2 INJECTION SKIDS

REFERENCE ONLY
NOT FOR CONSTRUCTION

LEGEND

	3" WATER PIPE
	1" CO2 PIPE
	2" CHEM PIPE

PLAN
1"=50'

3" ON ORIGINAL DOCUMENT
0 1 2 3

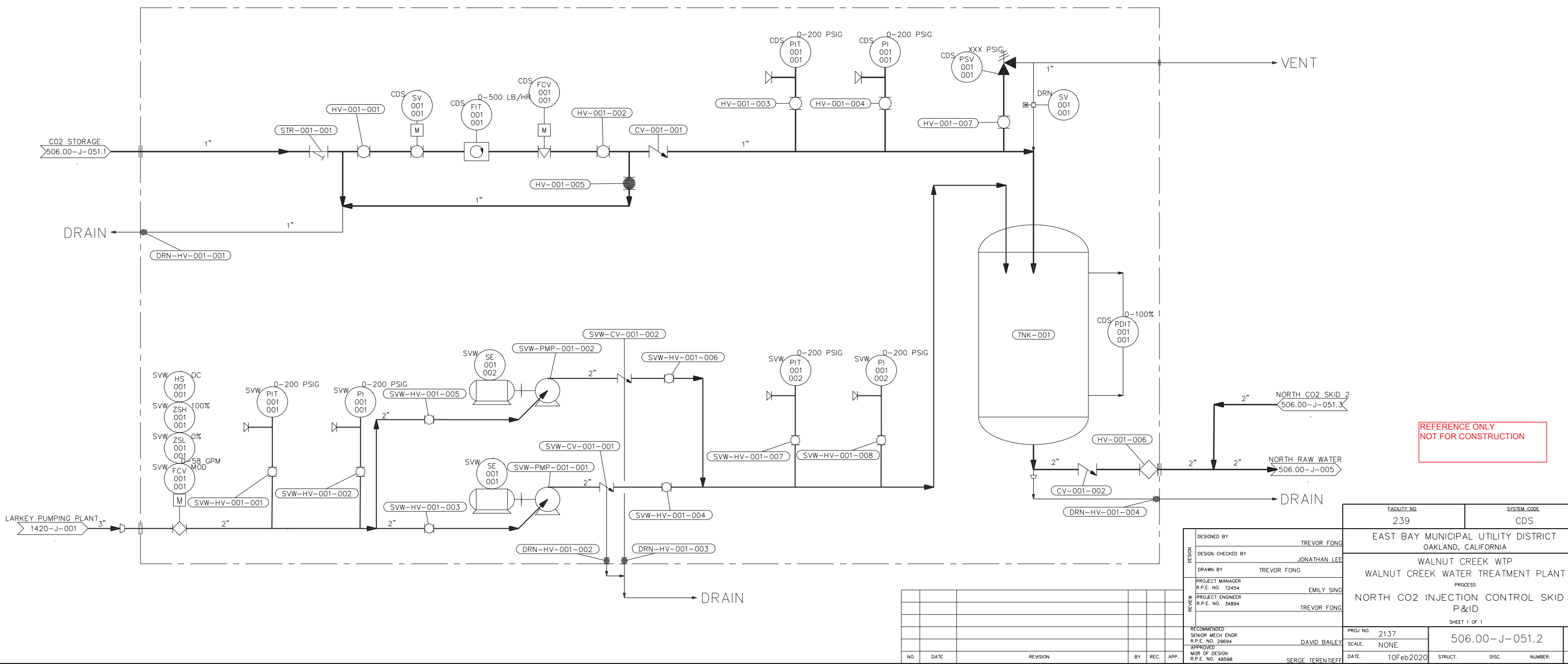
NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	TREVOR FONG
DESIGN CHECKED BY	
DRAWN BY	K. ENG
RECOMMENDED BY	
APPROVED BY	

EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA		
WALNUT CREEK WATER TREATMENT PLANT		
MECHANICAL RAW WATER TREATMENT FACILITIES IMPROVEMENT PROJECT - SITE PLAN		
PROJ. NO.	506.00-M-SK 1	0
SCALE	1"=50'	
DATE		
STRUCT.	DISC.	NUMBER

SIGNATURES
NOT VALID

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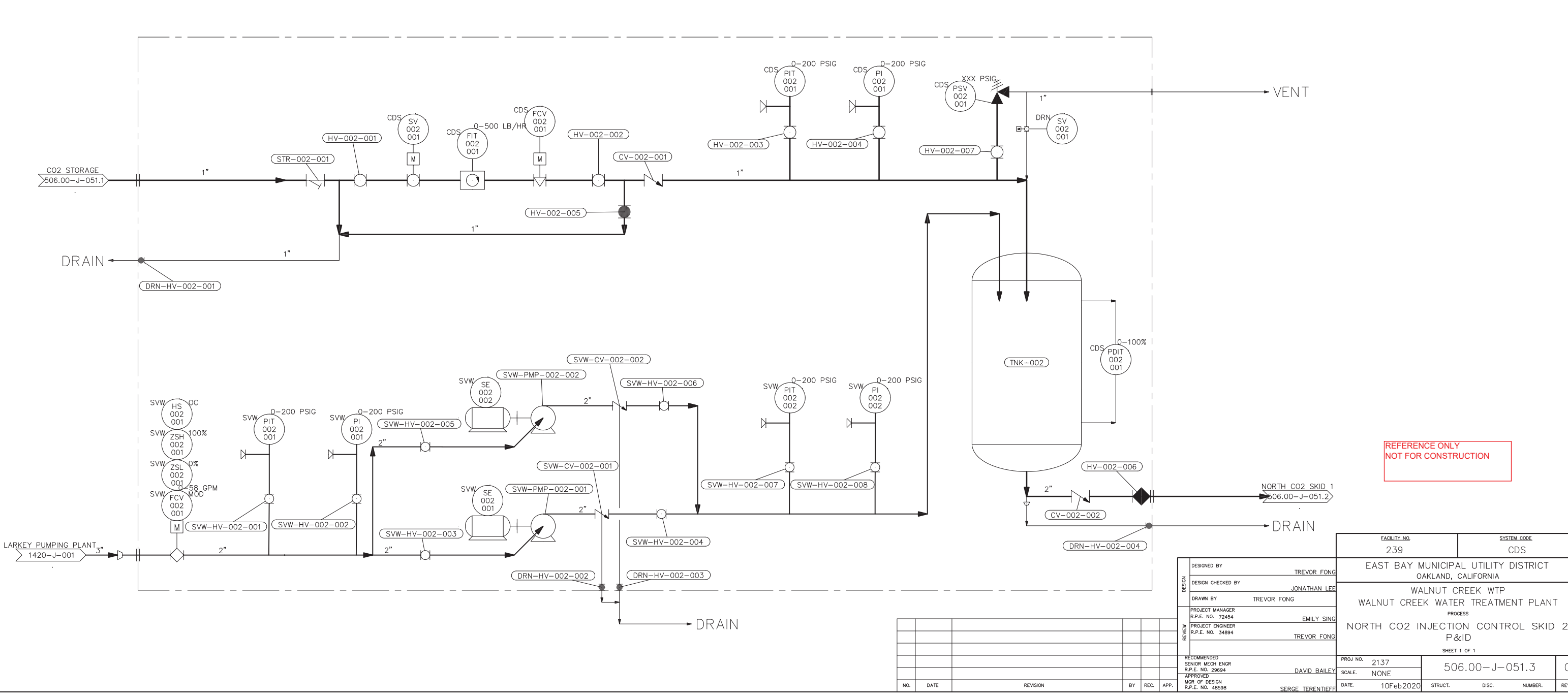
REFERENCE ONLY
 NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	TREVOR FONG
DESIGN CHECKED BY	JONATHAN LEE
DRAWN BY	TREVOR FONG
PROJECT MANAGER	EMILY SING
PROJECT ENGINEER	TREVOR FONG
APPROVED	DAVID BAILEY
MGR OF DESIGN	SERGE TERENTIEFF

FACILITY NO	239	SYSTEM CODE	CDS
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
WALNUT CREEK WTP WALNUT CREEK WATER TREATMENT PLANT PROCESS			
NORTH CO2 INJECTION CONTROL SKID 1 P&ID			
SHEET 1 OF 1			
PROJ NO	2137	SCALE	NONE
DATE	10Feb2020	STRUCT.	DISC.
NUMBER	506.00-J-051.2	REV.	0

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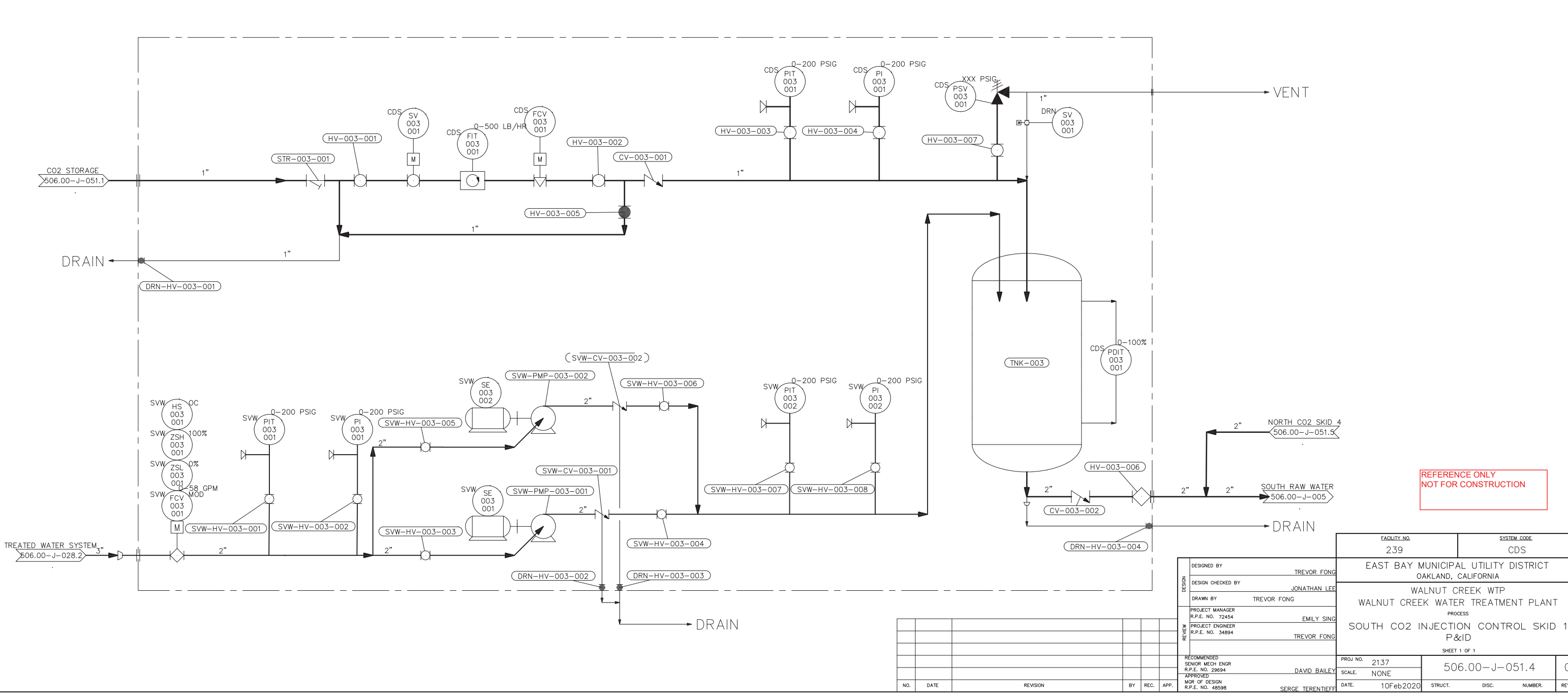
REFERENCE ONLY
 NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	TREVOR FONG
DESIGN CHECKED BY	JONATHAN LEE
DRAWN BY	TREVOR FONG
PROJECT MANAGER	EMILY SING
PROJECT ENGINEER	TREVOR FONG
APPROVED	DAVID BAILEY
RECOMMENDED	SERGE TERENTIEFF
SENIOR MECH ENGR	DAVID BAILEY
R.P.E. NO. 29694	
MGR OF DESIGN	SERGE TERENTIEFF
R.P.E. NO. 48598	

FACILITY NO.	239	SYSTEM CODE	CDS
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
WALNUT CREEK WTP WALNUT CREEK WATER TREATMENT PLANT PROCESS			
NORTH CO2 INJECTION CONTROL SKID 2 P&ID			
SHEET 1 OF 1			
PROJ NO.	2137	506.00-J-051.3	0
SCALE	NONE		
DATE	10Feb2020	STRUCT.	DISC.
		NUMBER	REV.

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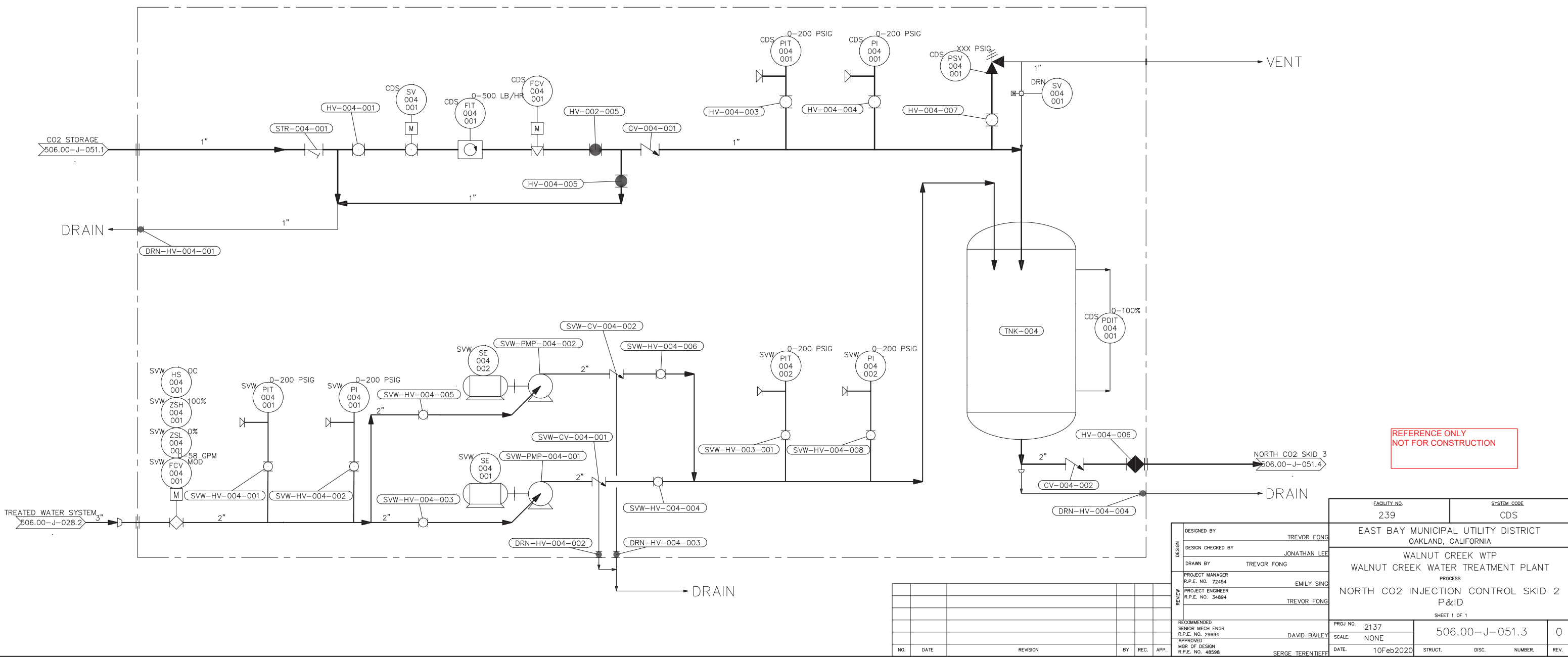


NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	TREVOR FONG
DESIGN CHECKED BY	JONATHAN LEE
DRAWN BY	TREVOR FONG
PROJECT MANAGER	EMILY SING
APPROVED	TREVOR FONG
PROJECT ENGINEER	TREVOR FONG
RECOMMENDED	
SENIOR MECH ENGR	DAVID BAILEY
R.P.E. NO. 29694	
APPROVED	
MGR OF DESIGN	SERGE TERENTIEFF
R.P.E. NO. 48598	

FACILITY NO.	239	SYSTEM CODE	CDS
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
WALNUT CREEK WTP WALNUT CREEK WATER TREATMENT PLANT PROCESS			
SOUTH CO2 INJECTION CONTROL SKID 1 P&ID			
SHEET 1 OF 1			
PROJ NO.	2137	SCALE	NONE
DATE	10Feb2020	STRUCT.	
		DISC.	
		NUMBER.	506.00-J-051.4
		REV.	0

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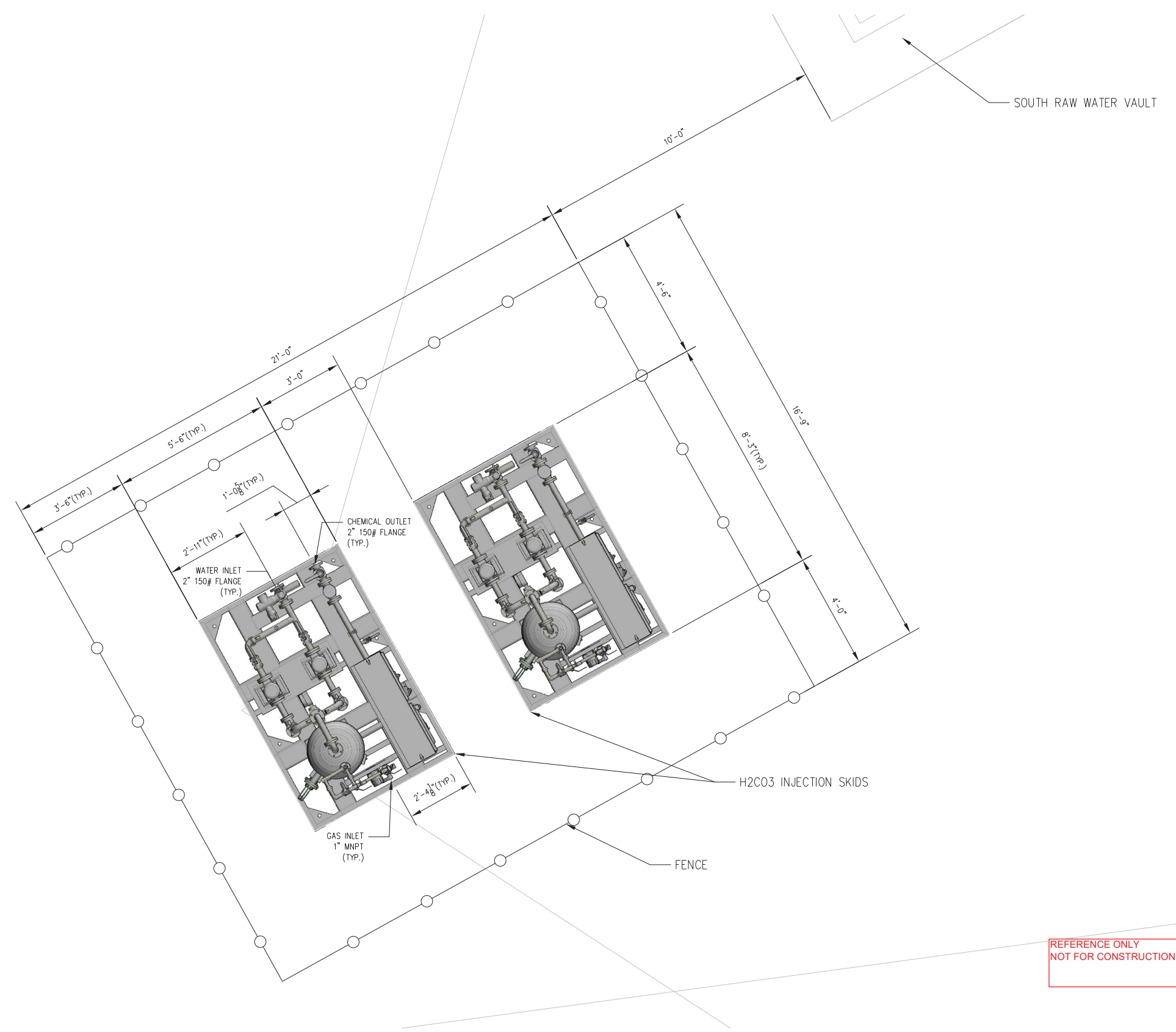


NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	TREVOR FONG
DESIGN CHECKED BY	JONATHAN LEE
DRAWN BY	TREVOR FONG
PROJECT MANAGER	EMILY SING
PROJECT ENGINEER	TREVOR FONG
APPROVED	DAVID BAILEY
MGR OF DESIGN	SERGE TERENTIEFF

FACILITY NO.	239	SYSTEM CODE	CDS
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
WALNUT CREEK WTP WALNUT CREEK WATER TREATMENT PLANT PROCESS			
NORTH CO2 INJECTION CONTROL SKID 2 P&ID			
SHEET 1 OF 1			
PROJ NO.	2137	506.00-J-051.3	0
SCALE	NONE		
DATE	10Feb2020	STRUCT.	DISC. NUMBER. REV.

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REFERENCE ONLY
 NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY #####	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
DESIGN CHECKED BY #####	WALNUT CREEK WATER TREATMENT PLANT SOUTH CO2 INJECTION SKIDS MECHANICAL			
DRAWN BY FACILITY DRAFTING	PROJECT P&ID			
PROJECT MANAGER R.P.E. NO. ----	EMILY SING	PROJ. NO.	2137	#
PROJECT ENGINEER R.P.E. NO. ----	TREVOR FONG	SCALE	1" = 2"	
RECOMMENDED SENIOR MECH ENGR R.P.E. NO. ----	DAVID BAILEY	DATE	30 July 2019	506.00-M-SK2.1
APPROVED MGR OF DESIGN R.P.E. NO. ----	SERGE TERENTIEFF	STRUCT.	DISC.	NUMBER.
				REV.

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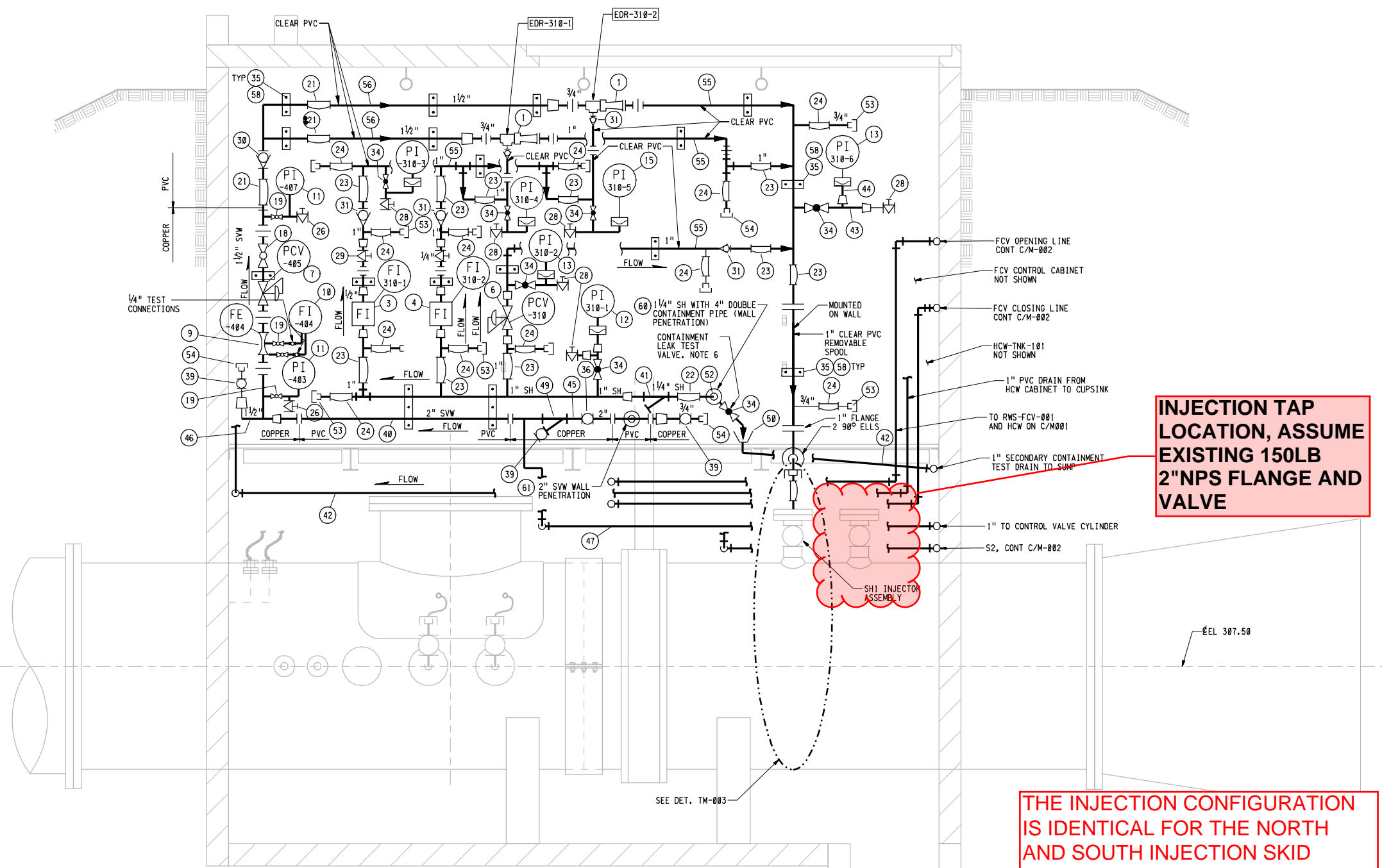


REFERENCE ONLY
 NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY #####	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA		
DESIGN CHECKED BY #####	WALNUT CREEK WATER TREATMENT PLANT NORTH CO2 INJECTION SKIDS MECHANICAL		
DRAWN BY FACILITY DRAFTING	PROJECT P&ID		
PROJECT MANAGER R.P.E. NO. ---- EMILY SING	PROJ. NO. 2137	506.00-M-SK2.2	#
PROJECT ENGINEER R.P.E. NO. ---- TREVOR FONG	SCALE 1"=2'		
RECOMMENDED SENIOR MECH ENGR R.P.E. NO. ---- DAVID BAILEY	DATE 30 July 2019	STRUCT.	DISC.
APPROVED MGR OF DESIGN R.P.E. NO. ---- SERGE TERENTIEFF		NUMBER.	REV.

MATERIAL LIST			
ITEM	REQUIRED	DESCRIPTION	REMARKS
1	2	EDUCTOR, 1", PVC, THD, 22 GPH CHEM. FLOW	
2			
3	1	ROTAMETER, 1/2", PVC, 180-1800 ML/MIN, THD, TYPE 4	
4	1	ROTAMETER, 1/2", PVC, 19-190 ML/MIN, THD, TYPE 3	
5			
6	1	BACKPRESSURE VALVE, 1/2", PVC, SET AT 60 PSI	
7	1	PRESSURE RED. VLV., 1 1/2", BRZ, 125 LB, THD, SET AT 60 PSIG	
8			
9	1	VENTURI, BRASS, 1/4" THD, 30" H2O AT 16 GPM	
10	1	DIFFERENTIAL PRESSURE GAUGE, 4 1/2" DIAL, 0-60 H2O	
11	2	PRESSURE GAUGE, 4 1/2" DIAL, 1/2" NPT, 0 TO 120 PSI, TYPE 1	PI-403, 407
12	1	PRESSURE GAUGE, 2 1/2" DIAL, 1/4" NPT, 0 TO 100 PSI, PI-310-1	PI-310-1
13	2	PRESSURE GAUGE, 2 1/2" DIAL, 1/4" NPT, 0 TO 30 PSI, WITH 1/2"x1/4" NPT DIAPHRAGM SEAL, TYPE 2	PI-310-2, 6
14			
15	3	PRESSURE GAUGE, 2 1/2" DIAL, 1/4" NPT, COMPOUND 30" Hg VAC/ 0 TO 15 PSIG, WITH 1/2"x1/4" NPT DIAPHRAGM SEAL, TYPE 2	PI-310-3, -4, -5
16			
17			
18	1	GLOBE VALVE, 1 1/2", BRASS, 125 LB, THD	
19	4	GLOBE VALVE, 1/2", BRASS, 125 LB, THD	
20			
21	3	DIAPHRAGM VALVE, 1 1/2", PVC, 150 LB, SOCKET WITH DOUBLE UNION	
22	1	DIAPHRAGM VALVE, 1 1/4", PVC, 150 LB, SOCKET WITH DOUBLE UNION	
23	10	DIAPHRAGM VALVE, 1", PVC, 150 LB, SOCKET WITH DOUBLE UNION	
24	12	DIAPHRAGM VALVE, 3/4", PVC, 150 LB, SOCKET WITH DOUBLE UNION	
25			
26	2	NEEDLE VALVE, 1/4", BRONZE, 150 LB	
27			
28	7	NEEDLE VALVE, 1/4", PVC, 150 LB, THD	
29	2	NEEDLE VALVE, 1/4", MONEL, 150 LB, THD	
30	1	BALL CHECK VALVE, 1 1/2", PVC, 150 LB, SOCKET WITH DOUBLE UNION	
31	5	BALL CHECK VALVE, 1", PVC, 150 LB, SOCKET WITH DOUBLE UNION	
32			
33			
34	7	GLOBE VALVE, 3/4", PVC, 150 LB, THD	
35	AS REQ'D	U CHANNEL STRUT, 1 5/8"x 1 5/8", SST W/ PIPE CLAMP	
36	1	BALL VALVE, 2", BRONZE, 150 LB, THD	
37			
38			
39	3	BALL VALVE, 3/4", BRONZE, 150 LB, THD	
40	5'±	PIPE, 2" PVC, SCH 80, W/ SOCKET FITTINGS, GREY	
41	3'±	PIPE, 1 1/4" PVC, SCH 80, W/ SOCKET FITTINGS, GREY	
42	65'±	PIPE, 1" PVC, SCH 80, W/ SOCKET FITTINGS, GREY	
43	10'±	PIPE, 3/4" PVC, SCH 80, W/ SOCKET FITTINGS, GREY	
44	10'±	PIPE, 1/2" PVC, SCH 80, W/ SOCKET FITTINGS, GREY	
45	3'±	COPPER TUBING, 2", TYPE K, W/ SOLDER FITTINGS	
46	9'±	COPPER TUBING, 1 1/2", TYPE K, W/ SOLDER FITTINGS	
47	AS REQ'D	COPPER TUBING, 1", TYPE K, W/ SOLDER FITTINGS	
48			
49	1	STRAINER, 2", BRONZE, 125 LB, THD	
50	1	CUP SINK, 6"x3", 1 1/2" THD OUTLET	
51	1	STRAINER, 1 1/4", CLEAR PVC, 150 PSI, SOCKET ENDS	
52	1	FLEXIBLE TERMINATION FITTING, 4"x1 1/2", W/ TEST NOZZLE	
53	12	QUICK CONNECT COUPLING, CAM TYPE, 3/4", POLYPROPYLENE, W/ DUST CAP	
54	2	QUICK CONNECT COUPLING, CAM TYPE, 3/4", BRONZE, W/ DUST CAP	
55	30'±	PIPE, 1", CLEAR, PVC, SCH 40 W/ CLEAR SOCKET FITTINGS	
56	16'±	PIPE, 1 1/2", CLEAR, PVC, SCH 40 W/ CLEAR SOCKET FITTINGS	
57			
58	AS REQ'D	WEDGE ANCHOR BOLT, 3/8"x4 1/2" SST	
59			
60	1	WALL SEAL FOR 4" PIPE, EPDM LINK TYPE	
61	1	WALL SEAL FOR 2" PIPE, EPDM LINK TYPE	

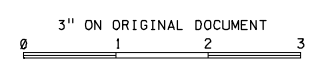


**INJECTION TAP
LOCATION, ASSUME
EXISTING 150LB
2\"/>**

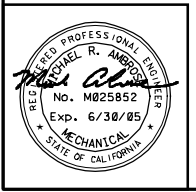
**THE INJECTION CONFIGURATION
IS IDENTICAL FOR THE NORTH
AND SOUTH INJECTION SKID**

- NOTES**
1. ABOVE MATERIAL LIST IS NOT COMPLETE, MANY REQUIRED FITTINGS SUCH AS UNIONS, ELLS, REDUCERS, BUSHINGS AND PIPE SUPPORTS ARE NOT LISTED OR SHOWN. CONTRACTOR SHALL FURNISH AND INSTALL ALL MATERIALS NECESSARY TO COMPLETE THE INSTALLATION.
 2. PVC PIPING SHALL BE SCH 80 WITH SOLVENT WELD JOINTS. SOME INSTRUMENTS OR EQUIPMENT MAY HAVE THREADED CONNECTIONS, HOWEVER THREADED CONNECTIONS SHALL BE KEPT TO A MINIMUM.
 3. COPPER TUBING SHALL BE TYPE K HARD TEMPER WITH SOLDER COPPER FITTINGS, OR BRASS OR BRONZE. VALVES SHALL BE THREADED.
 4. SEE DRAWING 506.08-M-901 FOR PRESSURE GAUGE AND FLUSHING CONNECTION DETAILS. MATERIAL LIST DOES NOT INCLUDE ALL ITEMS SHOWN ON DETAILS.
 5. PIPING SHALL BE SUPPORTED AT SPACING NOT TO EXCEED 4'.
 6. INSTALL LEAK TEST VALVE OUTLET AND FUNNEL WITH MINIMUM 8" AIR GAP FOR EASY VISUAL INDICATION OF SECONDARY CONTAINMENT LEAK.

SECTION B
3/4" x 1'-0" M-001



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DATE: 31-JUL-2007 11:57 REF 1: REF 2:
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NO.	DATE	REVISION	BY	REC.	APP.
1	14MAY2007	IN SERVICE AS BUILT			
2	17AUG2004	REVISED PER DCR 82			

DESIGNED BY <i>[Signature]</i>	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA
DESIGN CHECKED BY <i>[Signature]</i>	WALNUT CREEK WTP IMPROVEMENTS PROJECT INFLUENT CONTROL WORKS
DRAWN BY FACILITY DRAFTING	MECHANICAL
PROJECT MGR. R.P.E. NO. C 38862	NORTH RAW WATER FLOW CONTROL STRUCTURE SODIUM HYPOCHLORITE EDUCTOR FEED SYSTEM (SH1)
PROJECT ENGR. R.P.E. NO. C	PROJ NO. Z-009
APPROVED MGR. OF DESIGN R.P.E. NO. C 38851	SCALE AS SHOWN
	506.08-M-003 02
	DATE 07SEP2001
	STRUCT. DISC. NUMBER
	REV.

♦

LAFAYETTE WATER TREATMENT PLANT

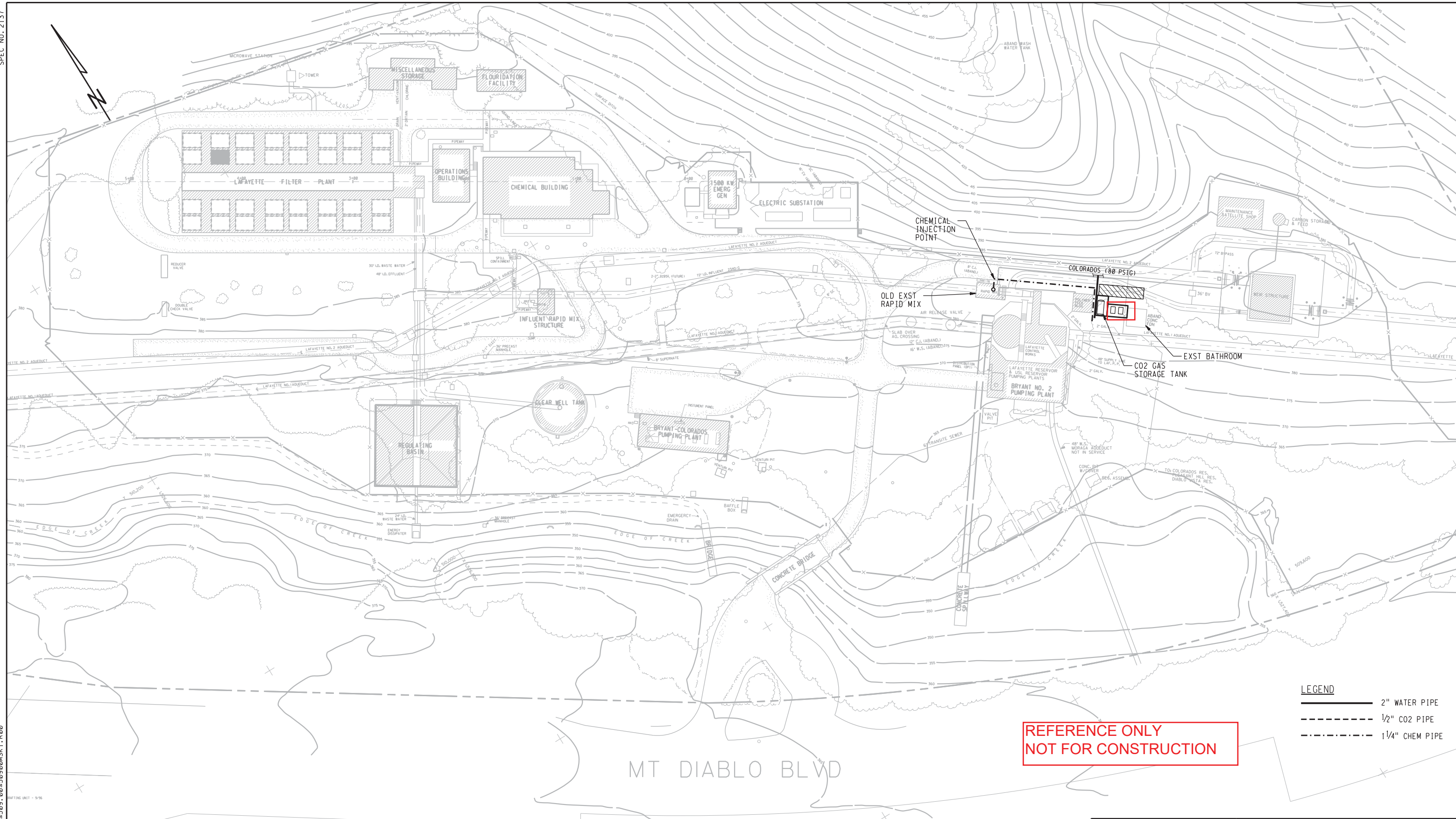
♦

TECHNICAL DRAWINGS

RFQ 2014



EAST BAY MUNICIPAL UTILITY DISTRICT



REFERENCE ONLY
NOT FOR CONSTRUCTION

LEGEND

—————	2" WATER PIPE
- - - - -	1/2" CO2 PIPE
- · - · -	1/4" CHEM PIPE

MT DIABLO BLVD

PLAN
1" = 40'

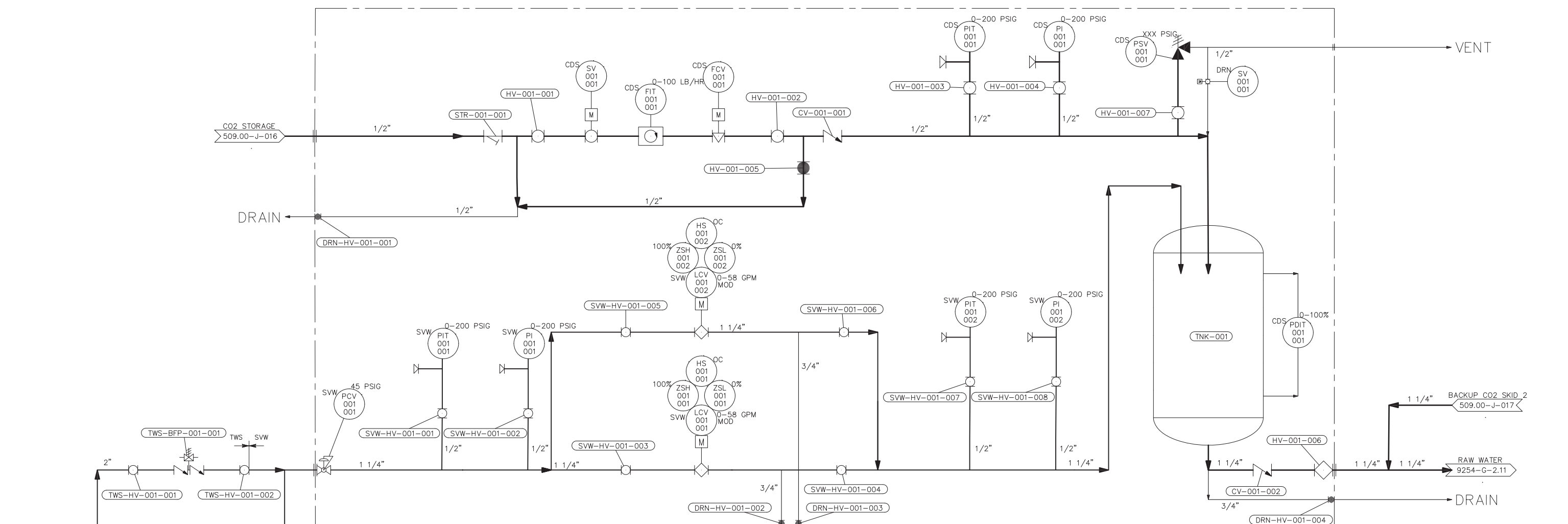
3" ON ORIGINAL DOCUMENT
0 1 2 3

DESIGNED BY	TREVOR FONG	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA	
DESIGN CHECKED BY		LAFAYETTE WATER TREATMENT PLANT	
DRAWN BY	K. ENG	MECHANICAL	
		RAW WATER TREATMENT FACILITIES IMPROVEMENT PROJECT - SITE PLAN	
PROJ. NO.		509.00-M-SK 1	0
SCALE	1" = 40'		
DATE		STRUCT.	DISC.
		NUMBER	REV.

NO.	DATE	REVISION	BY	REC.	APP.

SIGNATURES
NOT VALID

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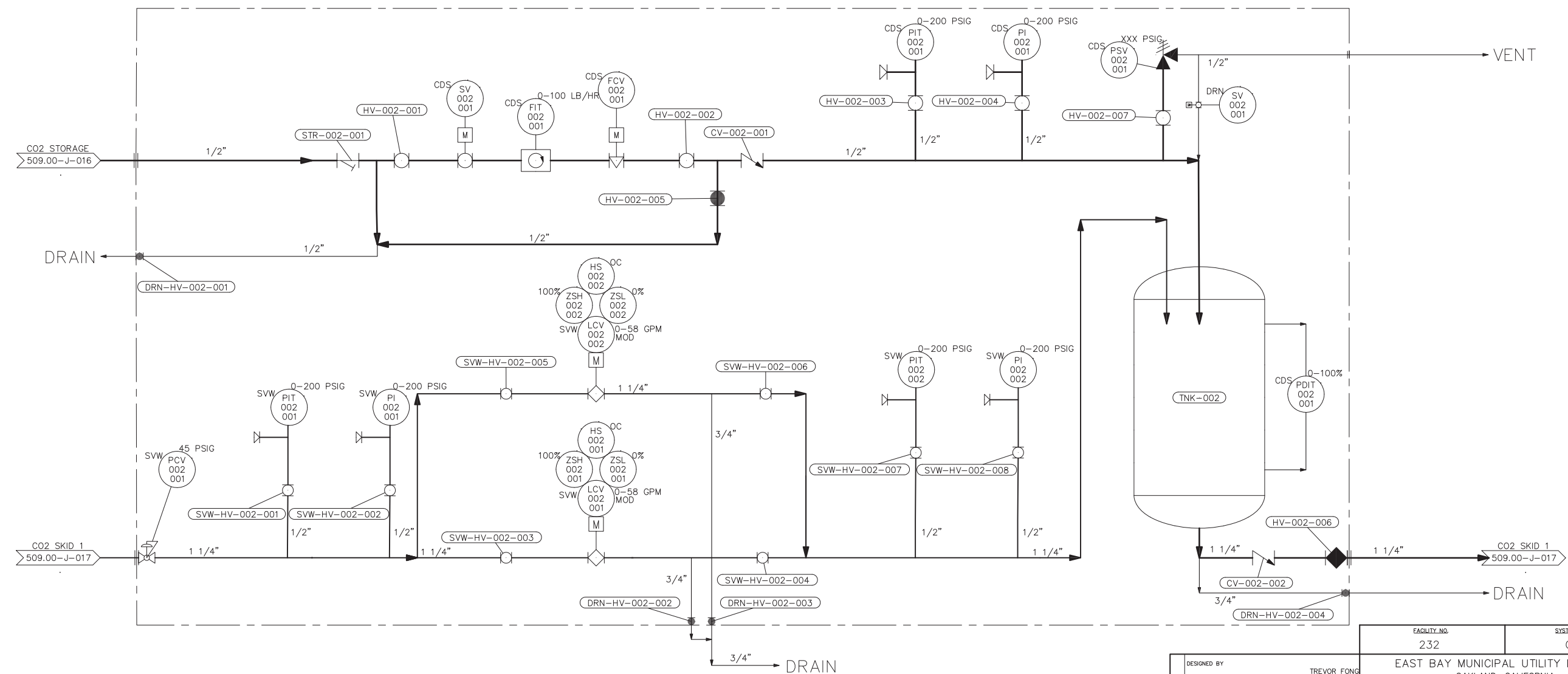


REFERENCE ONLY
NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	REC.	APP.

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DESIGNED BY	TREVOR FONG																																														
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SCALE	NONE																																														
DATE	10Feb2020	STRUCT.	DISC. NUMBER. REV.																																												

User: Tfong Date: 2/11/2020 9:28:24 AM
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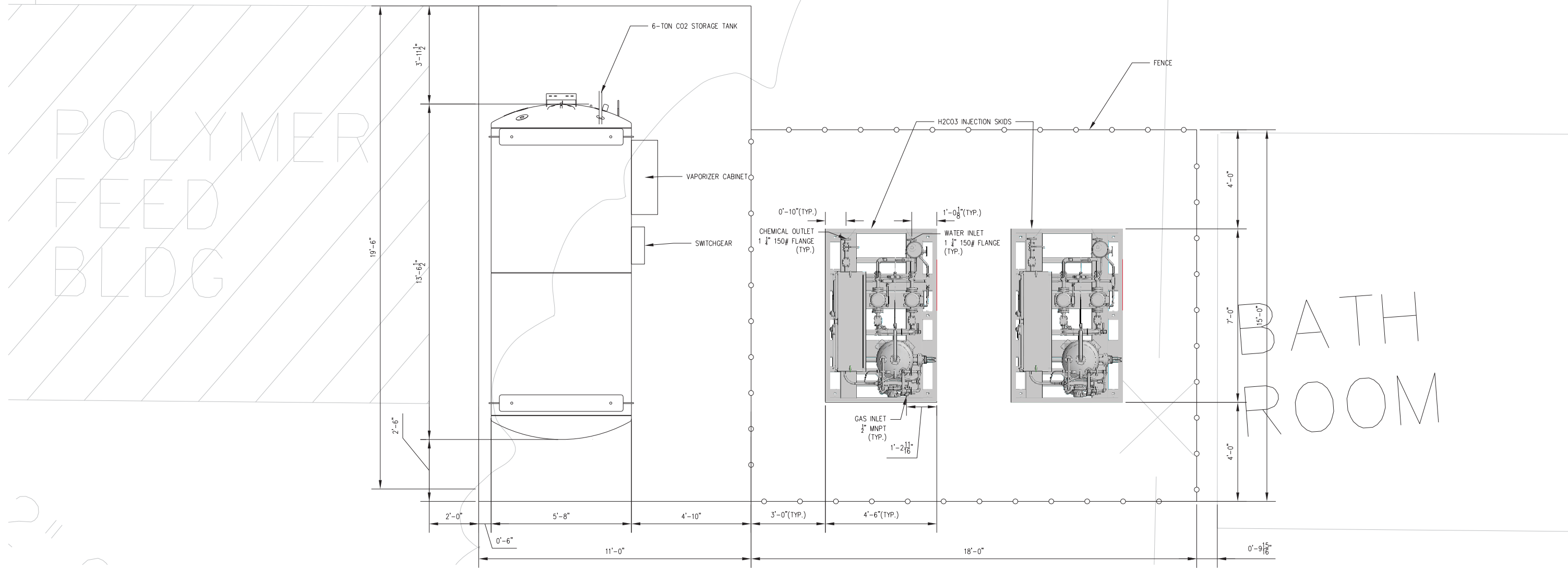


REFERENCE ONLY
 NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY TREVOR FONG	FACILITY NO. 232	SYSTEM CODE CDS
DESIGN CHECKED BY JONATHAN LEE	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA	
DRAWN BY TREVOR FONG	LAFAYETTE WTP LAFAYETTE WATER TREATMENT PLANT	
PROJECT MANAGER R.P.E. NO. 72454 EMILY SING	PROCESS	
PROJECT ENGINEER R.P.E. NO. 34894 TREVOR FONG	CO2 INJECTION CONTROL BACKUP SKID 2 P&ID	
RECOMMENDED SENIOR MECH ENGR R.P.E. NO. 29694 DAVID BAILEY	PROJ NO. 2137	509.00-J-018
APPROVED MGR OF DESIGN R.P.E. NO. 48598 SERGE TERENTIEFF	SCALE NONE	0
	DATE 11Feb2020	STRUCT. DISC. NUMBER. REV.

SHEET 1 OF 1



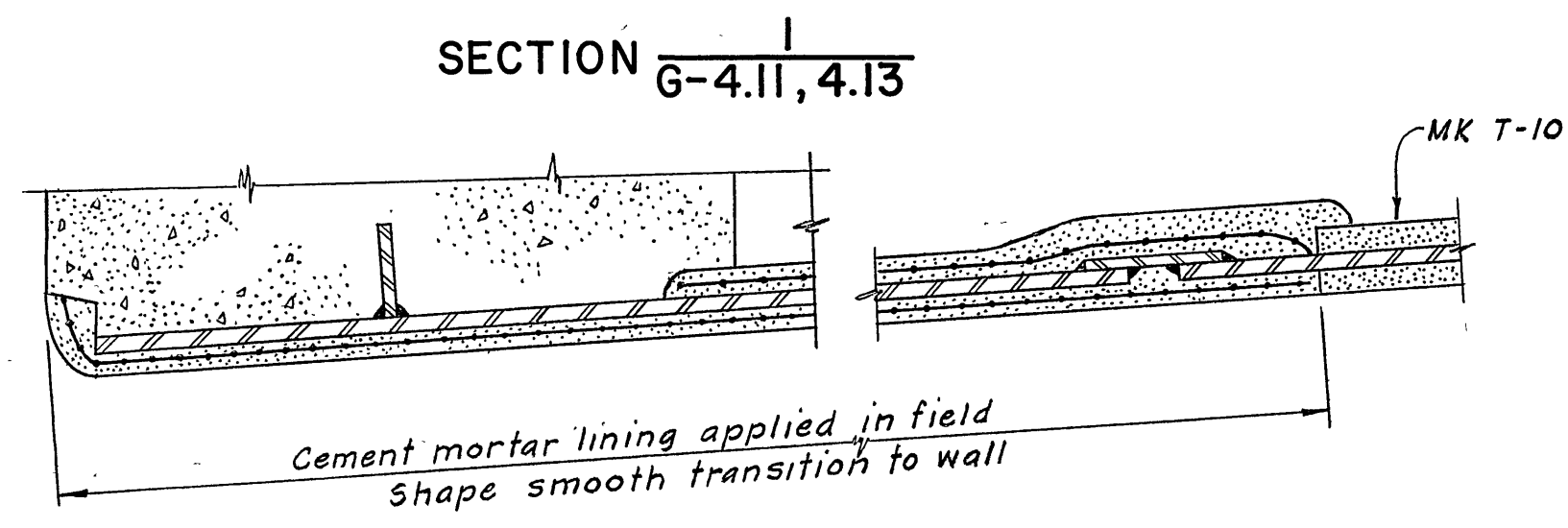
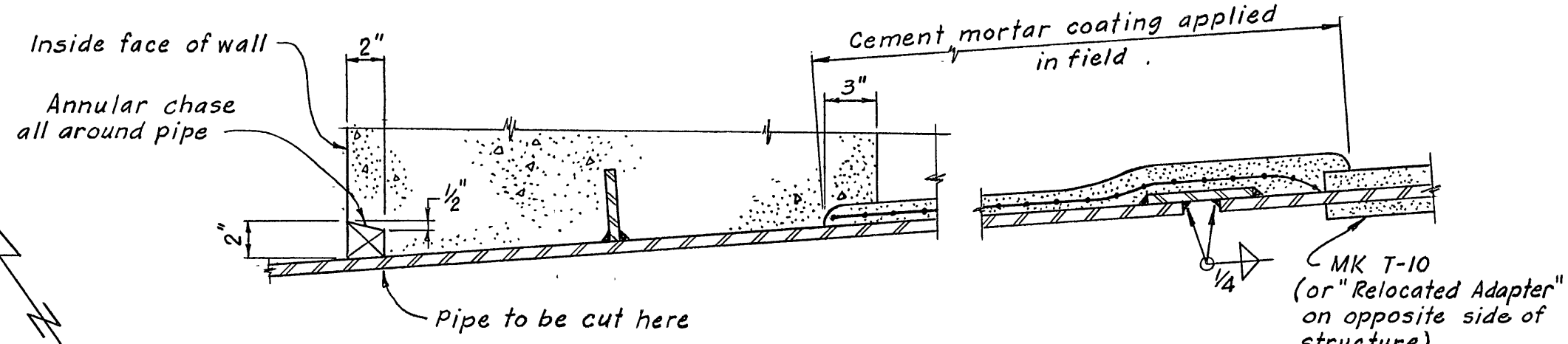
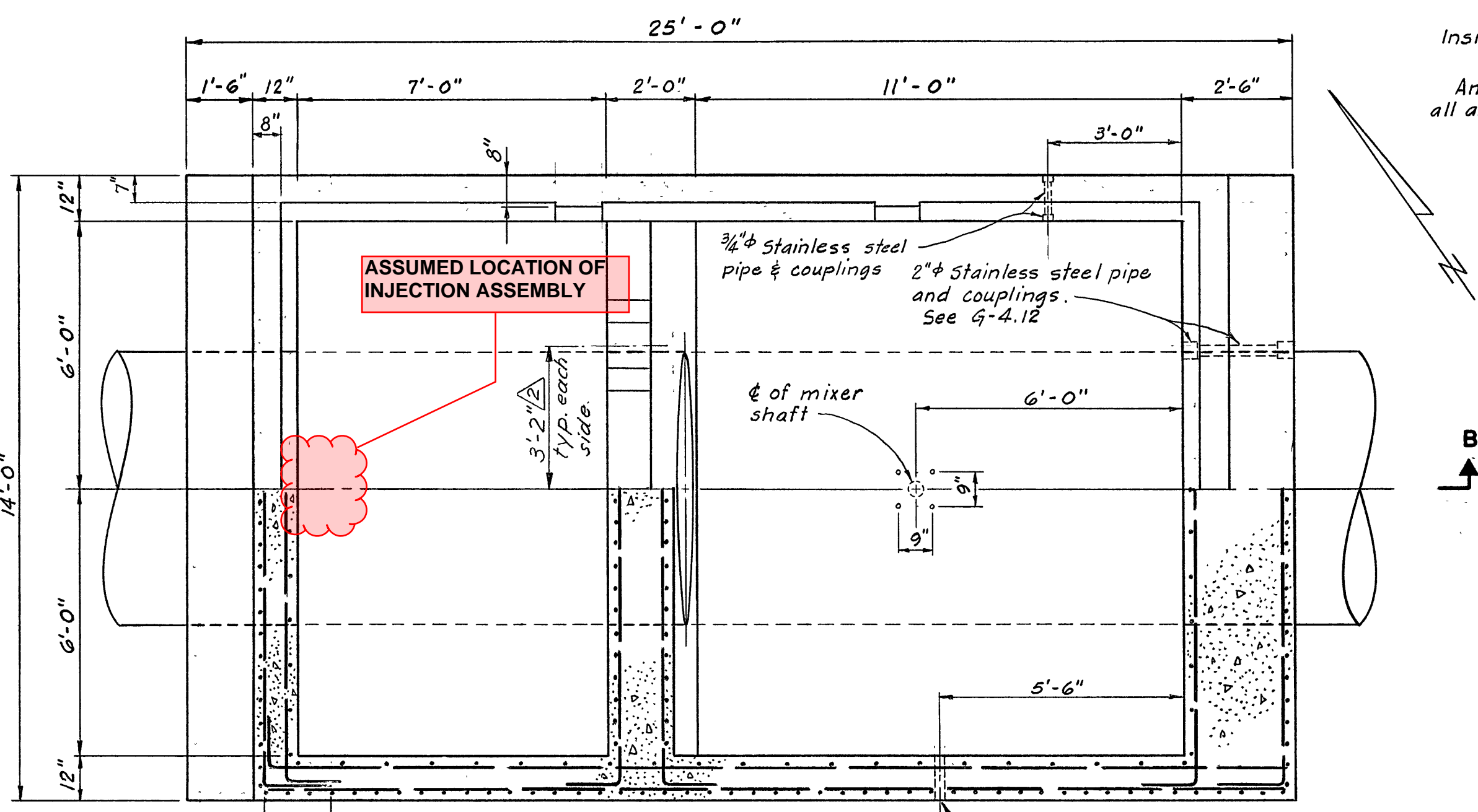
POLYMER
 FEED
 BLDG

BATH
 ROOM

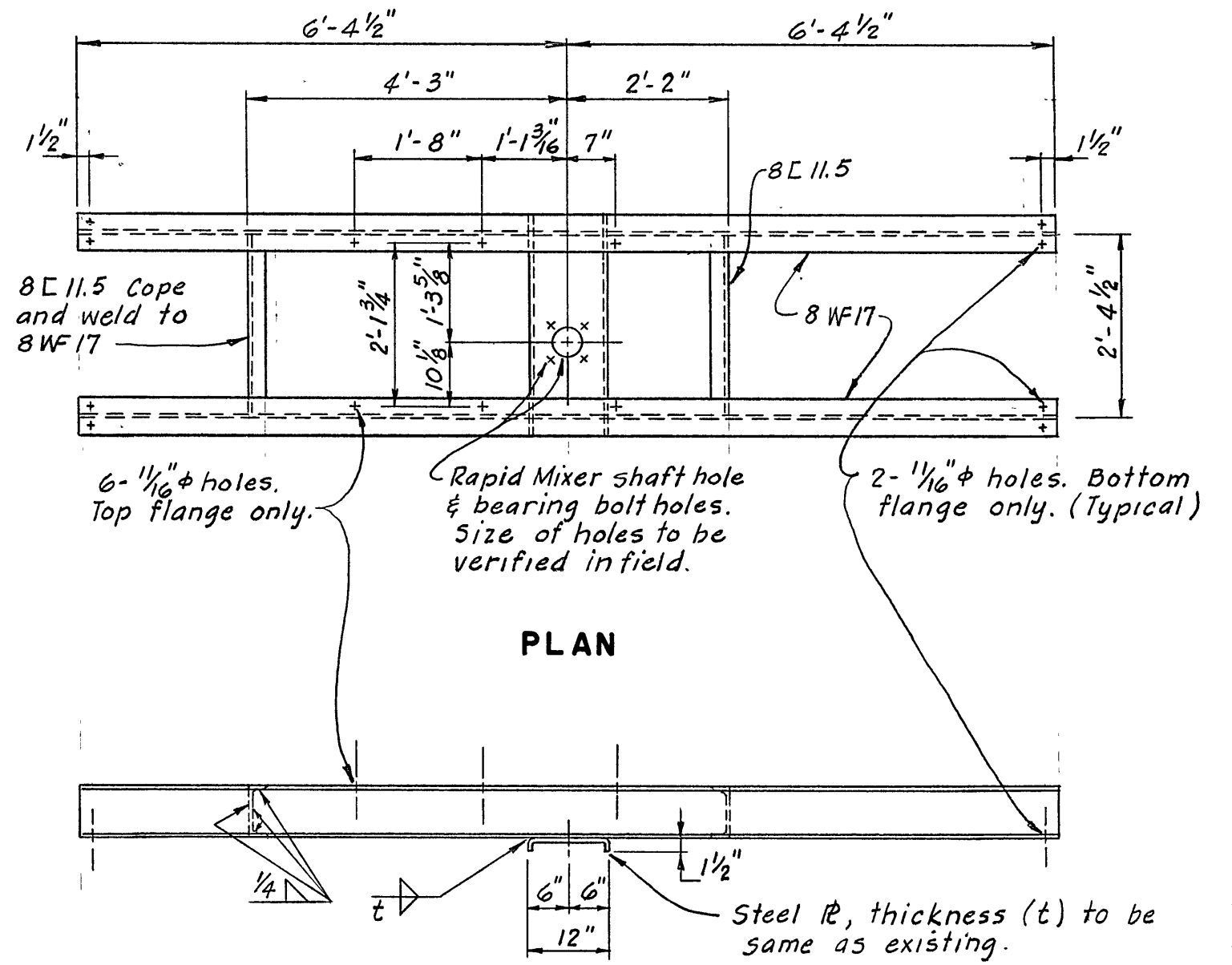
REFERENCE ONLY
 NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	REC.	APP.

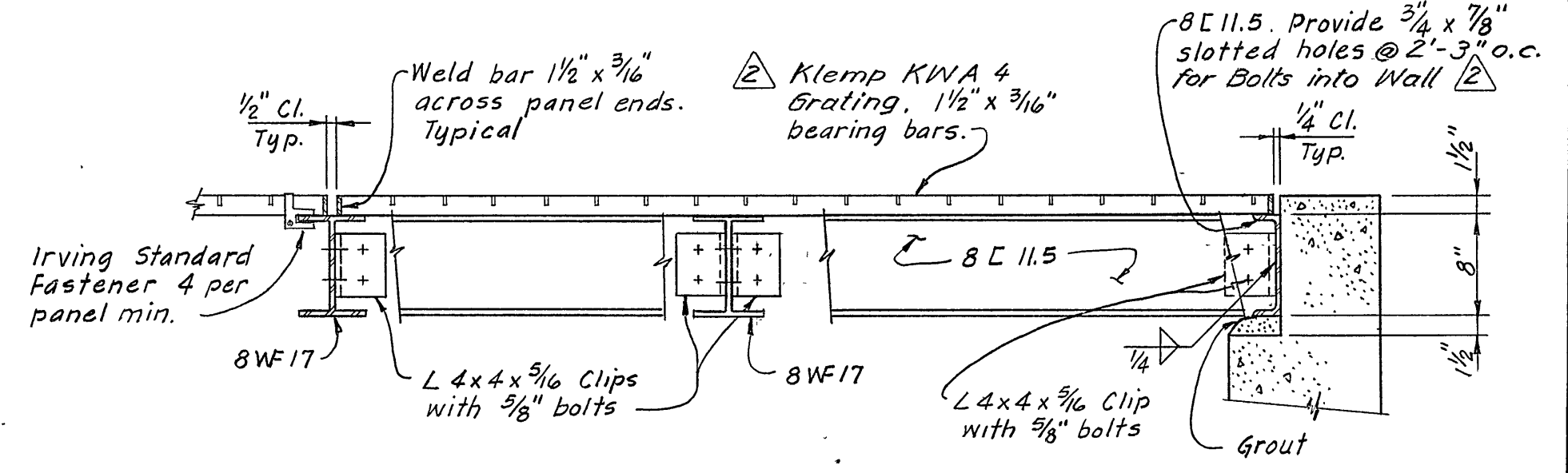
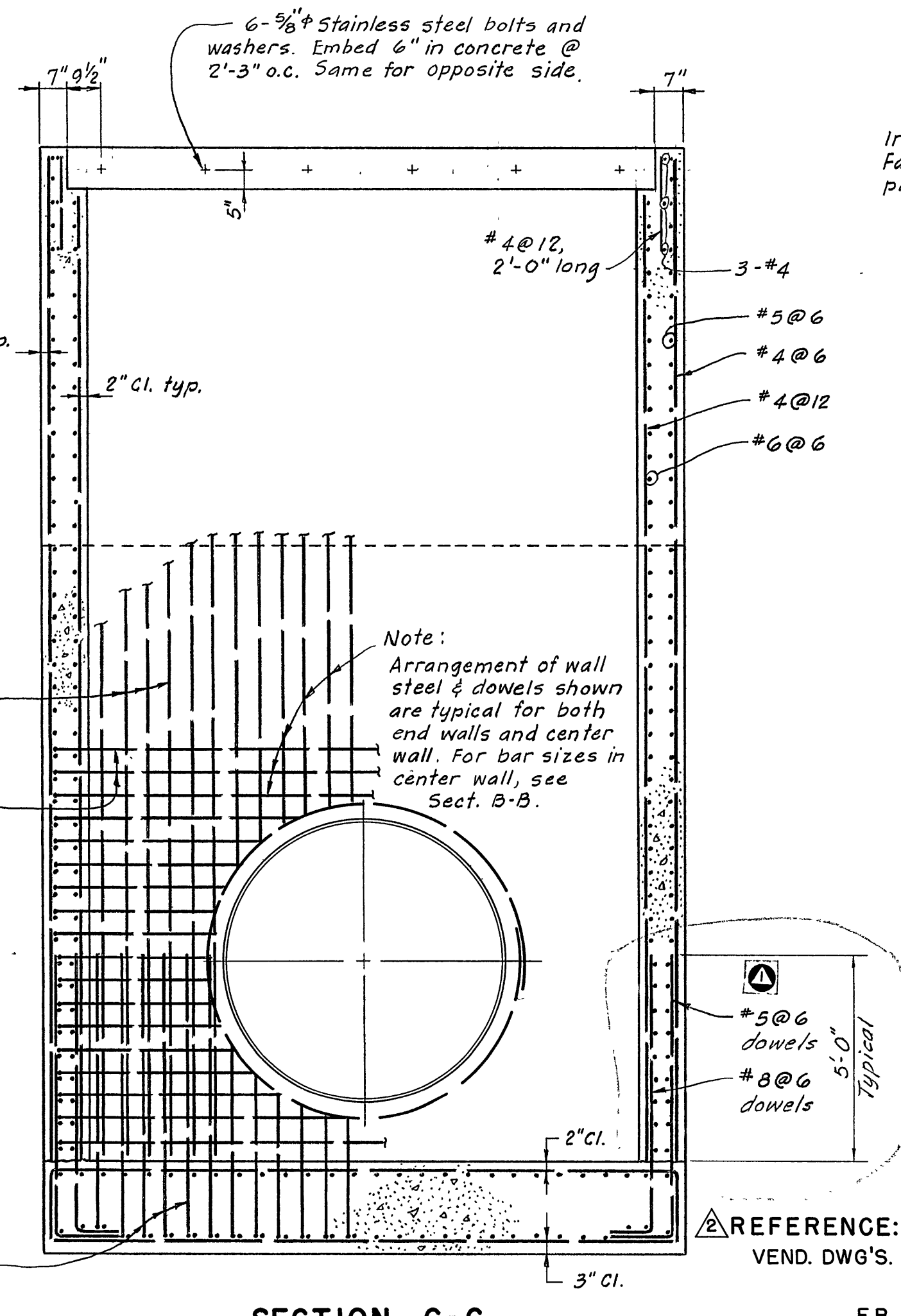
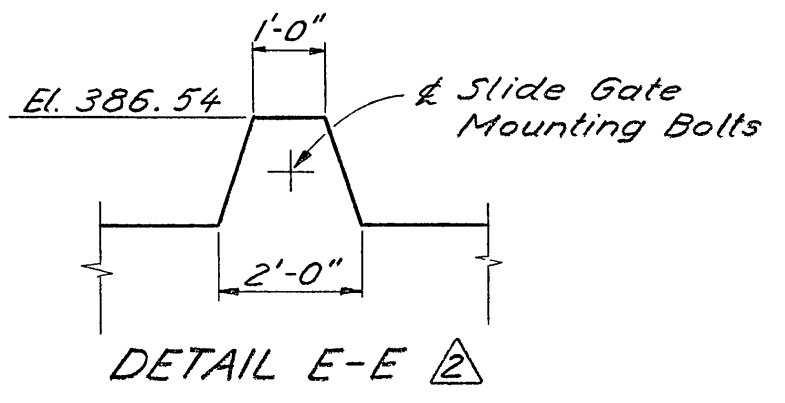
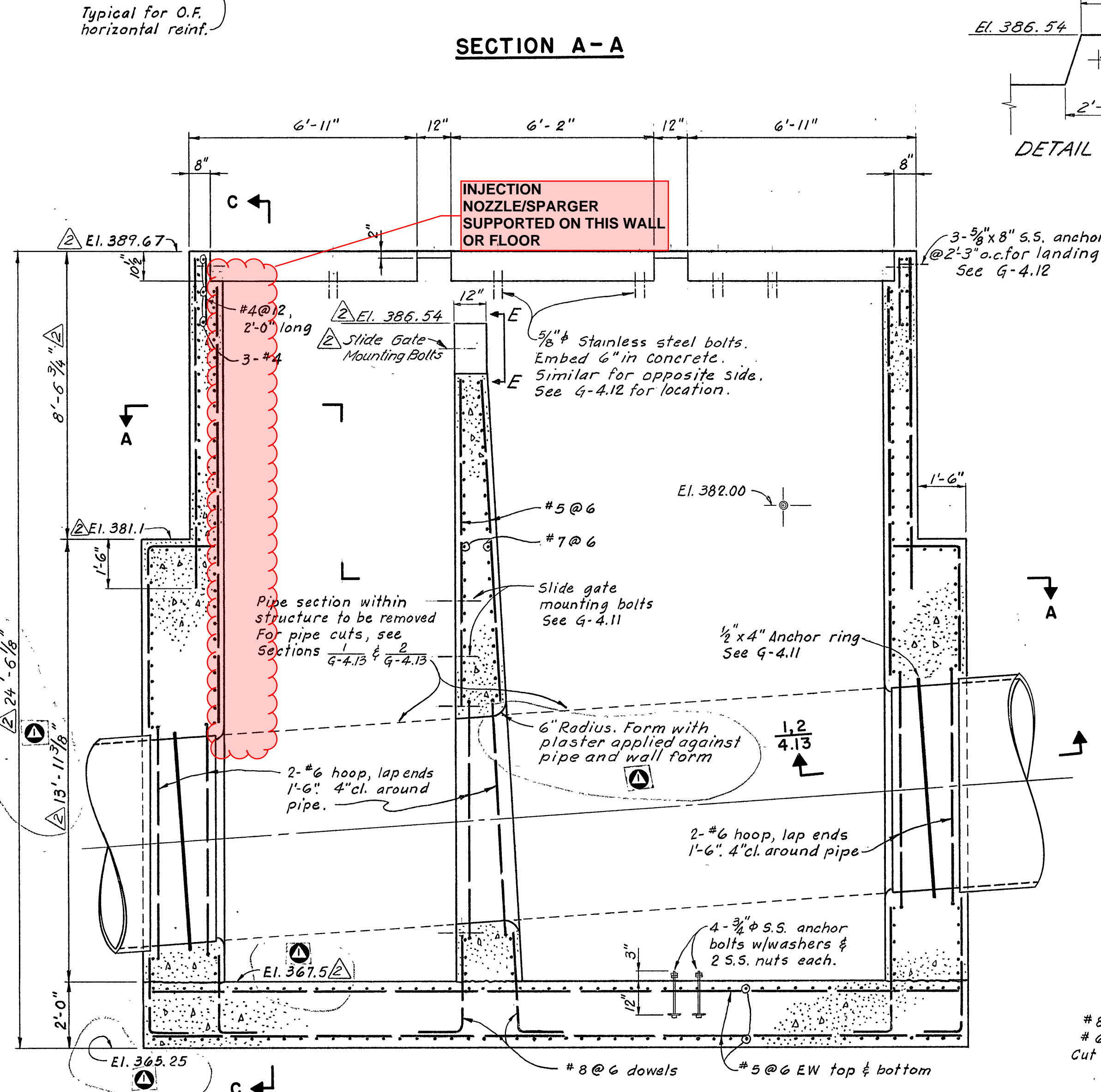
DESIGNED BY #####	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
DESIGN CHECKED BY #####	LAFAYETTE WATER TREATMENT PLANT ORINDA WATER TREATMENT PLANT CARBON DIOXIDE TANK AND INJECTION SKIDS			
DRAWN BY FACILITY DRAFTING	PROJECT P&ID			
PROJECT MANAGER R.P.E. NO. ----	EMILY SING			
PROJECT ENGINEER R.P.E. NO. ----	TREVOR FONG			
RECOMMENDED SENIOR MECH ENGR R.P.E. NO. ----	PROJ. NO. 2137	SCALE 1"=2'	509.00-M-SK2	#
APPROVED MGR OF DESIGN R.P.E. NO. ----	DATE 1 August 2019	STRUCT.	DISC.	NUMBER



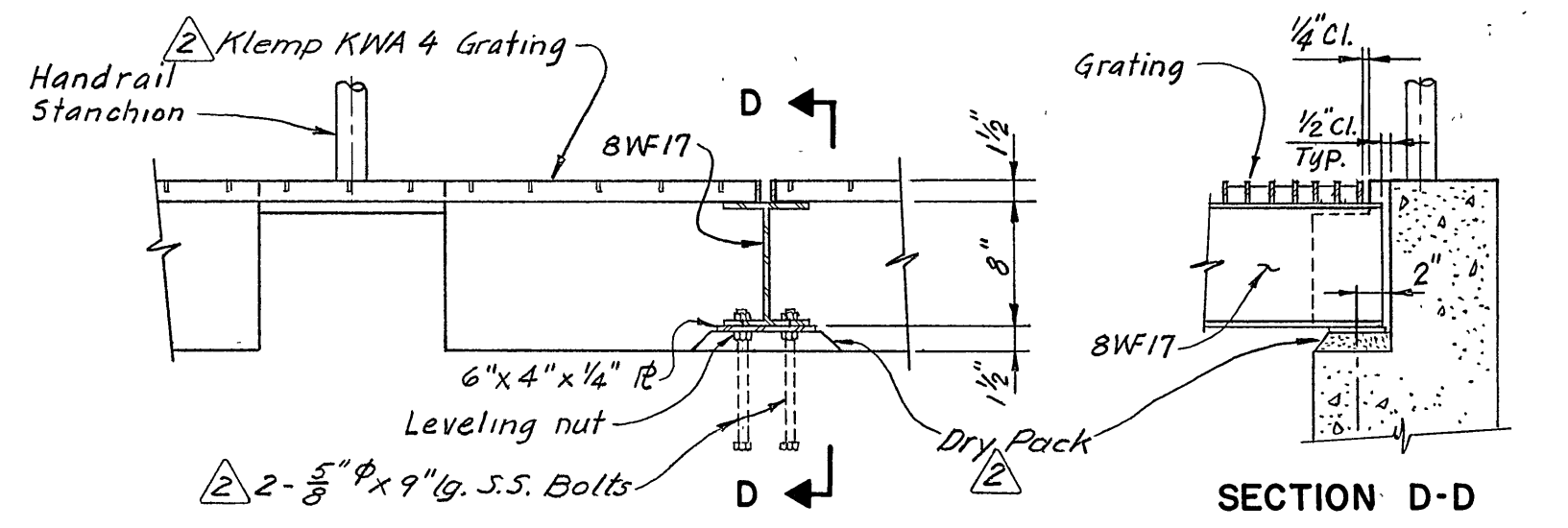
Note: Details shown above are typical for both end wall



RAPID MIXER SUPPORT BEAM DETAILS
Scale: 1/2" = 1'-0"



SECTION 3 G-4.12
Scale: 1" = 1'-0"



SECTION D-D
DETAIL A G-4.12
Scale: 1" = 1'-0"

NOTES

1. For location of structure, see G-4.01.
2. For "Sequence of Construction", see G-4.11.
3. For details of equipment installation, grating, and access stairs, see G-4.12.

APPROVED: *[Signature]*
CHIEF ENGINEER R. E. No. 969

DESIGNED BY: J. Tom	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA LAFAYETTE AQUEDUCT NO. 2 LAFAYETTE DIVERSION WORKS AREA LAFAYETTE RAPID MIXING CHAMBER STRUCTURAL DETAILS
DRAWN BY: C. Yamasaki	
CHECKED BY: <i>[Signature]</i>	
CORROSION CHECK BY: <i>[Signature]</i>	
PROJECT ENGR. <i>[Signature]</i>	
SUPERVISOR MECH. & ELEC. DESIGN: <i>[Signature]</i>	STRUCTURE OR ZONE DESIGNATION
SUPERVISOR STRUCTURES DESIGN: <i>[Signature]</i>	SCALE: 3/8" = 1'-0" & as noted
MANAGER DESIGN ENGR. <i>[Signature]</i>	DATE: 23 Aug 60
MANAGER WATER PROD. & DIST. <i>[Signature]</i>	

REFERENCE:
VEND. DWG'S. S-804.2-22 THRU. 26
S-804.3-4
F.B. 3270, 3271

NO.	DATE	REVISION	BY	APP.
18 OCT 66		REVISED AS BUILT		
22 Sep 61		Revised elevations & dimensions.		
		Added rounded entry in center wall		

SECTION B-B

SECTION C-C

♦

ORINDA WATER TREATMENT PLANT

♦

TECHNICAL DRAWINGS

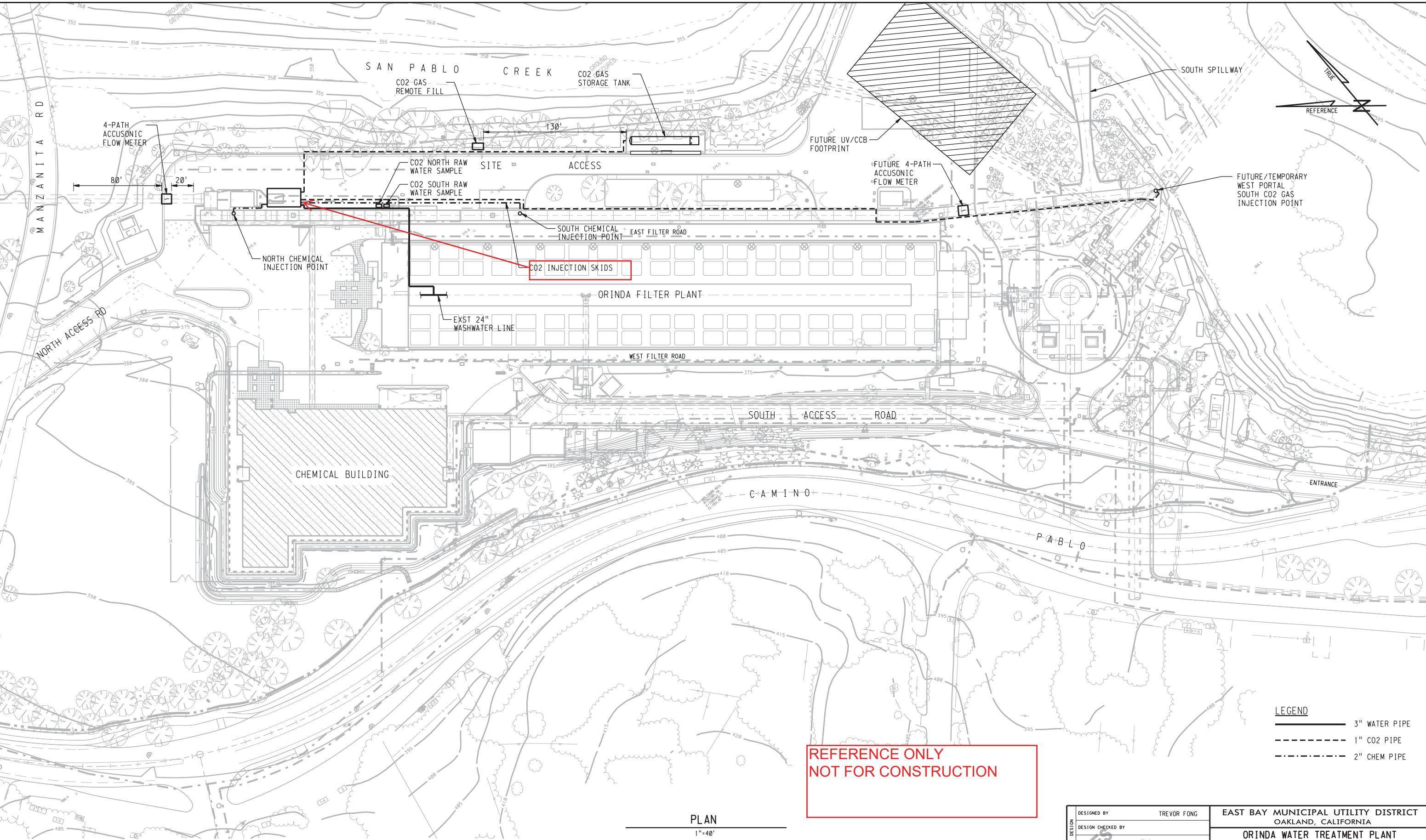
RFQ 2014



EAST BAY MUNICIPAL UTILITY DISTRICT

SPEC NO. 2137

USER: keng
DATE: 30-JUL-2019 13:29
FILE: H:\strtmnt-sor\indos510_00s51000msk1.r00



LEGEND

	3" WATER PIPE
	1" CO2 PIPE
	2" CHEM PIPE

**REFERENCE ONLY
NOT FOR CONSTRUCTION**

PLAN

1"=40'



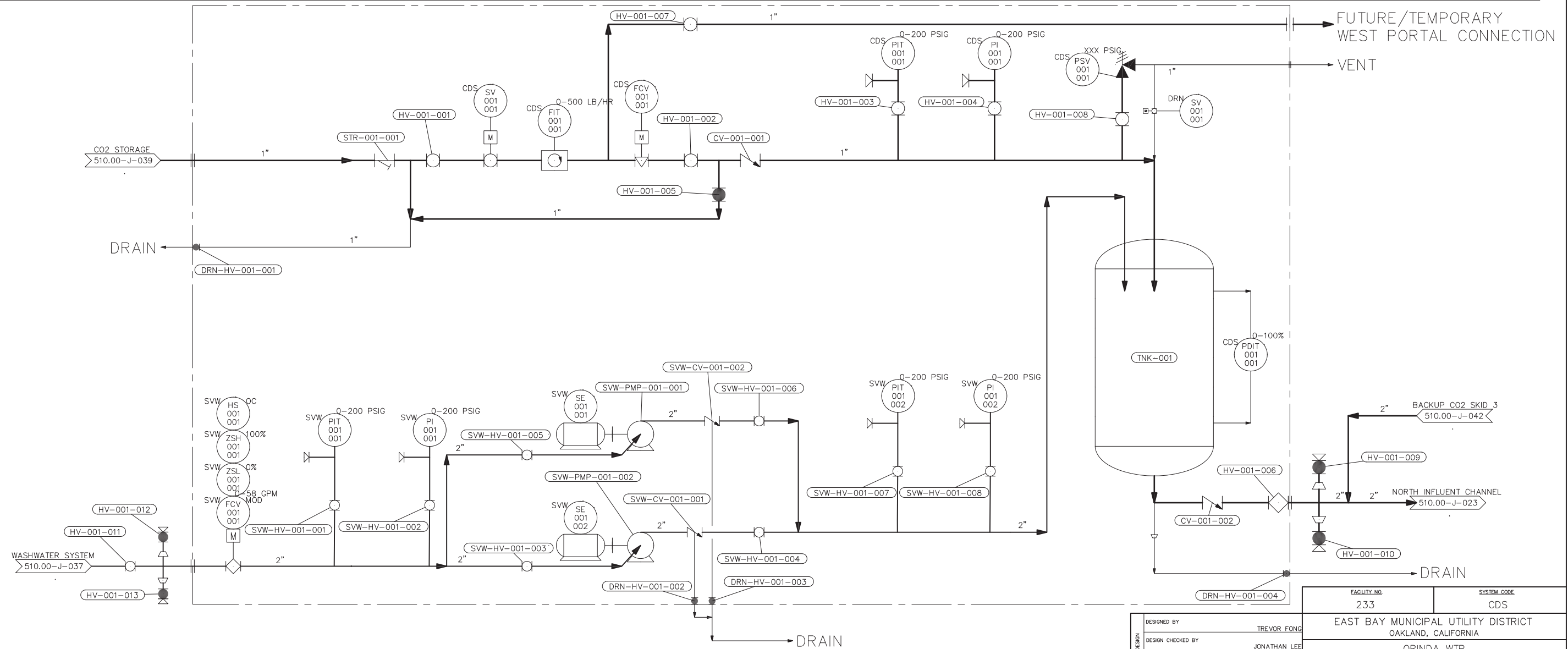
NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	TREVOR FONG	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA		
DESIGN CHECKED BY		ORINDA WATER TREATMENT PLANT		
DRAWN BY	K. ENG	MECHANICAL		
		RAW WATER TREATMENT FACILITIES IMPROVEMENT PROJECT - SITE PLAN		
PROJ. NO.		510.00-M-SK 1	0	
SCALE	1"=40'			
DATE				

SIGNATURES
NOT VALID

User: Tfong Date: 2/11/2020 3:10:19 PM
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CONTROL PANEL
 OIT
 RTU SAXX
 OP/NET



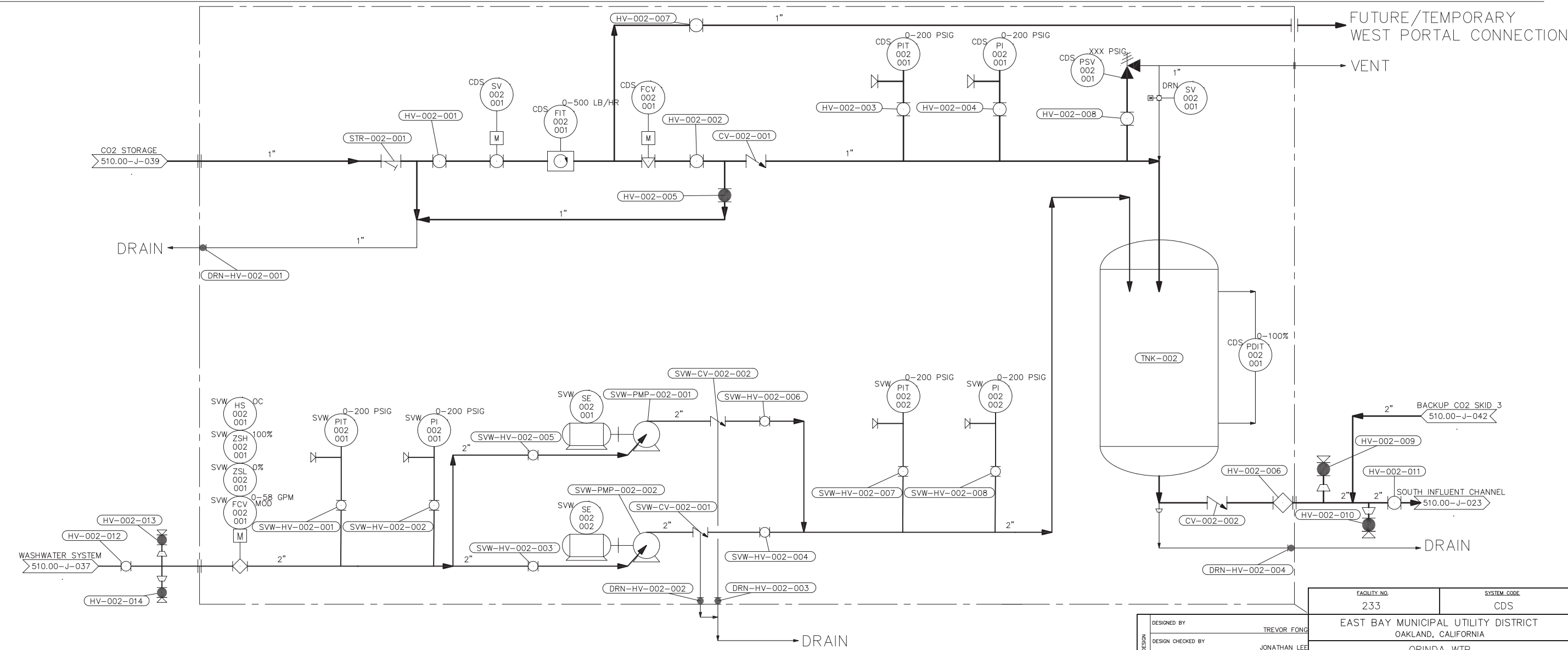
REFERENCE ONLY
 NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	TREVOR FONG
DESIGN CHECKED BY	JONATHAN LEE
DRAWN BY	TREVOR FONG
PROJECT MANAGER	EMILY SING
R.P.E. NO.	72454
PROJECT ENGINEER	TREVOR FONG
R.P.E. NO.	34894
RECOMMENDED	DAVID BAILEY
SENIOR MECH ENGR	R.P.E. NO. 29694
APPROVED	SERGE TERENTIEFF
MGR OF DESIGN	R.P.E. NO. 48598

FACILITY NO.	233	SYSTEM CODE	CDS
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
ORINDA WTP ORINDA WATER TREATMENT PLANT PROCESS			
CO2 INJECTION CONTROL NORTH SKID 1 P&ID			
SHEET 1 OF 1			
PROJ. NO.	2137	510.00-J-040	0
SCALE	NONE		
DATE	11Feb2020	STRUCT.	DISC. NUMBER. REV.

User: Tfong Date: 2/11/2020 3:06:24 PM
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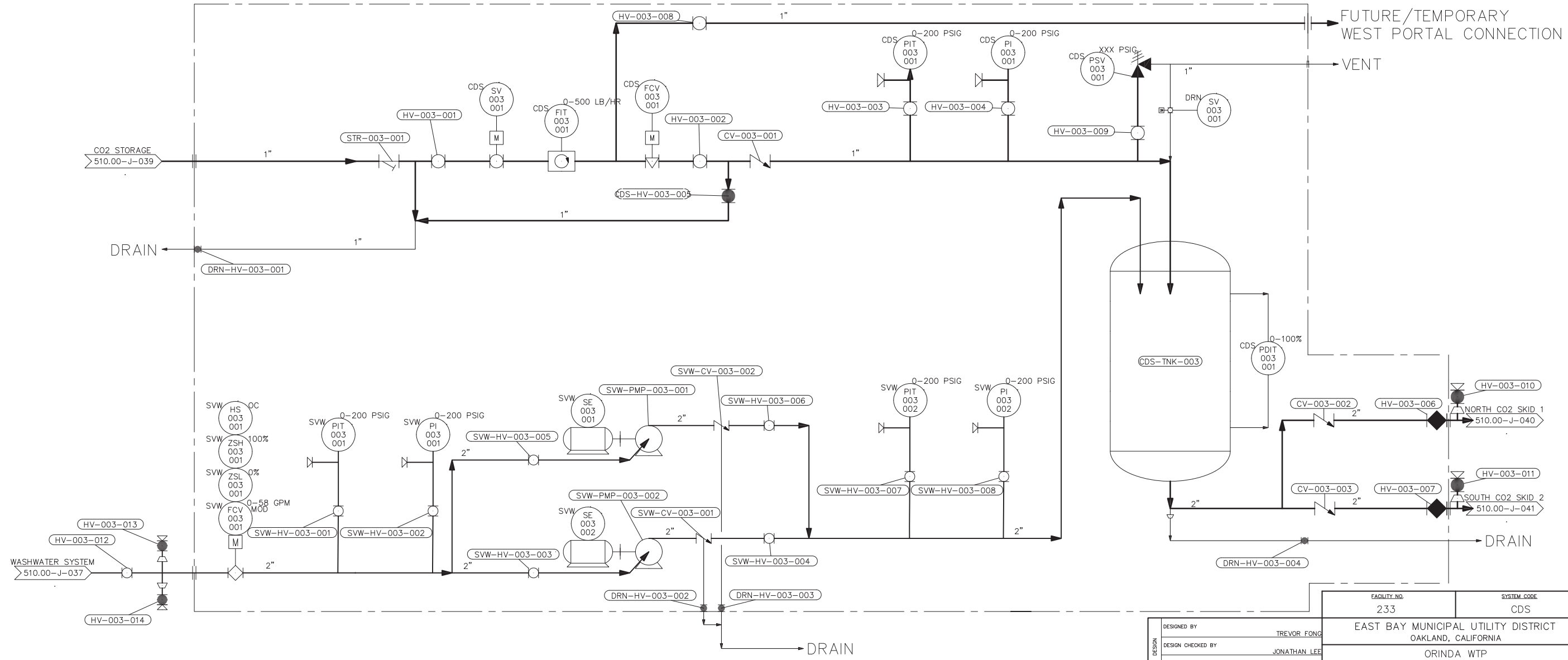
REFERENCE ONLY
 NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY	TREVOR FONG
DESIGN CHECKED BY	JONATHAN LEE
DRAWN BY	TREVOR FONG
PROJECT MANAGER	EMILY SING
PROJECT ENGINEER	TREVOR FONG
RECOMMENDED	DAVID BAILEY
APPROVED	DAVID BAILEY
MGR OF DESIGN	SERGE TERENTIEFF

FACILITY NO.	233	SYSTEM CODE	CDS
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
ORINDA WTP ORINDA WATER TREATMENT PLANT PROCESS			
CO2 INJECTION CONTROL NORTH SKID 2 P&ID			
SHEET 1 OF 1			
PROJ NO.	2137	SCALE	NONE
DATE	11Feb2020	STRUCT.	510.00-J-041
DISC.		NUMBER.	0
REV.			

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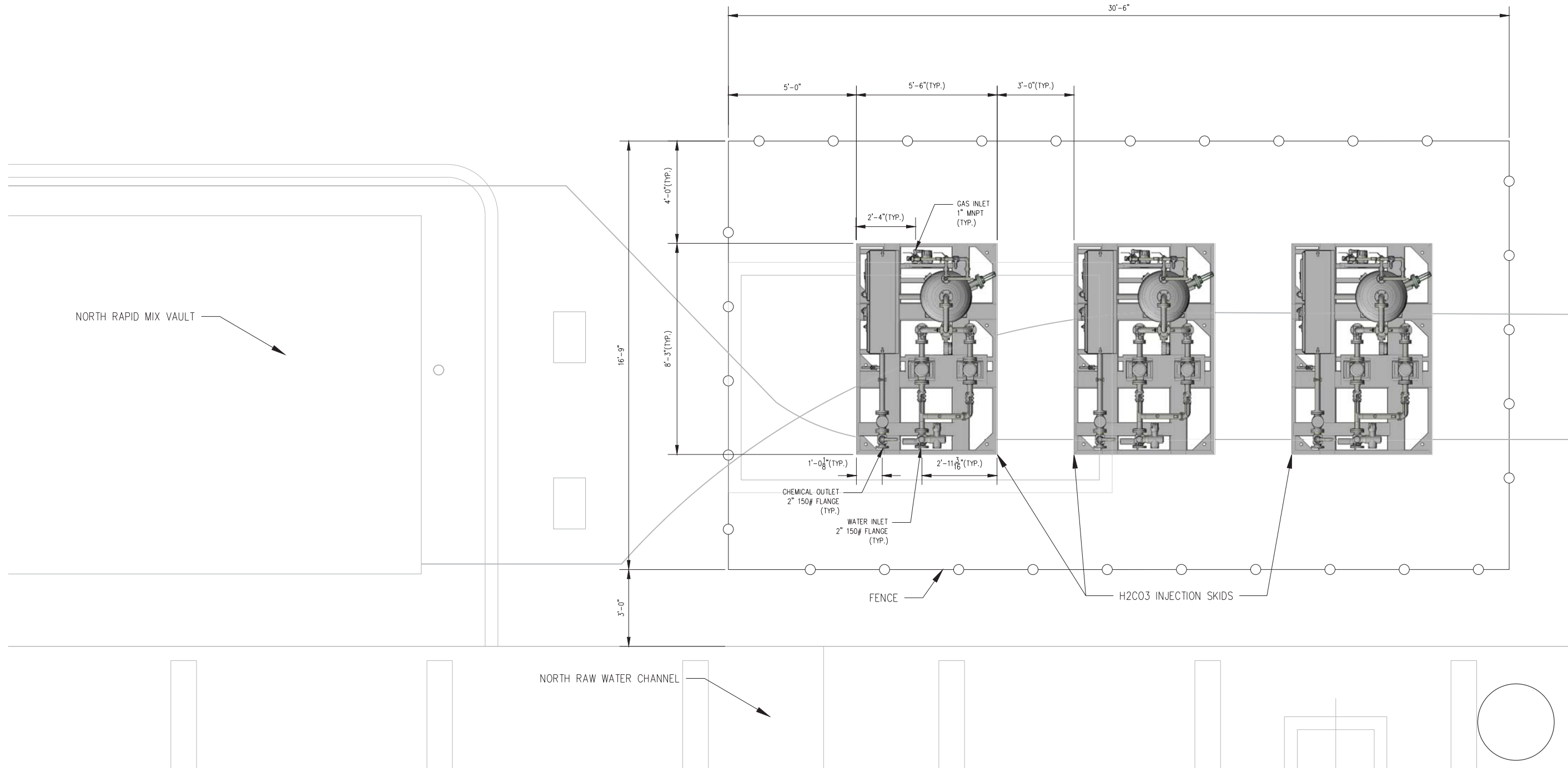


REFERENCE ONLY
 NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY TREVOR FONG	FACILITY NO. 233	SYSTEM CODE CDS
DESIGN CHECKED BY JONATHAN LEE	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA	
DRAWN BY TREVOR FONG	ORINDA WTP ORINDA WATER TREATMENT PLANT PROCESS	
PROJECT MANAGER R.P.E. NO. 72454 EMILY SING	##### P&ID	
PROJECT ENGINEER R.P.E. NO. 34894 TREVOR FONG	SHEET 1 OF 1	
RECOMMENDED SENIOR MECH ENGR R.P.E. NO. 29694 DAVID BAILEY	PROJ. NO. 2137	510.00-J-042
APPROVED MGR OF DESIGN R.P.E. NO. 48598 SERGE TERENTIEFF	SCALE NONE	0
	DATE 11Feb2020	STRUCT. DISC. NUMBER. REV.

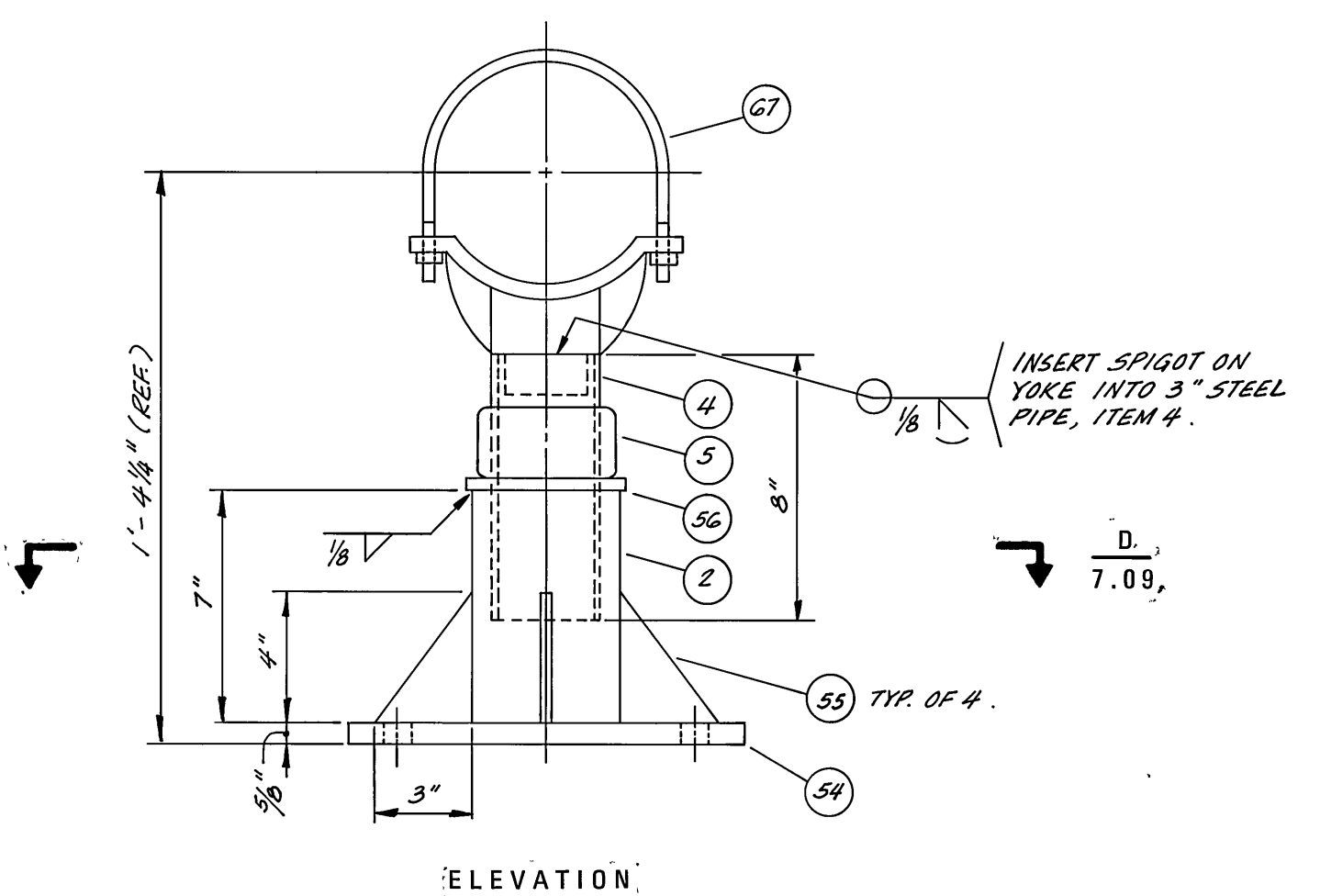
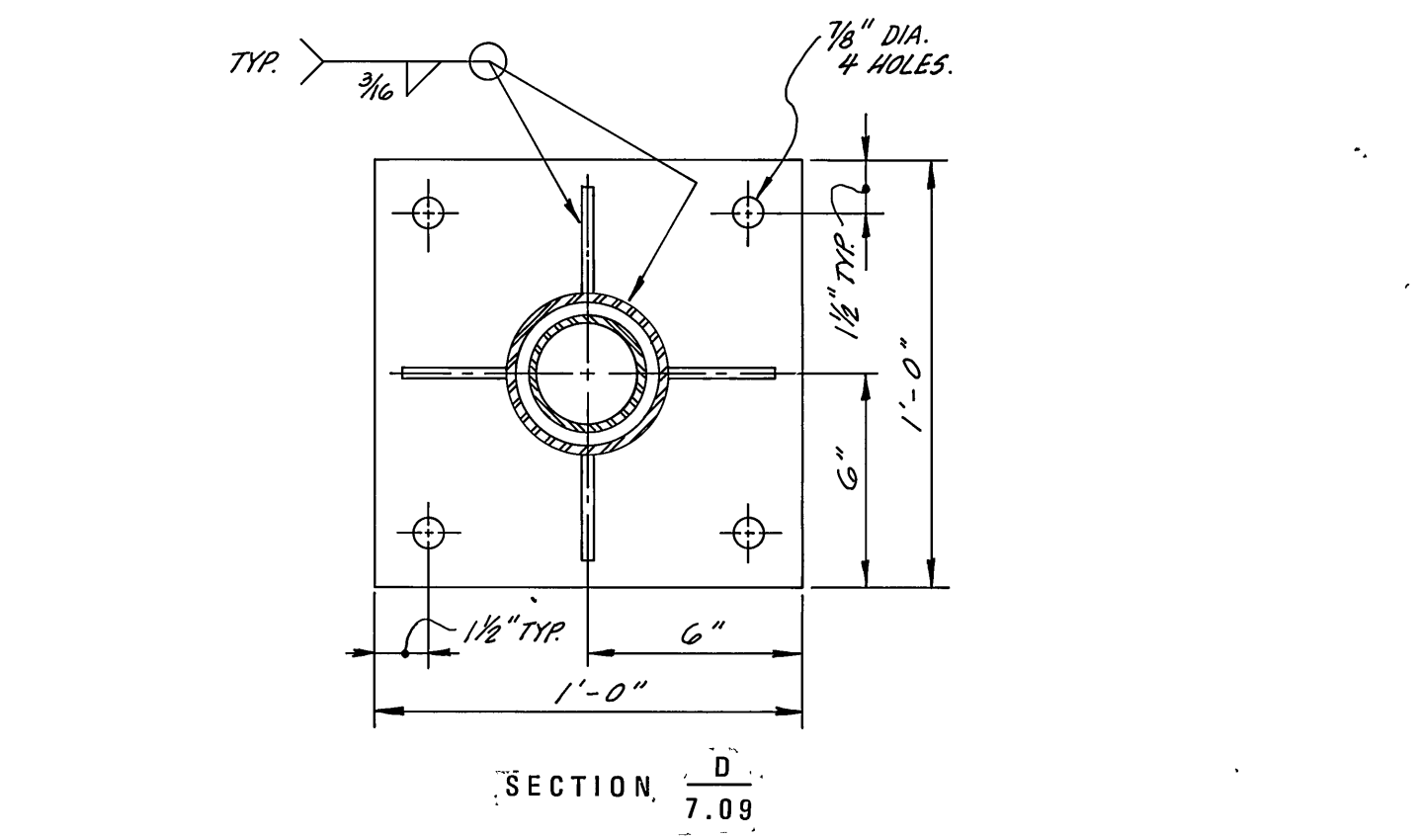
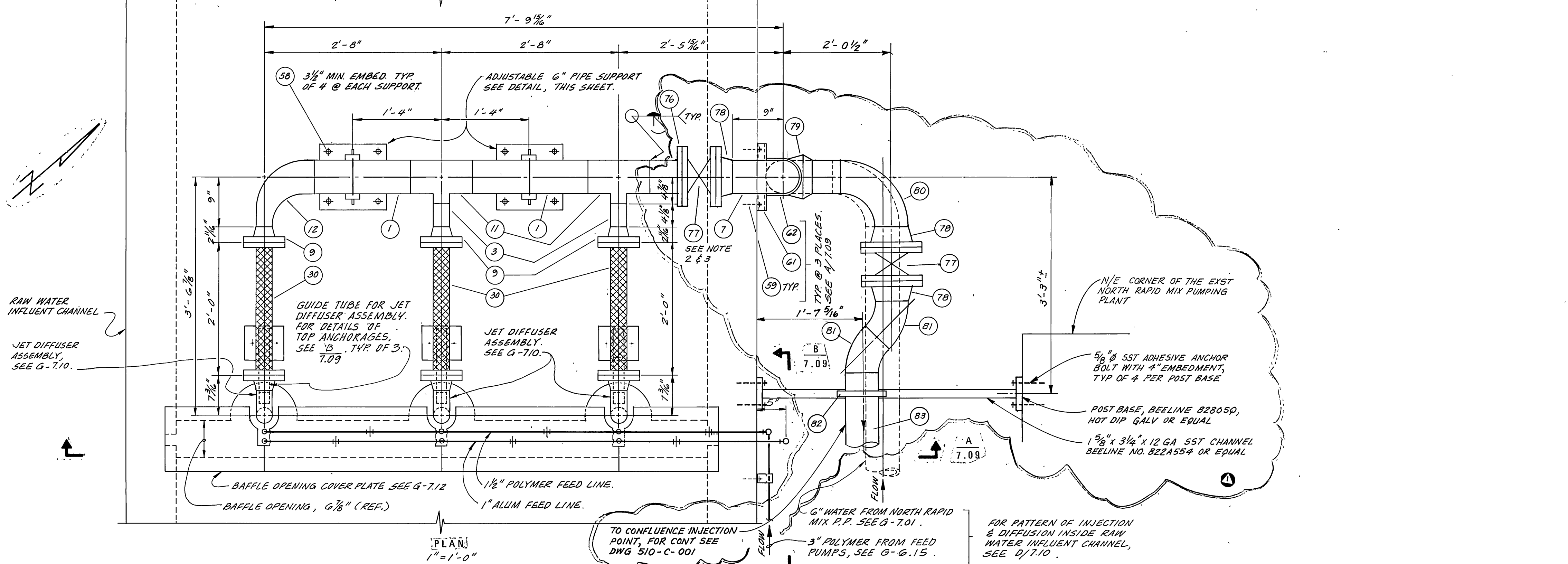
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REFERENCE ONLY
NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY #####	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA		
DESIGN CHECKED BY #####	ORINDA WATER TREATMENT PLANT CO2 INJECTION SKIDS		
DRAWN BY TREVOR FONG	MECHANICAL PLAN VIEW		
PROJECT MANAGER R.P.E. NO. ### EMILY SING	PROJ. NO. 2137	510.00-M-SK1	#
PROJECT ENGINEER R.P.E. NO. ##### TREVOR FONG	SCALE 1" = 2'	DATE 30 July 2019	STRUCT. DISC. NUMBER. REV.
RECOMMENDED R.P.E. NO. #####			
APPROVED R.P.E. NO. #####			



1 1/4" POLYMER FEED LINE CONNECT TO 1" POLYMER NOZZLE MANIFOLD OF JET DIFFUSER ASSEMBLIES AS INDICATED. SEE NOTE 7.

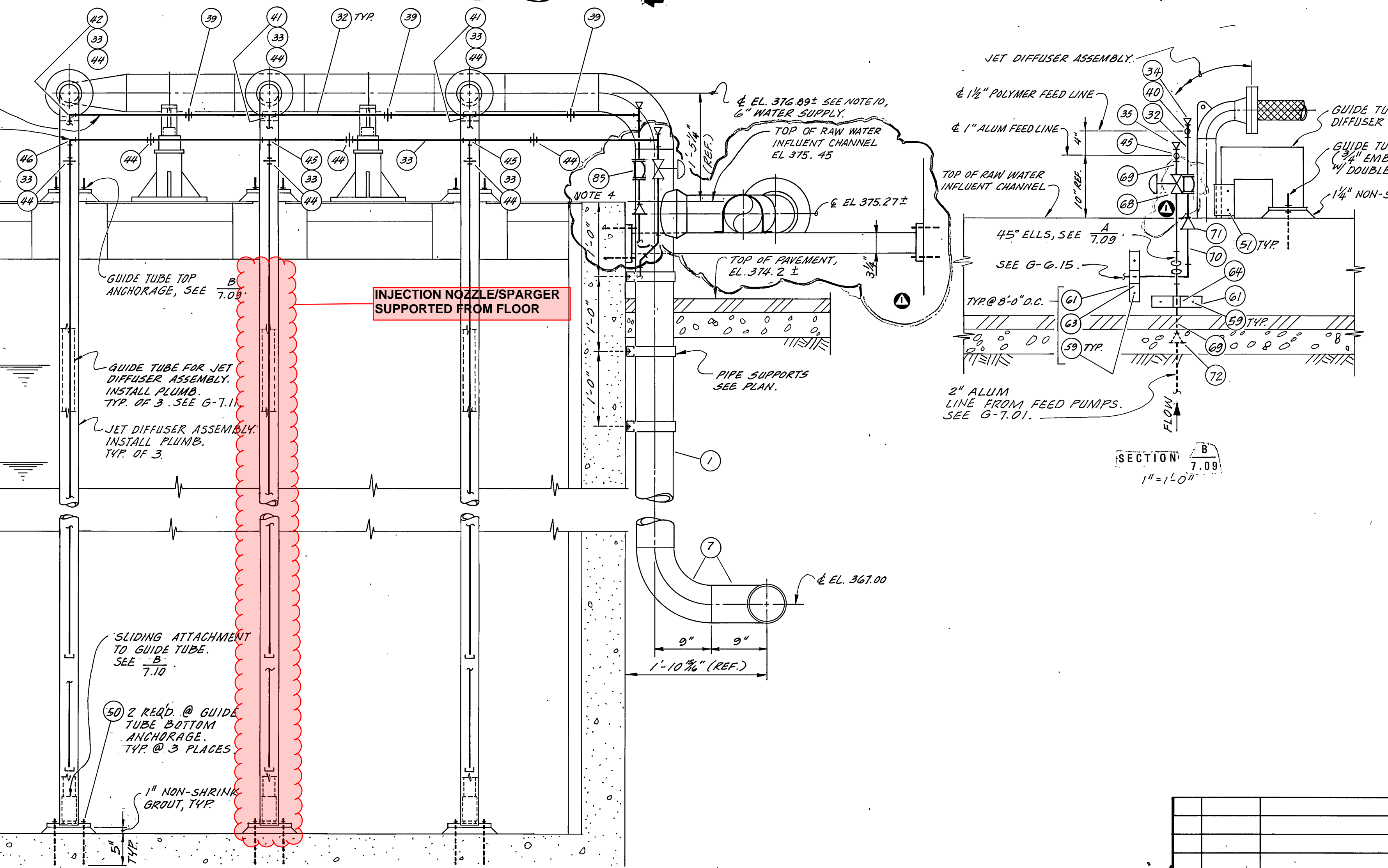
1" ALUM FEED LINE CONNECT TO 1" ALUM NOZZLE MANIFOLD OF JET DIFFUSER ASSEMBLIES AS SHOWN. SEE NOTE 7.

BAFFLE OPENING COVER

MAX. WATER LEVEL, EL. 373.3

MIN. WATER LEVEL, EL. 372.0

FLOOR OF RAW WATER INFLUENT CHANNEL EL. 363.96



- NOTES**
- 1. NOTES AND MATERIALS ARE LISTED ON G-7.11.
 - 2. REMOVE EXISTING 6" PIPE AS REQUIRED TO INSTALL NEW BUTTERFLY VALVE.
 - 3. AFTER INSTALLING NEW PIPING COAT EXTERIOR MATCH EXISTING COATING ON ADJACENT PIPING.
 - 4. INSTALL 1 1/2" FLANGED DIAPHRAGM VALVE ON EXISTING 1 1/2" POLYMER FEED LINE.

APPROVED

CHIEF ENGINEER, R.P.E. NO. C 26724

DESIGN BY T. Hayer	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA
DESIGN CHECK BY R. CRAIG	ORINDA FILTER PLANT COAGULANT FEED AND FILTER WASH IMPROVEMENTS
DRAWN BY E. YU & ED JOW	NORTH RAPID MIX
SR. CIVIL ENGR. R.P.E. NO. C 10297 SR. MECH. ENGR. R.P.E. NO. M 13155 SR. ELEC. ENGR. R.P.E. NO. E 2146 PROJECT ENGR. R.P.E. NO. C 24035	MECHANICAL - JET DIFFUSERS AND CHEMICAL INJECTORS
SR. CIVIL ENGR. W.D. Reising SR. MECH. ENGR. J.J. Caville PROJECT ENGR. Jim Handcock	SH. 1 OF 4
MGR. OF DESIGN R.P.E. NO. C 10873	STRUCTURE OR ZONE DESIGNATION 510
14 APR 93	SCALE AS SHOWN
ADDED PIPING FOR CONFLUENCE RAPID MIX	7399-G-7.09
NO. DATE REVISION	DATE 31 MAY 84

NO.	DATE	REVISION	BY	REC.	APP.

SPEC. NO.

USER: pcorlgeo
DATE: 26-APR-2017 15:27
FILE: H:\s1\ds\8\st\dwg\94920003.R08

VALVES		ACTUATORS		FITTINGS		MISCELLANEOUS SYMBOLS	
HAND VALVES OR VALVE BODY	CHECK VALVES	CHANNEL VALVES					
ANGLE VALVE	BALL CHECK OR ANTI-SYPHON VALVE	BUTTERFLY GATE	DIAPHRAGM OR UNSPECIFIED ACTUATOR	BLIND FLANGE	PULSATION DAMPENER		
BALL VALVE	BACKFLOW PREVENTER, REDUCED PRESSURE ZONE W/RELIEF	MUD VALVE	CYLINDER ACTUATOR, DOUBLE-ACTING	FLEXIBLE CONNECTION	DIAPHRAGM SEAL		
BUTTERFLY VALVE	DIAPHRAGM CHECK VALVE/VACUUM BREAKER	SHEAR GATE	CYLINDER ACTUATOR, SPRING-OPERATED SINGLE-ACTING	UNION	PRESSURE SNUBBER		
CIRCUIT BALANCE VALVE (HVAC)	FOOT VALVE (SUBMERGED)	SLIDE GATE	MANUAL ACTUATOR OR HANDWHEEL	SCREWED CAP	ANNULAR DIAPHRAGM SEAL		
COCK	SPRING POPPET CHECK VALVE	SLUICE GATE	S= SOLENOID ACTUATOR M= MOTOR ACTUATOR EH= ELECTRO HYDRAULIC ACTUATOR	WELDED CAP	RUPTURE DISK		
CONE VALVE	SWING CHECK VALVE (INCLUDES SWING, DOUBLE DOOR, FLAPPER, AND TILTING DISC)	STOP LOGS	FLOAT ACTUATOR	PLUG	LIQUID SURFACE		
DIAPHRAGM VALVE	SWING CHECK VALVE W/HOLD OPEN DEVICE	TELESCOPING VALVE	DIAPHRAM ACTUATOR CONTROL (ASSUMED FLOW DIRECTION →)				
ECCENTRIC PLUG VALVE NORMALLY CLOSED (NOTE 1)	TRIPLE DUTY VALVE (ISO, CHECK, FLOW LIMIT) (HVAC)	WEIR GATE	BACKPRESSURE, INTEGRAL TAP	AIR COUPLER	CALIBRATION COLUMN		
ECCENTRIC PLUG VALVE NORMALLY OPEN (NOTE 1)			BACKPRESSURE, REMOTE TAP	QUICK DISCONNECT COUPLING W/PLUG	AIR CAP		
GATE VALVE (OR GENERIC VALVE)			PRESSURE REDUCING, INTEGRAL TAP	QUICK DISCONNECT COUPLING W/CAP	OVERFLOW		
GLOBE VALVE			PRESSURE REDUCING, REMOTE TAP	CONCENTRIC REDUCER/INCHREASER	ATMOSPHERIC VENT		
KNIFE GATE VALVE			PRESSURE REDUCING AND BACKPRESSURE SUSTAINING	ECCENTRIC REDUCER/INCHREASER	ATMOSPHERIC VENT WITH BIRD SCREEN		
NEEDLE VALVE				REDUCING FLANGE	ULTRAVIOLET SENSOR		
NEEDLE VALVE, SCALED				BALL JOINT			
PINCH VALVE				EXPANSION JOINT			
PLUG VALVE				CLEAR VIEW PIPE			
SELF CLOSING VALVE (SPRING)				DOUBLE BALL FLEXIBLE EXPANSION JOINT			
SLEEVE VALVE							
TRAP PRIMER							
THREE-WAY VALVE							
FOUR-WAY VALVE							
V-BALL VALVE							
	END VALVES*	ACTUATED VALVES (WIRED OR WITH SETPOINT)					
	AIR, COMBINATION, OR AIR/VACUUM RELIEF VALVE	BACK PRESSURE VALVE					
	ENERGY DISSIPATION (FREE DISCHARGE) VALVE	LEVEL CONTROL VALVE, FLOAT OPERATED					
	FLAP GATE	PRESSURE REDUCING VALVE					
	FLEXIBLE SLEEVE CHECK VALVE	PRESSURE REDUCING & BACK PRESSURE SUSTAINING VALVE					
	HOSE BIB	PRESSURE RELIEF OR SAFETY VALVE					
	HYDRANT	SOLENOID OPERATED VALVE WITH MANUAL ACTUATOR					
		USE INSTRUMENT BUBBLE					
		SYSTEM CODE SETPOINT					
	* ONE SIDE IS OPEN TO ATMOSPHERE						

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

NO.	DATE	REVISION	BY	REC.	APP.
1	26APR2017	ADDED DIAPHRAM ACTUATORS	HEE	ST	
2	20DEC2016	REORGANIZED SYMBOLS, ADDED TRAP PRIMER	HEE	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			
PROJ. NO.	9492-G-003	NUMBER	8
SCALE	AS SHOWN	STRUCT.	DISC.
DATE	13JUL1999	NUMBER	REV.

INSTRUMENT IDENTIFICATION SYSTEM

INSTRUMENT IDENTIFICATION (TAG) NUMBER (SEE NOTE 2)

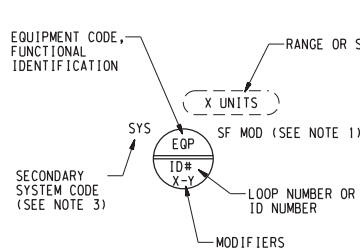
EXAMPLE: 233-CA-FIC-300-1-A
(LOC-SYS-EQP-ID#-MOD)

LOCATION (LOC)	SYSTEM CODE (SYS)	FUNCTIONAL IDENTIFICATION OR EQUIPMENT CODE (EQP)	LOOP IDENTIFICATION NUMBER (ID#)	MODIFIERS (MOD) (OPTIONAL)		SPECIAL FUNCTION (MOD)
233	CA	HS	301	(X)	(Y)	LR
				1	A	

UNIT NO. (MULTIPLE PROCESS TRAINS) OR MULTIPLE INSTRUMENTS IN SAME LOCATION

LETTER FOR MULTIPLE INSTRUMENTS IN DIFFERENT LOCATIONS (PANELS)

INSTRUMENT SYMBOL CONFIGURATION

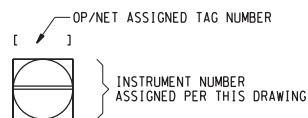


- NOTES 1. "SF" IS USED TO REPRESENT ANY "SPECIAL" FUNCTION MODIFIER OR VARIABLE AND MAY BE DEFINED AS LISTED BELOW.
2. THE APPLICABLE FACILITY NUMBER IS IDENTIFIED ABOVE THE TITLE BLOCK ON THE P&ID.
3. THE PRIMARY SYSTEM CODE IS IDENTIFIED ABOVE THE TITLE BLOCK ON THE P&ID. A SECONDARY SYSTEM CODE IS SHOWN HERE.

SPECIAL FUNCTION MOD OR VARIABLE

AM	AUTO-MANUAL
CL2	CHLORINE
COND	CONDUCTIVITY
D	DISCHARGE, SERVICE, OUTLET
DD2	DISSOLVED OXYGEN
E/E	VOLTAGE-TO-VOLTAGE
E/I	VOLTAGE-TO-CURRENT
FL	FLUORIDE
HOA	HAND-OFF-AUTO
I/E	CURRENT-TO-VOLTAGE
I/I	CURRENT-TO-CURRENT
L	LEFT
LCP/OWS	LOCAL CONTROL PANEL-OPERATOR WORKSTATION
LOR	LOCAL-OFF-REMOTE
LR	LOCAL-REMOTE
MOD	MODULATING
NH	AMMONIA
O3	OZONE
OC	OPEN-CLOSE
OO	ON-OFF
ORP	OXIDATION-REDUCTION POTENTIAL
PB	PUSHBUTTON
pH	pH
R	RIGHT
S	SUCTION, SOURCE, INLET
SCD	STREAMING CURRENT DETECTOR
SD2	SULFUR DIOXIDE
SS	START-STOP
TURB	TURBIDITY
UV	ULTRAVIOLET

REMOTE SIGNAL DESIGNATION



INSTRUMENT SYMBOLS

	FIELD MOUNTED INSTRUMENT		BACKUP CONTROL AND DISPLAY TO CONFIGURABLE CONTROL SYSTEM
	AUXILIARY PANEL MOUNTED INSTRUMENT (OPERATOR ACCESSIBLE)		CONFIGURABLE CONTROL SYSTEM ACCESSIBLE TO OPERATOR
	AUXILIARY PANEL MOUNTED INSTRUMENT (NORMALLY NOT OPERATOR ACCESSIBLE)		CONFIGURABLE CONTROL SYSTEM NOT ACCESSIBLE TO OPERATOR
	PRIMARY PANEL MOUNTED INSTRUMENT (OPERATOR ACCESSIBLE)		NORMALLY ACCESSIBLE TO OPERATOR AS PACKAGED PROGRAMMABLE LOGIC CONTROLLER (PLC) OR DIGITAL LOGIC CONTROL INTEGRAL TO CONTROL SYSTEM
	PRIMARY PANEL MOUNTED INSTRUMENT (NORMALLY NOT OPERATOR ACCESSIBLE)		NORMALLY NOT ACCESSIBLE TO OPERATOR AS PACKAGED PROGRAMMABLE LOGIC CONTROLLER (PLC) OR DIGITAL LOGIC CONTROL INTEGRAL TO CONTROL SYSTEM
	LOCAL ON-OFF INDICATING LAMP		EXISTING FIELD INSTRUMENT
	REMOTE ON-OFF INDICATING LAMP		

INSTRUMENT FUNCTIONAL IDENTIFICATION (EQUIPMENT CODE)

	FIRST LETTER MEASURED OR INITIATING VARIABLE	SUCCEEDING LETTER, MODIFIER READOUT OR INPUT FUNCTION	SUFFIX LETTER FOR DISCRETE FUNCTION (OUTSIDE BALLOON)
A	ANALYSIS, TURBIDITY	ALARM	AUTO
B	BURNER, COMBUSTION, FIRE	ISOLATOR	REMOTE
C	CONDUCTIVITY	CONTROL (LER)	CLOSED
D	DENSITY, DAMPER	DIFFERENTIAL, DEVIATION	DISCRETE
E	VOLTAGE	SENSOR, PRIMARY ELEMENT	ENERGIZED
F	FLOW	RATIO, BIAS	FAIL OVER RESET
G	GAGING (DIMENSIONAL)	GLASS	READY
H	HAND	HIGH	1ST ALARM OR HI
I	CURRENT (ELECTRICAL)	INDICATE (OR), (ING)	INCREASE
J	POWER	SCAN (NER)	MOTOR POWER
K	TIME	CONTROL STATION (SETPOINT)	
L	LEVEL	LIGHT, LOW	
M	MOISTURE, MASS		MANUAL
N	EQUIPMENT STATUS		2ND ALARM OR LOW
O	VIDEO, OCCUPANCY	OPERATOR, ORIFICE	OPENED
P	PRESSURE, VACUUM	POINT (TEST)	STOP
Q	QUANTITY, TORQUE	TOTALIZE (OR) (ING)	
R		RECORD (ER)	RUNNING
S	SPEED, FREQUENCY	SAFETY, SWITCH	START
T	TEMPERATURE	TRANSMITTER	TROUBLE 1 ALARM
U	MULTI-POINT, VARIABLE		TROUBLE 2 ALARM
V	VIBRATION	VALVE	VIRTUAL
W	WEIGHT	WELL	
X	SPECIAL, EQUIPMENT COMMAND		INTERMEDIATE
Y	EVENT, STATE, COMPUTER CONTROL OUTPUT	RELAY, CONVERTER, SOLENOID	
Z	POSITION	DRIVER, ACTUATOR, FINAL CONTROL DEVICE	

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.

SIGNAL LINES

	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)
	ELECTROMAGNETIC, RADIATION, OR SONIC SIGNAL WITHOUT TUBING OR WIRING (UNGUIDED)
	ELECTRIC HEAT TRACED LINE
	ELECTRICAL HEAT TRACING ON VESSEL
	a. DIGITAL COMMUNICATION DATA LINK b. DIGITAL CONTROL SYSTEM SOFTWARE LINK BETWEEN FUNCTION MODULES
	MECHANICAL LINK
	MICROWAVE SYSTEM

PROCESS LINES

	PRIMARY PIPE
	SECONDARY PIPE
	INSTRUMENT PIPE
	CHANNEL
	DOUBLE-WALL PIPE
	HEAT TRACED PIPE
	PIPE INTERIOR DETAIL

SIGNAL IDENTIFICATION

AI	ANALOG INPUT	PD	PULSE DURATION INPUT
AO	ANALOG OUTPUT	PI	PULSE INPUT
CO	CONTROL OUTPUT FROM THE RTU WITH ASSOCIATED FEEDBACK AND HANDSHAKING SIGNAL	PV	PROCESS VARIABLE
DI	DIGITAL INPUT	RSP	REMOTE SET POINT
DO	DIGITAL OUTPUT	SA	SOFTWARE ALARM
DL	DISCRETE LATCHED OUTPUT	SP	SET POINT
		VA	VIRTUAL OR CALCULATED ANALOG

LOGIC & 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)
	CONTROL OUTPUT IS EFFECTIVE IF ONE OR MORE INPUT EXISTS
	CONTROL OUTPUT IS EFFECTIVE (TRUE) IF INPUT IS FALSE. OUTPUT IS FALSE IF INPUT IS TRUE.

RTU / PLC SYMBOLS

	NORMALLY ACCESSIBLE TO OPERATOR AS INDICATOR/CONTROLLER/RECORDER OR ALARM POINT
	NORMALLY NOT ACCESSIBLE TO OPERATOR AS a. INPUT/OUTPUT INTERFACE b. COMPUTATION/SIGNAL CONDITIONING WITHIN THE COMPUTER c. BLIND CONTROLLER OR SOFTWARE CALCULATION MODULE

PROCESS CONNECTORS & IDENTIFIERS

	EQUIPMENT NUMBER/IDENTIFIER TAG
	SYSTEM CODE OR SAMPLE NUMBER IDENTIFIER
	OFF-PAGE CONNECTOR CONNECT TO OR FROM PROCESS DRAWING INDICATES DRAWING WHERE LINE IS CONTINUED
	OFF-PAGE CONNECTOR CONNECT TO OR FROM PROCESS WITH NO EXISTING P&ID
	ON-PAGE CONNECTOR, CONTINUATION OF SIGNAL OR LINE WITH MATCHING LETTERS
	PROCESS PIPE ANNOTATION: SYSTEM, SIZE & NUMBER

NOTES

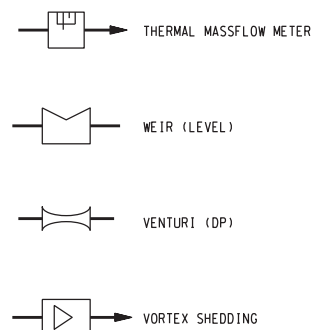
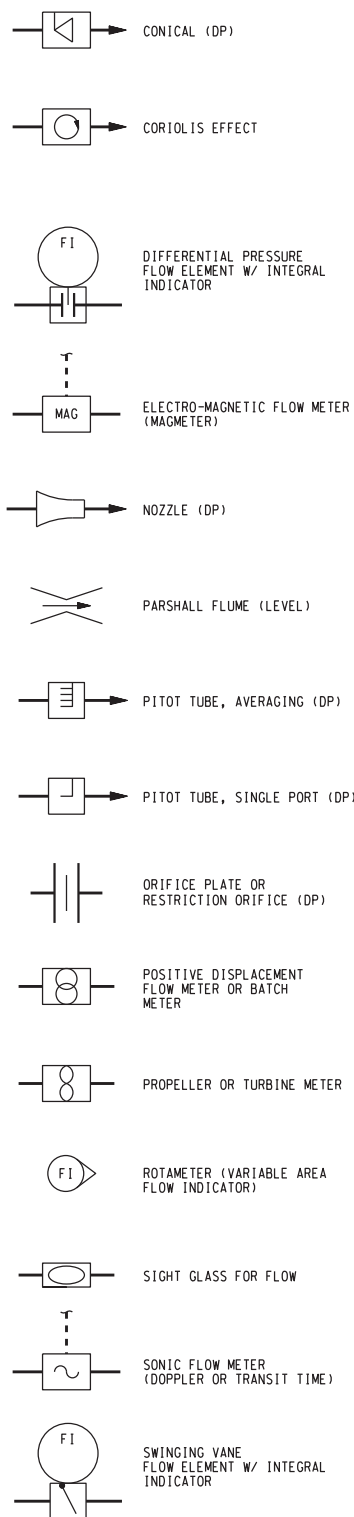
1. SEE ANSI/ISA 55.1, INSTRUMENTATION SYMBOLS AND IDENTIFICATION, FOR MORE DETAILS.
2. SEE DISTRICT ENGINEERING STANDARD PRACTICE 130.0 AND STANDARD DRAWING 9492-G-006 FOR DIRECTION ON ASSIGNING NEW TAG NUMBERS.
3. REFER TO ESP 130.0 FOR TAGGING INFORMATION.

NO.	DATE	REVISION	BY	REC.	APP.
1	15FEB2018	GENERAL REVISION			

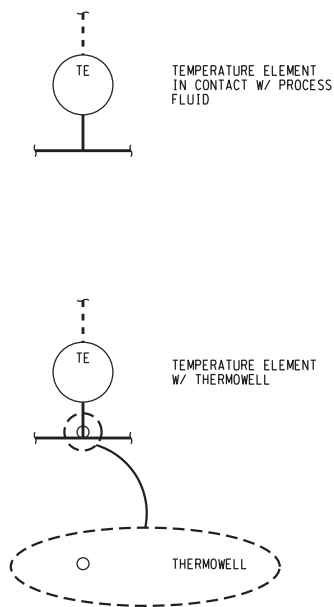
DESIGNED BY	---	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA		
DESIGN CHECKED BY	---	STANDARD DRAWING		
DRAWN BY	---	GENERAL LEGEND, SYMBOLS, AND ABBREVIATIONS FOR P&ID DRAWINGS		
A COPY OF THE ORIGINAL DRAWING WITH ORIGINAL SIGNATURES CAN BE FOUND IN ENGINEERING RECORDS.				
RECOMMENDED:	---	PROJ. NO.	9492-G-002	5
APPROVED:	---	SCALE	NONE	
		DATE	13JUL1999	STRUCT. DISC. NUMBER REV.

SPEC. NO.

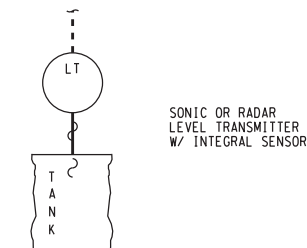
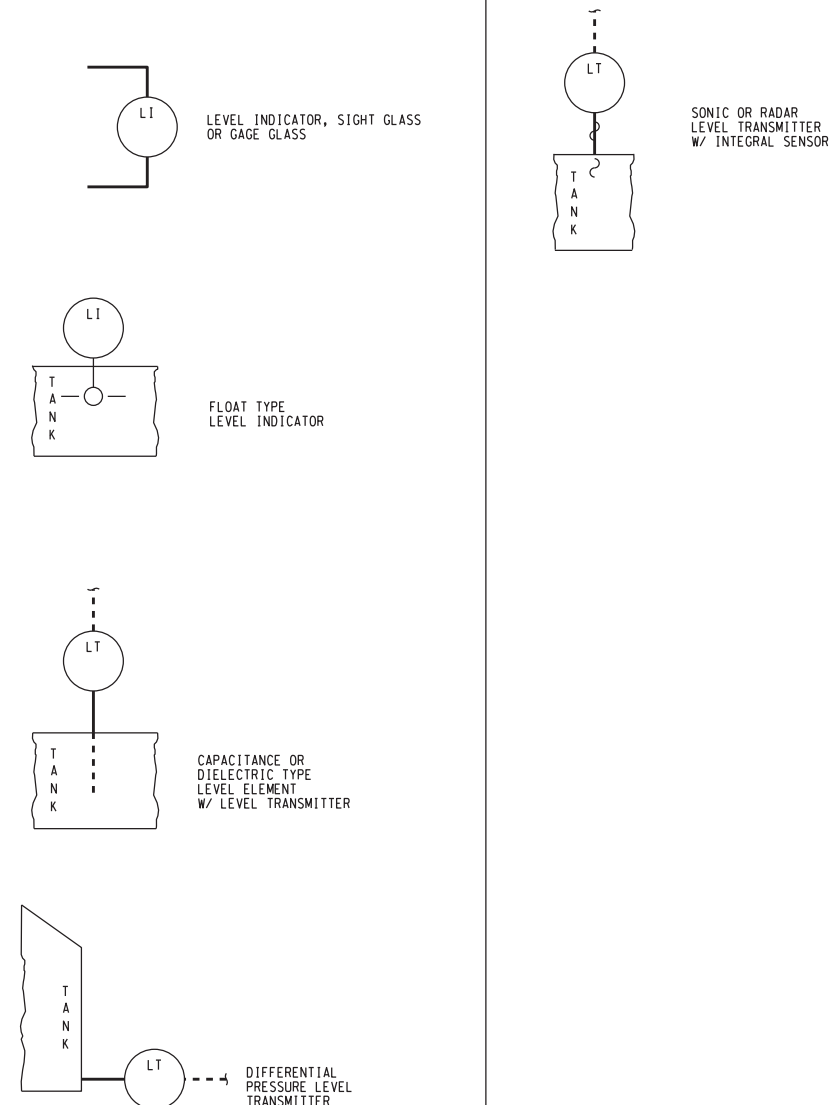
FLOW ELEMENTS



TEMPERATURE ELEMENTS



LEVEL ELEMENTS



NOTES

1. SEE ANSI/ISA S5.1, INSTRUMENTATION SYMBOLS AND IDENTIFICATION, FOR MORE INFORMATION.

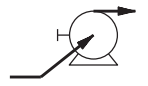
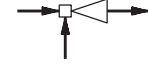
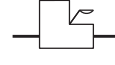

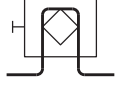


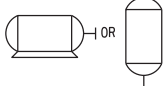
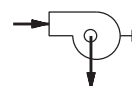
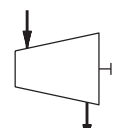
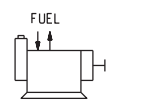
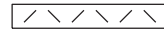
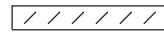

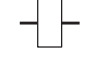

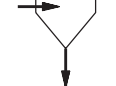
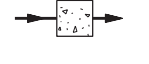

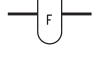
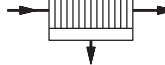
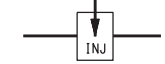
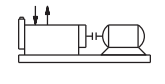


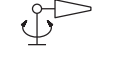
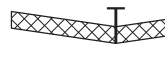



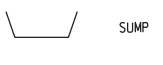

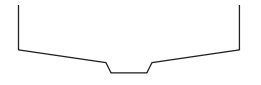


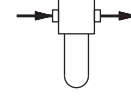
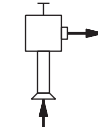
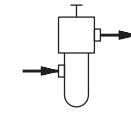
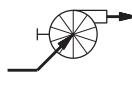

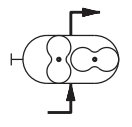

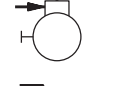
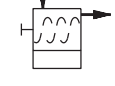
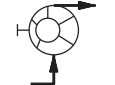
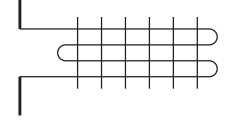
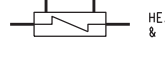

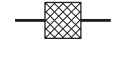
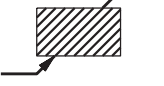

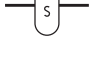

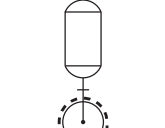


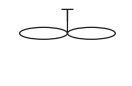
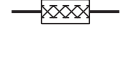


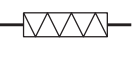


NO.	DATE	REVISION	BY	REC.	APP.
	26APR2017	REORGANIZED SYMBOL			

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			
RECOMMENDED:	—	PROJ. NO. NONE	9492-G-004	4	
APPROVED:	—	SCALE NONE			
		DATE 13JUL1999	STRUCT. DISC. NUMBER	REV.	

USER: pccr\jgso
DATE: 26-APR-2017 15:28
FILE: H:\sstdwg\85sstdwg\94920004.R04

SPEC. NO.

PUMPS	DRIVES	DAMPERS	FILTRATION/ SEPARATION EQUIPMENT	MISCELLANEOUS EQUIPMENT	TANKS/ VESSELS
 CENTRIFUGAL PUMP  EDUCTOR, EJECTOR, JET PUMP  FOOT PUMP  GEAR PUMP (PD)  PERISTALTIC OR TUBING PUMP (PD)  METERING PUMP (PD)  PROGRESSIVE CAVITY PUMP (PD)	 ELECTRIC MOTOR DRIVER OR GENERATOR, HORIZONTAL OR VERTICAL  HYDRAULIC TURBINE  GAS OR STEAM TURBINE  INTERNAL COMBUSTION ENGINE	 OPPOSED BLADES  PARALLEL BLADES	 BAR RACK  BASKET STRAINER  CONDENSATION TRAP  CYCLONE SEPARATOR  DESSICANT DRYER  DRIP OR AUTOMATIC DRIP TRAP  FILTER  FILTER PRESS	 CHEMICAL INJECTOR  ENGINE-DRIVEN GENERATOR SET  SAFETY SHOWER/ EYEWASH COMBINATION  SILENCER (HVAC)  WASHDOWN MONITOR  SCRAPER, COLLECTOR	 ACCUMULATOR, GAS CHARGED  ACCUMULATOR, SPRING LOADED  PRESSURE VESSEL  SUMP  TANK (ATM PRESSURE)  SETTLING BASIN
 REGENERATIVE TURBINE PUMP  SUMP PUMP  VERTICAL TURBINE PUMP IN BARREL  VERTICAL TURBINE PUMP IN OPEN SUMP  VERTICAL TURBINE PUMP WITH BARREL SUCTION	<p style="text-align: center;">FANS/ COMPRESSORS/ BLOWERS</p>  CENTRIFUGAL COMPRESSOR  CENTRIFUGAL (RADIAL) FAN OR BLOWER  LOBE BLOWER (ROOTS)  PROPELLER OR AXIAL FAN  RECIPROCATING COMPRESSOR  ROTARY SCREW COMPRESSOR  SLIDING VANE COMPRESSOR	<p style="text-align: center;">HEAT EXCHANGERS</p>  HEAT EXCHANGER, COIL FINNED, AIR-TO-LIQUID  HEAT EXCHANGER, SHELL & TUBE OR GENERIC  HEATER (STEAM OR ELECTRIC)	 INLET FILTER OR SCREEN  PLATE SETTLER  SEDIMENT TRAP  STRAINER  THICKENER OR CLARIFIER  TRAVELING SCREEN  "1/2" STRAINER	<p style="text-align: center;">MIXERS/ STRAIGHTENERS</p>  FLOW STRAIGHTENING VANE  MECHANICAL MIXER/ AGITATOR  PUMP SUCTION DIFFUSER  SPARGER  SPRAY NOZZLES  STATIC, IN-LINE MIXER	

USER: wchow
 DATE: 21-FEB-2019 16:13
 FILE: H:\s1d5s\8sstddwg\9420005.R09



NO.	DATE	REVISION	BY	REC.	APP.
1	20FEB2019	ADDED NEW SYMBOLS	HEB	ST	
2	26APR2017	REORGANIZED SYMBOLS	HEB	ST	

DESIGNED BY	---	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA STANDARD DRAWING SYMBOLS FOR P&ID DRAWINGS EQUIPMENT SHEET 3 OF 3					
DESIGN CHECKED BY	---						
DRAWN BY	---						
A COPY OF THE ORIGINAL DRAWING WITH ORIGINAL SIGNATURES CAN BE FOUND IN ENGINEERING RECORDS.		PROJ. NO.	NONE	9492-G-005	9		
RECOMMENDED BY	---	SCALE	NONE				
APPROVED BY	---	DATE	13JUL1999	STRUCT.	DISC.	NUMBER	REV.

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	J
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	PV	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 INDICATING CONTROLLER	PI
TRIPLE DUTY VALVE	TDV	BLOWER	BLO	REFRIGERATOR UNIT	RFU	FLOW INDICATING CONTROLLER	FIC	PRESSURE INDICATING RECORDER	PIR
VACUUMBREAKER VALVE (ANTI-SYPHON)	VBV	BOILER	BLR	RELIEF FAN	RF	FLOW INDICATING RECORDER	FIR	PRESSURE INDICATING TRANSMITTER	PIT
WICKET GATE	WKT	CABINET (MSC)	CAB	RESTRICTING ORIFICE	OR	FLOW INDICATING TRANSMITTER	FIT	PRESSURE INDICATOR	PI
		CHILLER UNIT	CHU	RUPTURE DISK	RD	FLOW INDICATOR	FI	PRESSURE SWITCH HIGH, (LOW)	PSH, (PSL)
		CLARIFIER	CLF	SAFETY SHOWER	SHR	FLOW QUANTITY INDICATOR (CALIBRATION COLUMN)	FQI	PRESSURE TRANSMITTER	PT
		COLLECTOR	COL	SCREEN	SCN	FLOW SWITCH HIGH, (LOW)	FSH, (FSL)	SPEED CONTROL	SC
		COMPRESSOR	CMP	SCRUBBER	SCB	FLOW TRANSMITTER	FT	SPEED INDICATOR	SI
		COMPRESSOR CONDENSER UNIT	CCU	SEPARATOR	SEP	HAND SWITCH	HS	SPEED SENSING ELEMENT	SE
		CONDENSATE NEUTRALIZATION UNIT	CNU	SETTLER	SET	INSTRUMENT CABINET	IC	STATUS INDICATOR	NI
		CONDENSER	COND	SILENCER	SIL	LEVEL INDICATING CONTROLLER	LIC	STATUS LIGHT, (OPEN), (CLOSED)	NL, (NLO), (NLC)
		CONDENSING UNIT	CDU	SLUDGE VACUUM COLLECTOR	SVC	LEVEL INDICATING RECORDER	LIR	TEMPERATURE INDICATING CONTROLLER	TIC
		COOLER	CLR	SLUICE/SLIDE/WEIR/SHEAR/BUTTERFLY GATE/LOG	SGT	LEVEL INDICATING TRANSMITTER	LIT	TEMPERATURE INDICATING RECORDER	TIR
		COOLING TOWER	CTW	SPARGER	SPG	LEVEL INDICATOR	LI	TEMPERATURE INDICATING TRANSMITTER	TIT
		COUPLING	CPL	STRAINER	STR	LEVEL SWITCH HIGH	LSH	TEMPERATURE INDICATOR	TI
		CRANE	CRN	STOP LOG	LOG	LEVEL SWITCH LOW	LSL	TEMPERATURE SWITCH HIGH, (LOW)	TSH, (TSL)
		DAMPER	DMP	SUPPLY FAN	SF	LEVEL TRANSMITTER	LT	TEMPERATURE TRANSMITTER	TT
		DESSICANT DRYER	DDR	SURGE TANK	TNK	MOISTURE INDICATING TRANSMITTER	MT	TIME TOTALIZING INDICATOR	KQI
		DIFFUSER	DIF	SYPHON	SYP	MOISTURE SENSOR (OR DEW POINT)	ME	TIME TOTALIZING SWITCH	KQS
		DRYER	DRY	TANK	TNK	MOISTURE SWITCH HIGH	MSH	TOTAL STATION	TS
		DIAPHRAM SEAL	DSL	TIMER (MECHANICAL)	TMR	MULTIPOINT INDICATOR	UI	VIBRATION INDICATOR	VI
		EDUCTOR	EDR	TRAP	TRP	MULTIPOINT INDICATING RECORDER	UIR	VIBRATION SENSOR (AXIAL THRUST)	VZE
		EMERGENCY EYEWASH	EYW	TRAILER	TRL	MULTIPOINT SCAN INDICATOR	UII	VIBRATION SENSOR (RADIAL, X-DIRECTION)	VXE
		ENGINE	ENG	TRASH RAKE	RKE	OCCUPANCY SWITCH (SENSOR)	OE	VIBRATION SENSOR (RADIAL, Y-DIRECTION)	VYE
		ENGINE GENERATOR SET	EGS	TURBINE	TRB			VIBRATION SWITCH HIGH	VSH
		EVAPORATOR	EVP	ULTRAVIOLET REACTOR	UVR			VIBRATION TRANSMITTER (AXIAL THRUST)	VZT
		EXHAUST AIR DAMPER	EAD	VARIABLE AIR VOLUME UNIT	VAV			VIBRATION TRANSMITTER (RADIAL, X-DIRECTION)	VXT
		EXHAUST FAN	EF	VAPORIZER	VPR			VIBRATION TRANSMITTER (RADIAL, Y-DIRECTION)	VYT
		FAN	FAN	VENT	VNT			VOLTAGE SWITCH LOW	ESL
		FAN COIL UNIT	FCU	WASHDOWN MONITOR	WWR			WEIGHT INDICATING TRANSMITTER	WIT
		FEEDER (DRY)	FDR	WATER HEATER	WHR				
		FILTER	FLT	WWE 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)	AOV
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

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 2535.1 "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
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NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY <i>Nathan E. Grunland</i> NATHAN E. GRUNLAND	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA		
DESIGN CHECKED BY <i>David J. Baskley</i> DAVID J. BASKLEY	STANDARD DRAWING		
DRAWN BY FACILITY DRAFTING	EQUIPMENT TAG NUMBERING MECHANICAL EQUIPMENT & INSTRUMENTATION CODES		
REVIEW SR. MECH. ENGR. R.P.E. NO. 423694 <i>David J. Baskley</i> DAVID J. BASKLEY	SHEET 1 OF 2		
RECOMMENDED BY MGR. OF DESIGN R.P.E. NO. C48598 <i>S. Terentjeff</i> SERGE V. TEREENTJEFF	PROJ. NO. 9492-G-006.1	SCALE AS SHOWN	0
APPROVED BY DIRECTOR OF ENG & CONST R.P.E. NO. C44782 <i>James J. ...</i> JAMES J. ...	DATE 21FEB2019	STRUCT. DISC. NUMBER	REV.

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EQUIPMENT CODES					
ELECTRICAL DEVICES		ELECTRICAL DEVICES, CONT.		OTHER EQUIPMENT	
EQUIPMENT TYPE	EQUIPMENT CODE	EQUIPMENT TYPE	EQUIPMENT CODE	EQUIPMENT TYPE	EQUIPMENT CODE
ADJUSTABLE FREQUENCY DRIVE	VFD	RADIO TRANSMITTER/RECEIVER	RAD	ANODE	ANO
ANTENNA	ANT	RECTIFIER	REC	AR GAP	AG
AUTOMATIC TRANSFER SWITCH	ATS	REGULATOR, VOLTAGE	RG	AC MITIGATION TEST STATION	ACTS
BATTERY	BTR	RELAY, NOTE 8	RLY	BARREL	BRL
BATTERY MONITORING SYSTEM	BMS	RELAY CUT OUT	RCO	CASTING TEST STATION	CTS
BATTERY CHARGER	BYC	REMOTE I/O	RIO	CATHODIC PROTECTION STATION	CPS
BREAKER, NOTE 6	BKR	REMOTE SWITCH ACTUATOR	RSA	CROSS FENCE	FNC
CABLE	CBL	REMOTE TERMINAL UNIT	RTU	CULVERT	CUL
CAPACITOR	CAP	SOFT START	SFS	DOOR	DR
COMBINER BOX	CBN	SMOKE DETECTOR	SD	ELECTROLYTIC TEST STATION	ETS
COMMUNICATION PROCESSOR	COM	SOLENOID	SOL	ELEVATOR OR MANLIFT	ELEV
CONTROL PANEL	CP	SURGE SUPPRESSOR	SS	ENERGY DISSIPATOR (DISCHARGE)	DSP
CONTROL STATION	CS	SMTCH, HAND	HS	GATE (VEHICLE OR PERSONNEL)	GATE
CURRENT ISOLATOR	IB	SWITCH, NON-FUSED (FUSED), NOTE 6	SWN, (SWF)	GALVANIC ANODE TEST STATION	GATS
CURRENT TRANSFORMER	XCT	SWITCHBOARD	SWB	INSULATING JOINT TEST STATION	IJS
DATA ACQUISITION SYSTEM	DAS	SWTCHGEAR	SWR	MANHOLE (ACCESS TO TOP OF PIPE)	MH
DISCONNECT	DIS	TERMINATION BOX	JTB	MANWAY (ACCESS INTO PIPE)	MW
EMERGENCY LIGHTS	EML	TEST SWITCH	TS	OVERFLOW	OF
ETHERNET SECURITY GATEWAY	ESG	TRANSFORMER	XFR	ROAD (ACCESS)	ROAD
ETHERNET SWITCH	ESW	UNINTERRUPTIBLE POWER SUPPLY	UPS	ROOF	ROF
EXCITER	EXC	UNIT SUBSTATION	USS	SCALE	SCL
FIBER PATCH PANEL	FPP	VARIABLE FREQUENCY DRIVE	VFD	SUMP	SMP
FIELD PANEL	FP			TEST STATION	TST
GENERATOR	GEN			TOTE	TOT
TIME TOTALIZING INDICATOR	KQI			TRAILER	TRL
GPS SYNCHRONIZATION CLOCK	GSC			VAULT OR PIT	VL
GROUND TEST STATION	GTS			VEHICLE	VEH
GROUNDING REACTOR	REA				
GROUNDING RESISTOR	RES				
HUMAN MACHINE INTERFACE	HMI				
INVERTER	INV				
ISOLATION SURGE PROTECTORS	ISP				
JUNCTION BOX	JB				
KEYBOARD, VIDEO, MOUSE	KVM				
LIGHTING FIXTURE, EXTERIOR	LFE				
LIGHTING FIXTURE, INTERIOR	LFI				
LIGHTING PANEL	LP				
LOAD CENTER	LCR				
LOCAL CONTROL PANEL	LCP				
MAIN CONTROL PANEL	MCP				
MANUAL TRANSFER SWITCH	MFS				
MEDIUM VOLTAGE CONTROLLER	MVC				
METER	NOTE 7				
METEOROLOGICAL SYSTEM	MET				
METER PANEL	MPL				
MINI DISTRIBUTION PANELBOARD	MDP				
MINI UNIT SUBSTATION	MUS				
MOTOR	MTR				
MOTOR CONTROL CENTER	MCC				
MOTOR GENERATOR SET	MS				
MOTOR OPERATED DAMPER	MDD				
MOTOR OPERATOR	MO				
MOTOR STARTER	MS				
MULTIFUNCTION PROTECTIVE RELAY	MFR				
OPERATOR INTERFACE TERMINAL	OIT				
PHOTOVOLTAIC ARRAY	PVA				
POTENTIAL TRANSFORMER	XPT				
POWER DISTRIBUTION PANEL	PP				
POWER MONITORING UNIT	PMU				
POWER SUPPLY UNIT	PSU				
POWER SWITCH PANEL	PSP				
PROGRAMMABLE LOGIC CONTROLLER	PLC				
PULL BOX	PB				

NOTES
 1. REFER TO DWG G-006.1 FOR NOTES.



NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY <i>Nathan E. Gronlund</i> NATHAN E. GRONLUND	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA		
DESIGN CHECKED BY <i>David J. Bailey</i> DAVID J. BAILEY	STANDARD DRAWING		
DRAWN BY FACILITY DRAFTING	EQUIPMENT TAG NUMBERING ELECTRICAL EQUIPMENT CODES		
REVIEW SR. MECH. ENGR. R.P.E. NO. M29694 <i>David J. Bailey</i> DAVID J. BAILEY	SHEET 2 OF 2		
RECOMMENDED BY MGR. OF DESIGN R.P.E. NO. C48598 <i>S. Terentjev</i> SERGE V. TEREENTJEV	PROJ. NO. 9492-G-006.2	SCALE AS SHOWN	REV. 0
APPROVED BY DIRECTOR OF ENG & CONST R.P.E. NO. C44782 <i>James Lee</i> JAMES LEE	DATE 21FEB2019	STRUCT.	DISC.

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A	AMBER, AMMETER, AMPERES, AUTO
AB	AGGREGATE BASE, ANCHOR BOLT
ABC	AGGREGATE BASE COURSE
ABAND	ABANDONED
ABS	ABSOLUTE, ACRYLONITRILE-BUTADIENE-STYRENE
ABV	ABOVE
a/c	ALTERNATING CURRENT
A/C	AIR CONDITIONING
AC	ASBESTOS CEMENT, ASPHALTIC CONCRETE, ACRES, ACCUMULATOR
ACB	AIR CIRCUIT BREAKER
ACC	AREA CONTROL CENTER, ACCUMULATOR
ACI	AMERICAN CONCRETE INSTITUTE
ACK	ACKNOWLEDGE
AC ST	ACOUSTIC
A/D	ANALOG TO DIGITAL
ADD	ADDITION
ADDL	ADDITIONAL
ADJ	ADJACENT, ADJUST
ADP	ADAPTER
AF	AIR FILTER, AMPERE FRAME
AFD	ADJUSTABLE FREQUENCY DRIVE
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AGG	AGGREGATE
Ah	AMPERE HOUR
AHD	AHEAD
AHU	AIR HANDLING UNIT
AI	ANALOG INPUT
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AL	ALUMINUM, ACOUSTIC LINED
ALLOW	ALLOWANCE
ALM	ALARM
ALT	ALTERNATE, ALTERNATIVE
AM	AUTO-MANUAL
AMB	AMBIENT
AMP	AMPERES
ANSI	AMERICAN NATIONAL STANDARD INSTITUTE
AO	ANALOG OUTPUT
AP	ACCESS PANEL
APP	APPLIED
APPROX	APPROXIMATE
AR	AUXILIARY RELAY
ARCH	ARCHITECTURAL
ARV	AIR RELEASE VALVE
AS	ADJUSTABLE SWITCH, AIR SUPPLY, AMMETER SWITCH, AMPERE SENSOR
ASD	ADJUSTABLE SPEED DRIVE
ASB	ASBESTOS
ASC	ADJUSTABLE SPEED CONTROLLER
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASPH	ASPHALT
ASSY	ASSEMBLY
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
ASU	AIR SUPPLY UNIT
AT	AMPERE TRIP
ATM	ATMOSPHERE
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AUX	AUXILIARY
AVG	AVERAGE
AVR	AUTOMATIC VOLTAGE REGULATOR
AWG	AMERICAN WIRE GAUGE
AWS	AMERICAN WELDING SOCIETY
AWWA	AMERICAN WATER WORKS ASSOCIATION

B	BELL, BLUE, BOTTOM, BROADCASTING
BBH	BASEBOARD HEATER
B/C	BOTTOM OF CONCRETE
BC	BARE COPPER, BEGINNING OF CURVE, BOLT CIRCLE
BCT	BUSHING CURRENT TRANSFORMER
BD	BAUD, BOARD
BDD	BACKDRAFT DAMPER
BEG	BEGIN, BEGINNING
BF	BACKFLOW, BLIND FLANGE
BFP	BACKFLOW PREVENTER
BFV	BUTTERFLY VALVE
BG	BELOW GRADE
BHP	BRAKE HORSEPOWER
BIL	BASIC INSULATION LEVEL
BITUM	BITUMINOUS
BKR	BREAKER
BLT	BOLT
BLDG	BUILDING
BLK	BLOCK
BLKG	BLOCKING
BLO	BLOW OFF
BLV	BALL VALVE
BM	BEAM, BENCHMARK
BMCS	BUILDING MANAGEMENT CONTROL SYSTEM
BO	BLOWOFF
B/D	BOTTOM OF DUCT
B/P	BOTTOM OF PIPE, BLUE PRINT
BOP	BALANCE OF PLANT
BOT	BOTTOM
BP	BYPASS
BPS	BITS PER SECOND
BRG	BEARING
BRK	BREAK
BRZ	BRONZE
B&S	BELL & SPIGOT
BSHG	BUSHING
BTU	BRITISH THERMAL UNIT
BTUH	BTU PER HOUR
BTWN	BETWEEN
Buna-N	NITRILE RUBBER
BV	BALL VALVE
BVC	BEGINNING OF VERTICAL CURVE
BW	BAND WIDTH
BWS	BACKWASH SUPPLY WATER
BWW	BACKWASH WASTE WATER

C	CABLE, CENTIGRADE, CLOSE, STRUCTURAL STEEL CHANNEL, COMMAND, COMPUTER
CA	CAUSTIC, CONCRETE ANCHOR, CABLE
CAB	CABINET
CAD	COMPUTER AIDED DESIGN
CALIB	CALIBRATE
CAP	CAPACITY, CAPACITOR
CAT	CATALOG, COMPUTER AIDED TOMOGRAPHY
CB	CATCH BASIN, CIRCUIT BREAKER
CBC	CALIFORNIA BUILDING CODE
CC	CONTROL CABLE, COOLING COIL, CONTINUOUS, CURRENT, CURB COCK, CONTROL CENTER
C-C	CENTER TO CENTER
CCTV	CLOSE-CIRCUIT TELEVISION
CCW	COUNTER CLOCKWISE
CD	CEILING DIFFUSER, CENTER DISTANCE
CDF	CONTROLLED DENSITY FILL
CEM	CEMENT

CER	CERAMIC
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CG	CEILING GRILLE
CHAM	CHAMFER
CHEM	CHEMICAL
CHK	CHECK, CHECKED
CI	CAST IRON
CIMJ	CAST IRON MECHANICAL JOINT
CIP	CAST IRON PIPE, CAST IN PLACE
CIR	CIRCLE
CIRC	CIRCULAR
CISP	CAST IRON SOIL PIPE
CJ	CONSTRUCTION JOINT
CJP	COMPLETE JOINT PENETRATION WELD
CKT	CIRCUIT
CL	CLASS, CONTROL LOOP, CLOSE, CENTERLINE
CL2	CHLORINE
CLG	CEILING
CLJ	CONTROL JOINT
CLKG	CAULKING
CLO	CLOSET
CLR	CLEAR, CLEARANCE
CLSM	CONTROLLED LOW STRENGTH MATERIAL
CLT	CURRENT LIMITING
CMIL	CIRCULAR MILL
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CNDCT	CONDUCTIVITY
CNTL	CONTROL
CNTLR	CONTROLLER
CNTR	COUNTER
CNTOR	CONTACTOR
CO	CLEANOUT, CONTROL OUTPUT, COMPANY
CO2	CARBON DIOXIDE
COAX	COAXIAL
COL	COLUMN
COM	COMMON
COMM	COMMUNICATION
COMPT	COMPARTMENT
CON	CONCENTRIC
CONC	CONCRETE
COND	CONDENSER, CONDUCTIVITY, CONDITION
CONF	CONFERENCE
CONN	CONNECTION
CONSTR	CONSTRUCTION
CONT	CONTINUOUS, CONTINUATION
COORD	COORDINATE
CORR	CORRUGATED
COTG	CLEANOUT TO GRADE
CP	CONTROL POINT
CPS	CATHODIC PROTECTION STATION
CPT	CONTROL POWER TRANSFORMER
CR	CEILING REGISTER, CONTROL RELAY
CRE	CORROSION RESISTANT
CRG	CARRIAGE
CRS	COATED RIGID STEEL CONDUIT, COLD ROLL STEEL
CS	CONTROL STATION, CONTROL SWITCH, CUP SINK
CT	CONDUIT, COURT, CURRENT TRANSFORMER
CTD	CENTERED
CTR	CENTER
CU FT	CUBIC FOOT
CU IN	CUBIC INCH
CU YD	CUBIC YARD
CW	COLD WATER, CLEAR WELL, CLOCKWISE
CY	CUBIC YARD

D	PENNY (NAIL SIZE)
D	DEPTH, DIMMER, DISCHARGE
DAC	DIGITAL-TO-ANALOG CONVERTER
DB	DECIBEL, DRY BULB
DBL	DOUBLE
dc	DIRECT CURRENT
DCS	DISTRIBUTED CONTROL SYSTEM
DECR	DECREASING
DEG	DEGREES
DEMO	DEMOLISH
DEPT	DEPARTMENT
DESC	DESCRIPTION
DET	DETAIL
DF	DOUGLAS FIR
DFL	DOUGLAS FIR, LARCH
DG	DECOMPOSED GRANITE
DI	DIGITAL INPUT, DROP INLET, DRAINAGE INLET, DUCTILE IRON
DIA	DIAMETER
DIAG	DIAGRAM, DIAGONAL
DIFF	DIFFERENCE, DELTA
DIMJ	DUCTILE IRON MECHANICAL JOINT
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DISC	DISCONNECT SWITCH
DISCH	DISCHARGE
DISP	DISPENSER
DIV	DIVISION
DL	DAYLIGHT, DOOR LOUVER, DISCRETE LATCHED OUTPUT, DEAD LOAD
DMP	DAMPER
DMV	DIAPHRAGM VALVE
DMZ	DEMILITARIZED ZONE
DN	DOWN
DO	DIGITAL OUTPUT, DITTO
DO2	DISSOLVED OXYGEN
DP	DEEP DISCHARGE PRESSURE
DPNT	DOOR, DRIVE
DR	DOOR, DRIVE
DRN	DRAIN
DS	DOWNSPOUT, DISCONNECT SWITCH
DW	DECHLORINATED, DECHLORAMINATED WATER
DWG(S)	DRAWING(S)
DWV	DRAIN WASTE VENT
DWY	DRIVEWAY

E	EAST, EMPTY, EMERGENCY, VOLTAGE SYMBOL
(E)	EXISTING
EA	EACH, EXHAUST AIR
EAD	EXHAUST AIR DAMPER
EAT	ENTERING AIR TEMPERATURE
EC	END OF CURVE
ECC	ECCENTRIC
EYW	EMERGENCY EYEWASH
E/E	VOLTAGE-TO-VOLTAGE
EF	EACH FACE, EXHAUST FAN
EFF	EFFICIENCY
EFL	EFFLUENT
E/I	VOLTAGE-TO-CURRENT
EJ	EXPANSION JOINT
EL	ELEVATION (NUMERIC)
ELL	ELBOW
ELEC	ELECTRICAL
ELEV	ELEVATION (VIEW), ELEVATOR
ELB	ELBOW
EMB	EMBEDMENT
EMBED	EMBEDMENT

EMER	EMERGENCY
EMF	ELECTROMOTIVE FORCE
ENCL	ENCLOSURE
ENG	ENGINE
ENGR	ENGINEER
EP	EDGE OF PAVEMENT
EPDM	ETHYLENE PROPYLENE DIENE MONOMER ELASTOMER
EMCS	ENERGY MANAGEMENT CONTROL SYSTEM
EMPU	ELECTRONIC MOTOR PROTECTION UNIT
EMT	ELECTRICAL METALLIC TUBING
ENT	ENTRANCE
EPU	ELECTRONIC PROTECTION UNIT
EQ	EQUAL
EQPT	EQUIPMENT
EQUIV	EQUIVALENT
ESP	EXTERNAL STATIC PRESSURE
EST	ESTIMATE
ETM	ELAPSED TIME METER
ETW	EDGE OF TRAVELLED WAY
EVAP	EVAPORATOR
EVC	END OF VERTICAL CURVE
EW	EACH WAY
EWG	ELECTRIC WATER HEATER
EX	EXAMPLE, EXTRA, EXIT
EXH	EXHAUST
EXP	EXPANSION, EXPOSED
EXST, EXIST	EXISTING
EXT	EXTERIOR
EXTR	EXTRUDED
EYW	EMERGENCY EYEWASH

F	FUSE, FAHRENHEIT
FAB	FABRICATE
FAC	FACTORY
FACIL	FACILITY
FAT	FACTORY ACCEPTANCE TEST
FB	FLAT BAR, FUSE BLOCK
fc	FOOTCANDLE
FC	FACE OF CURB, FLEXIBLE CONNECTION, FLEXIBLE COUPLING, FAIL CLOSED
F'c	CONCRETE COMPRESSIVE STRENGTH
FCA	FLANGED COUPLING ADAPTER
FCO	FLOOR CLEANOUT
FCU	FAN COIL UNIT
FD	FIRE DAMPER, FLOOR DRAIN, FOUND
FDC	FLEXIBLE DUCT CONNECTION

FDN	FOUNDATION
FDR	FEEDER
FF	FINISH FLOOR, FAR FACE, FINISH FACE, FLAT FACE
F/F	FACE OF FOOTING
F-F	FACE TO FACE
FG	FINISH GRADE
FH	FIRE HYDRANT, FLAT HEAD
FI	FLOW INDICATOR, FAIL IN PLACE
FIG	FIGURE
FIN	FINISHED
FL	FLASHING, FLOWLINE, FLUORIDE
FLD	FIELD
FLEX	FLEXIBLE
FLH	FLATHEAD
FLG	FLANGE
FLGD	FLANGED
FLP	FAIL TO LAST POSITION
FLR	FLOOR
FLS	FLOAT SWITCH, FLOW SWITCH
FLT	FILTER
FLUOR	FLUORESCENT
FKM	FLUROELASTOMER (MTON)
FM	FREQUENCY MODULATOR
FMH	FLEXIBLE METAL HOSE
FND	FOUNDATION
FO	FAIL OPEN, FIBER OPTICS
FOC	FACE OF CURB
FPM	FEET PER MINUTE
FPRF	FIREPROOF
FPS	FEET PER SECOND
FPT	FEMALE PIPE THREAD
FR	FILTRATION, FLOW RECORDER
FRP	FIBERGLASS REINFORCED PLASTIC
FS	FAR SIDE, FLOW SWITCH
FT	FEET, FLOW TRANSMITTER
FTG	FOOTING
FU	FUSE
FURN	FURNACE
FUT	FUTURE
FWNR	FULL VOLTAGE NON-REVERSING
FVR	FULL VOLTAGE REVERSING
FXTR	FIXTURE
FW	FACE OF WALL, FILTERED WATER
FWD	FORWARD

NOTES

- FOR ADDITIONAL ABBREVIATIONS, SEE EBMUD ENGINEERING STANDARD PRACTICES ESP 207.1 "ABBREVIATIONS FOR MAPPING", ESP 251.1 "PIPE DESIGNATIONS", AND ANSI/ASME Y1.1 "ABBREVIATIONS".
- SEE DRAWING 9492-G-000.2 FOR ABBREVIATIONS FROM G THRU R.
- SEE DRAWING 9494-G-000.3 FOR ABBREVIATIONS FROM S THRU Z, AND FOR SYMBOLS.
- SEE DRAWING 9492-G-002 & G-006 FOR INSTRUMENT CODES.
- SEE DRAWING 9492-G-006 FOR EQUIPMENT CODES.
- SEE DRAWING 9492-G-007 FOR SYSTEM CODES.

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DESIGNED BY	<i>Paul M. Franceschi</i>	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA	
DESIGN CHECKED BY	<i>Paul M. Franceschi</i>	STANDARD DRAWING	
DRAWN BY	FACILITY DRAFTING	ABBREVIATIONS FOR WATER FACILITIES DESIGN DRAWINGS, A THRU F	
REVIEW		PROJ. NO.	9492-G-000.1
SR. CIVIL ENGR. R.P.E. NO. C38146	<i>Paul M. Franceschi</i>	SCALE	NONE
RECOMMENDED MGR. OF DESIGN R.P.E. NO. C48998	<i>S. Terentjev</i>	DATE	12AUG2016
APPROVED DIRECTOR OF ENG & CONST R.P.E. NO. C44782	<i>S. Terentjev</i>	REV.	0

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G
 G GAS, GREEN
 GA GAUGE OR GAGE
 GAL GALLON
 GALV GALVANIZED
 GA/TS GALVANIC ANODE/TEST STATION
 GC GAS COCK
 GDR GRINDER
 GEN GENERATOR
 GFCI GROUND-FAULT CIRCUIT INTERRUPTER
 GFI GROUND FAULT INTERRUPTER
 GFR GROUND FAULT RELAY
 GHz GIGA HERTZ
 GI GALVANIZED IRON
 GL GLASS, GLUE LAM, GROUND LINE
 GLV GLOBE VALVE
 GND GROUND
 GPD GALLONS PER DAY
 GPM GALLONS PER MINUTE
 GR GRADE
 GSKT GASKET
 GSM GALVANIZED SHEET METAL
 GSP GALVANIZED STEEL PIPE
 GUT GUTTER
 GWB GYPSUM WALLBOARD
 GWL GROUND WATER LEVEL
 GYP GYPSUM
 GT GATE
 GV GATE VALVE

H
 H HEIGHT, HIGH, HAND, HORN, HORIZONTAL
 H1E HOOK ONE END
 H2E HOOK BOTH ENDS
 HB HOSE BIBB
 HC HEATING COIL, HOLLOW CORE
 HD HEAD
 HDP HIGH DISCHARGE PRESSURE
 HDPE HIGH DENSITY POLYETHYLENE
 HDR HEADER
 HDWD HARDWOOD
 HDWE HARDWARE
 HESO HYDRAULIC EMERGENCY SHUTOFF VALVE
 HEX HEXAGONAL
 HH HANDHOLE
 HHWR HEATING HOT WATER RETURN
 HHWS HEATING HOT WATER SUPPLY
 HID HIGH INTENSITY DISCHARGE
 HIPOT HIGH POTENTIAL
 HMI HUMAN MACHINE INTERFACE
 HOA HAND-OFF-AUTOMATIC
 HORZ, HORIZONTAL
 HP HIGH PRESSURE, HIGH POINT, HORSEPOWER
 HPS HIGH PRESSURE SODIUM LAMP
 HR HOUR
 HS HIGH SPEED
 HSB HIGH STRENGTH BOLT
 HSG HOUSING
 HSS HOLLOW STRUCTURAL SECTION
 HT HEAT
 HTR HEATER
 HV HIGH VOLTAGE, HOSE VALVE
 HVAC HEATING, VENTILATING AND AIR CONDITIONING
 HW HOT WATER

HWH HOT WATER HEATER
 HWR HOT WATER RETURN
 HWY HIGHWAY
 HX HEAT EXCHANGER
 HYD HYDRANT
 HYDR HYDRAULIC
 Hz HERTZ (CYCLES PER SECOND)

I
 IC INTERRUPTING CAPACITY
 ID IDENTIFICATION, INSIDE DIAMETER
 I&C INSTRUMENTATION & CONTROL
 IE CURRENT-TO-VOLTAGE
 IED INTELLIGENT ELECTRONIC DEVICES
 IF INSIDE FACE
 IFC IN FURRED CEILING
 IFS IN FURRED SPACE
 IFW IN FURRED WALL
 II CURRENT-TO-CURRENT
 IJ INSULATING JOINT
 IJS IN JOIST SPACE
 IM INTRUSION MONITOR
 IN INCH
 INCAND INCANDESCENT
 INF INFLEUNT
 INST INSTANTANEOUS
 INSTR INSTRUMENT
 INSUL INSULATION
 INT INTERIOR
 INTFC INTERFACE
 INTLK INTERLOCK
 INTMD INTERMEDIATE
 INVT INVERT
 INVEL INVERT ELEVATION
 IO INLET/OUTLET
 IPB ILLUMINATED PUSH BUTTON
 IR INSIDE RADIUS
 IS INTRUSION SWITCH
 IW IN WALL
 IWC IN WALL CHASE

J
 J, JB JUNCTION BOX
 JCT JUNCTION
 JP JOINT POLE
 JST JOIST
 JT JOINT

K
 K KEY, KEY INTERLOCK
 KIP THOUSAND POUNDS
 KSF KIPS PER SQUARE FOOT
 kV KILOVOLT
 KVA KILOVOLT AMPERE
 kW KILOWATT
 kWh KILOWATT HOUR
 kWhd KILOWATT HOUR DEMAND METER

L
 L LENGTH, STRUCTURAL STEEL ANGLE, LOW SPEED, LIGHTING CONTACTOR LOW SPEED, LIGHTING CONTACTOR
 LA LIGHTNING ARRESTER
 LAB LABORATORY
 LAM LAMINATED
 LAV LAVATORY

LB POUND
 LCP LOCAL CONTROL PANEL
 LDP LOW DISCHARGE PRESSURE
 LF LINEAR FEET
 LI LEVEL INDICATOR
 LL LIVE LOAD
 LLH LONG LEG HORIZONTAL
 LLV LONG LEG VERTICAL
 LNLT LINTEL
 LOA LENGTH OVERALL
 LOC LOCATION, LOCAL
 LONG LONGITUDINAL
 LOS LOCK OUT STOP PUSHBUTTON
 LP LOW PRESSURE, LOW POINT
 LR LONG RADIUS, LATCHING RELAY, LOCAL-REMOTE
 LS LEVEL SWITCH, LIME SLURRY, LIMIT SWITCH
 LSP LOW SUCTION PRESSURE, LIFE SAFETY POWER
 LT LEFT, LIGHT, LEVEL TRANSMITTER
 LTC LOAD TAP CHANGER
 LT FLEX LIQUID TIGHT FLEXIBLE CONDUIT
 LTG LIGHTING
 LV LOW VOLTAGE
 LVL LEVEL
 LVR LOUVER
 LWR LOWER

M
 M MOTOR, MAGNETIC CONTACTOR COIL
 mA MILLIAMPERE
 MAINT MAINTENANCE
 MAN MANUAL
 MATL MATERIAL
 MAX MAXIMUM
 MB MACHINE BOLT
 MBH 1000 BTU'S PER HOUR
 MBR MEMBER
 MCC MOTOR CONTROL CENTER
 MCC MAXIMUM CONTINUOUS OPERATING VOLTAGE
 MCOV
 MD MOTORIZED DAMPER
 MECH MECHANICAL
 MEMB MEMBRANE
 MFR MANUFACTURER
 MG MILLION GALLONS
 MGD MILLION GALLONS PER DAY
 MH MANHOLE
 MI MALLEABLE IRON
 MIN MINIMUM, MINUTE
 MISC MISCELLANEOUS
 MJ MECHANICAL JOINT
 MK MARK
 ML&CS MORTAR LINED & COATED STEEL
 MLLW MEAN LOWER LOW WATER
 ML&PCS MORTAR LINED & PLASTIC COATED STEEL
 MLW MEAN LOW WATER
 M-M MONUMENT TO MONUMENT
 MNHT MALE NATIONAL HOSE THREAD
 MNL MANUAL
 MO MASONRY OPENING, MOTOR OPERATOR
 MON MONUMENT
 MORT MORTAR
 MOT MOTOR
 MOV MOTOR OPERATED VALVE
 MPT MALE PIPE THREAD
 MPH MILES PER HOUR

MS MOTOR STARTER
 MSL MEAN SEA LEVEL
 MR MULTI-RATIO CT
 MT MOUNT
 MTD MOUNTED
 MTG MOUNTING
 MTL METAL
 MTR METER
 MTS MOTOR THERMAL SWITCH
 MTRG METERING
 MULT MULTIPLY
 MV MILLIVOLT
 MVA MEGA-VOLT AMPERE
 MW MICROWAVE, MEGAWATT
 MWS MAXIMUM WATER SURFACE
 MWY MANWAY

N
 N NEUTRAL, NORTH
 (N) NEW
 NA, N/A NOT APPLICABLE, NOT AVAILABLE, NON-AUTOMATIC
 NAD NORTH AMERICAN DATUM
 NC NORMALLY CLOSED
 NE NORTHEAST
 NEG NEGATIVE
 NEMA NATIONAL ELECTRIC MANUFACTURERS ASSOC.
 NF NFAR FACT
 NH AMMONIA
 NIC NOT IN CONTRACT
 NL NIGHT LIGHT
 NO NORMALLY OPEN
 NO. NUMBER
 NOM NOMINAL
 NORM NORMAL
 NP NAMEPLATE
 NPS NOMINAL PIPE SIZE
 NPT NATIONAL PIPE THREAD
 NPW NONPOTABLE WATER
 NS NEAR SIDE
 NTS NOT TO SCALE
 NW NORTHWEST

O
 OA OUTSIDE AIR, OVERALL
 OAD OUTSIDE AIR DAMPER
 OAT OUTSIDE AIR TEMPERATURE
 OC ON CENTERS, OPEN-CLOSE
 OCC OAKLAND CONTROL CENTER
 OD OUTSIDE DIAMETER, OVERFLOW DRAIN
 OIU OPERATOR INTERFACE UNIT
 OIT OPERATOR INTERFACE TERMINAL
 OL OVERLOAD
 ONAF OIL-NATURAL CIRCULATION AIR-FORCED CIRCULATION (TRANSFORMER)
 ONAN OIL-NATURAL CIRCULATION AIR-NATURAL CIRCULATION (TRANSFORMER)
 OO ON-OFF
 OP OPEN
 OPNET OPERATIONS NETWORK
 OPH OPPOSITE HAND
 OPNG OPENING
 OPP OPPOSITE
 ORP OXYDATION-REDUCTION POTENTIAL
 OR OUTSIDE RADIUS
 OSD OPEN SITE DRAIN
 OS&Y OUTSIDE SCREW & YOKE
 OTS OVERCURRENT TRIP SWITCH

P
 P PAVEMENT, POLE, PUMP, PILOT
 PB PUSH BUTTON, PULL BOX
 PC POINT OF CURVATURE, PHOTO CELL, PRIMARY COAGULANT
 PCC POINT OF COMPOUND CURVE
 PCM POWER SYSTEM CONTROL AND MONITORING
 PCV PRESSURE CONTROL VALVE
 PDI PULSE DURATION INPUT
 PERF PERFORATED
 PERM PERMANENT, PERMISSIBLE
 PF POWER FACTOR, PREFILTER
 PG&E PACIFIC GAS & ELECTRIC
 PGV PLUG VALVE
 pH HYDROGEN-ION CONCENTRATION
 PH PHASE, POWER HOUSE
 PHC PREHEAT COIL
 PI POINT OF INTERSECTION, PULSE INPUT, PRESSURE INDICATOR
 P&ID PROCESS & INSTRUMENT DIAGRAM
 PK PEAK
 PL PLATE
 PLF POUNDS PER LINEAR FOOT
 PIL PROPERTY LINE
 PLAS PLASTER
 PLC PROGRAMMABLE LOGIC CONTROL
 PLCS PLACES
 PLSTC PLASTIC
 PLT PILOT LIGHT
 PLUM PLUMBING
 PLYWD PLYWOOD
 PMP PUMP
 PMU POWER MONITORING UNIT
 PNEU PNEUMATIC
 PNL PANEL
 PO POLYMER
 POC POINT ON CURVE
 PPO POWER POLE, PUMPING PLANT, POLYPROPYLENE
 PPLN PIPELINE
 PR PAIR, PRESSURE RELAY
 PRC POINT OF REVERSE CURVE
 PRCST PRECAST
 PREFAB PREFABRICATED
 PRESS PRESSURE
 PRI PRIMARY
 PROP PROPERTY
 PRPSD PROPOSED
 PRV PRESSURE RELIEF VALVE
 PS PRESSURE SWITCH, POWER SUPPLY, PUMP STATION, SOLIDS CONDITIONING POLYMER
 PSF POUNDS PER SQUARE FOOT
 PSI POUNDS PER SQUARE INCH
 PSIA PSI (ABSOLUTE)
 PSIG PSI (GAGE)
 PSH PRESSURE SWITCH HIGH
 PSL PRESSURE SWITCH LOW
 PSU POWER SUPPLY UNIT
 PSV PRESSURE SAFETY VALVE (RELIEF VALVE)
 PT POINT, POINT OF TANGENCY, POTENTIAL TRANSFORMER, TREATMENT AID POLYMER
 PTN PARTITION
 PTS POINTS
 PV PROCESS VARIABLE
 PVC POLYVINYL CHLORIDE
 PVCGRS PVC COATED RIGID GALVANIZED STEEL
 PVMT PAVEMENT
 PWR POWER

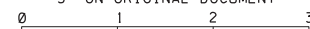
Q
 QTY QUANTITY
 QUAL QUALITY

R
 R RADIAL, RADIUS, RED, RISER, RUN
 RA RETURN AIR
 RAD RADIUS
 RC REINFORCED CONCRETE
 RCF RECIRCULATING FAN
 RCCP REINFORCED CONCRETE CULVERT PIPE
 RCP REINFORCED CONCRETE PIPE
 RCPT RECEPTACLE
 RCV RECEIVER
 RCVD RECEIVED
 RD ROAD, ROOF DRAIN
 RDA RETURN AIR DAMPER
 RDL ROOF DRAIN LEADER
 RDWD REDWOOD
 REBAR REINFORCING BAR
 RED REDUCING, REDUCER
 RECT RECTANGULAR
 REF REFERENCE
 REFR REFRIGERATOR
 REG REGULATOR
 REINF REINFORCED, REINFORCEMENT
 REM REMOVABLE, REMOTE
 REQD REQUIRED
 REQT REQUIREMENT
 RESIL RESILIENT
 RES RESERVOIR
 RET RETURN (CURB), RETAINING (WALL)
 REV REVERSE, REVISION
 REVD REISED
 RF RAISED FACE
 RGH ROUGH
 RGS RIGID GALVANIZED STEEL
 RGTR REGISTER
 RH REHEAT COIL
 RI RODDING INLET
 RIO REMOTE INPUT/OUTPUT
 RL RAIN LEADER
 RLA RATED LOAD AMPS
 RLY RELAY
 RM ROOM
 RMS ROOT MEAN SQUARE
 RMT REMOTE
 RMVD REMOVED
 RND ROUND
 RO ROUGH OPENING
 RP RADIAL POINT
 RPM REVOLUTIONS PER MINUTE
 RS RIGID STEEL CONDUIT
 RSP REMOTE SET (CASCADE)
 RSPVC RIGID STEEL, PVC COATED
 RT RIGHT, REMOTE TELEMETRY
 RTD RESISTANCE TEMPERATURE DETECTOR
 RTU REMOTE TELEMETRY UNIT, REMOTE TERMINAL UNIT
 RV ROOF VENT
 RWR REDUCED VOLTAGE NON-REVERSING
 RVR REDUCED VOLTAGE REVERSING
 RW RIGHT-OF-WAY
 RWS RAW WATER SYSTEM

NOTES

- SEE DRAWING 9492-G-000.1 FOR ABBREVIATIONS FROM A THRU F, AND FOR ADDITIONAL NOTES.
- SEE DRAWING 9494-G-000.3 FOR ABBREVIATIONS FROM S THRU Z, AND FOR SYMBOLS.

3" ON ORIGINAL DOCUMENT



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DESIGN CHECKED BY	<i>Paul M. Franceschi</i>
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DIRECTOR OF ENG & CONST.	

EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA	
STANDARD DRAWING	
ABBREVIATIONS FOR WATER FACILITIES DESIGN DRAWINGS, G THRU R	
PROJ. NO.	9492-G-000.2
SCALE	NONE
DATE	12AUG2016
REV.	0

NO.	DATE	REVISION	BY	REC.	APP.

S	
S	SINGLE, SOUTH, SIREN, SOIL OR WASTE, SUCTION, SOURCE, SUPPLY
SA	SUPPLY AIR, SOFTWARE ALARM, SURGE ARRESTER
SAN	SANITARY
SB	SODIUM BISULFITE
SC	SOLID CORE, SPEED CONTROL
SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
SCD	SCREWED, STREAMING CURRENT DETECTOR
SCFM	STANDARD CUBIC FEET PER MINUTE
SCG	SLUICE GATE
SCH	SCHEDULE (SPEC FOR MATL)
SCHED	SCHEDULE (TABLE, TIME)
SCRN	SCREEN
SD	SMOKE DETECTOR, STORM DRAIN
SDG	SLIDE GATE
SDMH	STORM DRAIN MANHOLE
SE	SOUTHEAST
SEC	SECOND, SECONDARY
SECT	SECTION
SEL	SELECTOR
SEP	SEPARATOR
SEW	SEWAGE, SEWER
SF	SUPPLY FAN
SFW	SURFACE WASH
SH	SHEET, SHOWER, SPACE HEATER, SODIUM HYPOCHLORITE
SHLD	SHIELD
SHT	SHEET
SIM	SIMILAR
SK	SINK
SLG	SLUDGE
SLP	SLOPE
SN	SOLID NEUTRAL
SOG	SLAB ON GRADE
SOL	SOLENOID
SOLN	SOLUTION
SO2	SULFUR DIOXIDE
SP	SPARE, SUCTION PRESSURE, SUMP PUMP
SPC	SPACE
SPCR	SPACER
SPD	SPEED
SPEC	SPECIFICATIONS
SPST	SINGLE POLE, SINGLE THROW
SPV	SPOOL VALVE
SQ	SQUARE
SR	SINGLE-RATIO CT, SPRING RELEASE RELAY
SS	SANITARY SEWER, SUBSTATION, START-STOP
SSMH	SANITARY SEWER MANHOLE
SST	STAINLESS STEEL
ST	START
STA	STATION
STD	STANDARD
STIFF	STIFFENER PLATE
STIR	STIRRUPS
STL	STEEL
STO	STORAGE
STP	STOP
ST PR	STATIC PRESSURE
STR	STRAINER, STRUCTURAL, STRUCTURE
STRUCT	STRUCTURAL
SV	SIGNAL VOLTAGE
SUB	SUBMERSIBLE
SUBST	SUBSTITUTE
SUBSTA	SUBSTATION
SUCT	SUCTION
SURF	SURFACE
SUSP	SUSPENDED
SW	SWITCH, SOUTHWEST
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SYMM	SYMMETRICAL

T	
T	THERMOSTAT, TREAD, THROW, TIME, THICKNESS
TB	TERMINAL BLOCK, TERMINAL BOX, TERMINAL BOARD
TBA	TO BE ABANDONED
TBG	TUBING
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
TC	TIME CLOCK, TIME CLOSE
T/C	TOP OF CONCRETE, TOP OF CURB, THERMOCOUPLE
TCE	TEMPORARY CONSTRUCTION EASEMENT
TCV	TEMPERATURE CONTROL VALVE
TD	TEMPERATURE DETECTOR RELAY, TIME DELAY
TDE	TEST DEVICE
TDH	TOTAL DYNAMIC HEAD
TDR	TIME DELAY RELAY
TEFC	TOTALLY ENCLOSED FAN COOLED (MOTORS)
TEL	TELEPHONE
TEMP	TEMPERATURE, TEMPORARY
TERM	TERMINAL
TEWAC	TOTALLY ENCLOSED WATER TO AIR COOLED (MOTORS)
TFE	TETRAFLUOROETHYLENE (TEFLON)
TH	TOTAL HEAD
THD	THREAD
THHN	HEAT RESISTANT THERMOPLASTIC ELECTRICAL WIRE
THK	THICK (NESS)
THWN	MOISTURE & HEAT RESISTANT THERMOPLASTIC ELECTRICAL WIRE
THRU	THROUGH
TJB	TERMINAL JUNCTION BOX
TNK	TANK
T/L	TRANSIT LINE
TMPD	TEMPERED
T o P	T O P O F
TOC	TOP OF CONCRETE
TOF	TOP OF FOOTING
TOG	TOP OF GRATING
TOS	TOP OF STEEL, TOP OF SLAB
TOT	TOTAL
TOW	TOP OF WALL
T/P	TOP OF PAVEMENT
TR	TOP REGISTER
TRG	TRANSFER GRILLE
TRNSN	TRANSITION
TRTD	TREATED
TRTMT	TREATMENT
TS	STRUCTURAL STEEL TUBING, TIME SWITCH, TEST STATION
T/S	TOP OF STEEL
TSP	TWISTED SHIELDED PAIR, TOTAL STATIC PRESSURE
TST	TWISTED SHIELDED TRIAD
TTC	TELEPHONE TERMINAL CABINET
TW	TREATED WATER
TW	TOP OF WALL
TURB	TURBIDITY
TYP	TYPICAL

U	
U	HEAT TRANSFER COEFFICIENT
U-F	UNFORMED, FLOAT FINISH
UFC	UNIFORM FIRE CODE
UH	UNIT HEATER
UNO	UNLESS NOTED OTHERWISE
UON	UNLESS OTHERWISE NOTED
UPR	UPPER
UPS	UNINTERRUPTIBLE POWER SUPPLY
UR	URINAL
USS	UNIT SUBSTATION
U-TB	UNFORMED, TROWELED, HAIR BRUSH FINISH
UVR	UNDER VOLTAGE RELAY

V	
V	VENT, VOLTS, VOLTMETER, VERTICAL
VA	VIRTUAL OR CALCULATED ANALOG, VOLT AMPERE
VAC	VACUUM, VOLTS ALTERNATING CURRENT
VAR	VARIES, VARIABLE
VC	VERTICAL CURVE
VCP	VITRIFIED CLAY PIPE
VDC	VOLT, DIRECT CURRENT
VEL	VELOCITY
VER	VERIFY
VERT	VERTICAL
VFD	VARIABLE FREQUENCY DRIVE
V	VIBRATION ISOLATOR
VF	VERIFY IN FIELD
VLV	VALVE
VP	VAPOR PROOF
VPC	POINT OF VERTICAL CURVATURE
VPT	POINT OF VERTICAL TANGENCY
VS	VOLTMETER SWITCH
VT	VOLTAGE TRANSFORMER
VTP	VERTICAL TURBINE PUMP
VTR	VENT THRU ROOF

W	
W	WASTE, WATT, WEST, WHITE, WIRE, STRUCTURAL STEEL WIDE FLANGE, WIDTH
W/	WITH
WB	WET BULB
WC	WATER CLOSET
WCO	WALL CLEANOUT
WDG	WINDING
WDO	WINDOW
WF	WATER FOUNTAIN
WHR	WATER HEATER
WHD	WATT HOUR DEMAND
WHSE	WAREHOUSE
WL	WATERLINE, WIND LOAD
WM	WATER METER, WATT METER
WOG	WATER, OIL, GAS
W/O	WITHOUT
WP	WEATHERPROOF, WORK POINT
WPJ	WEAKENED PLANE JOINT
WS	WATERSTOP, WATER SURFACE
WSHR	WASHER
WSP	WELDED STEEL PIPE
WT	WEIGHT
WTP	WATER TREATMENT PLANT
WTR	WATER
WTRPRF	WATERPROOF
WW	WASTE WATER, WASH WATER
WWF	WELDED WIRE FABRIC
WWS	WASH WATER SYSTEM

X	
XBAR	CROSSBAR
XCMR	TRANSCEIVER
XDCR	TRANSUDUCER
XFMR	TRANSFORMER
XHV	EXTRA HEAVY
XMSN	TRANSMISSION
XMTR	TRANSMITTER
XP	EXPLOSION PROOF
XSECT	CROSS SECTION
XS	EXTRA STRONG
XXS	DOUBLE EXTRA STRONG

Y	
YD	YARD
YIL	YELLOW INDICATING LIGHT
YSF	YIELD SAFETY FACTOR
YSLF	YIELD STRENGTH LOAD FACTOR

SYMBOLS

∠	ANGLE (STRUCTURAL STEEL)
@	AT
⊥	CENTERLINE
°	DEGREES
°C	DEGREES CENTIGRADE
°F	DEGREES FAHRENHEIT
∅	DIAMETER, PHASE
Δ	DELTA, DIFFERENCE
≥	GREATER THAN OR EQUAL TO
≤	LESS THAN OR EQUAL TO
#	NUMBER, POUND
/	OF
Ω	OHM
⊞	PLATE (STRUCTURAL STEEL)
±	PLUS OR MINUS

NOTES

- SEE DRAWING 9492-G-000.1 FOR ABBREVIATIONS FROM A THRU F, AND FOR ADDITIONAL NOTES.
- SEE DRAWING 9494-G-000.2 FOR ABBREVIATIONS FROM G THRU R.

REF 3:
REF 4:

REF 1:
REF 2:

USER: jcl900 PLOT SCALE:
DATE: 15-AUG-2016 11:56
FILE: H:\s1tds\8s1tds\949200003.R00



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NO.	DATE	REVISION	BY	REC.	APP.

DESIGNED BY <i>Joseph Nouri</i> JOSEPH NOURI	EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA	
DESIGN CHECKED BY <i>Paul M. Franceschi</i> PAUL M. FRANCESCO	STANDARD DRAWING	
DRAWN BY FACILITY DRATING	ABBREVIATIONS FOR WATER FACILITIES DESIGN DRAWINGS, S THRU Z	
REVIEW SR. CIVIL ENGR. R.P.E. NO. C38146 <i>Paul M. Franceschi</i> PAUL M. FRANCESCO	PROJ. NO. 9492-G-000.3	0
RECOMMENDED BY MGR. OF DESIGN R.P.E. NO. C48998 <i>S. Terenteff</i> SERGE V. TEREENTIEFF	SCALE NONE	
APPROVED BY DIRECTOR OF ENG & CONST R.P.E. NO. C44782 <i>Yves J. J. J.</i> YVES J. J.	DATE 12AUG2016	

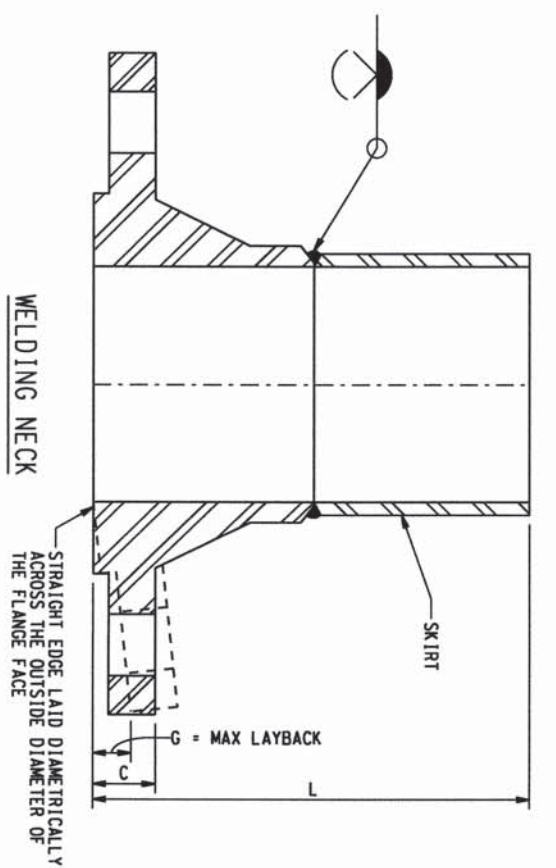
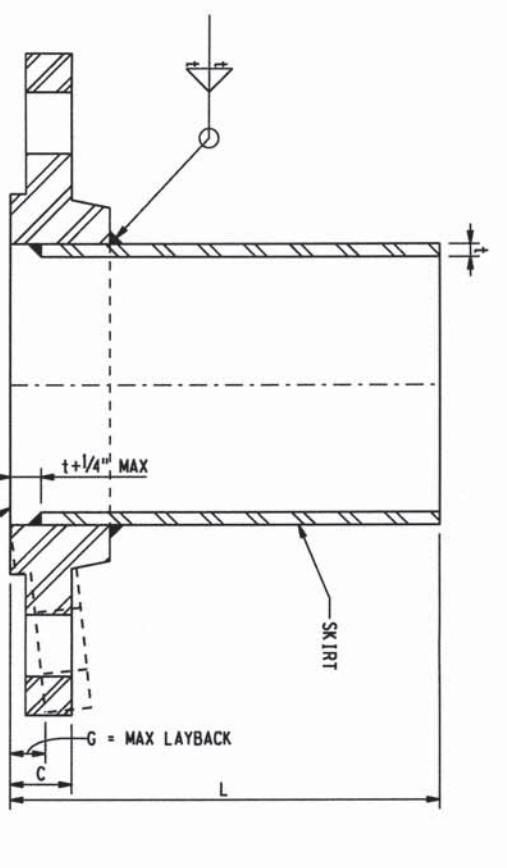
NOTES

1. THIS DRAWING IS APPLICABLE FOR COLD WATER SERVICE WITH EXTRA-HIGH PRESSURES UP TO 600 PSI
 SEE DRAWING 324-EA FOR PRESSURES 275 PSIG AND LOWER.
 SEE DRAWING 323-EA FOR PRESSURES 175 PSIG AND LOWER.
2. FLANGES 4-INCH THRU 24-INCH SHALL BE IN ACCORDANCE WITH ASME B16.5 CLASS 300, SLIP-ON OR WELDING-NECK, FLANGES 24-INCH THRU 60-INCH SHALL BE IN ACCORDANCE WITH ASME B16.47 CLASS 300 SERIES A, WELDING-NECK.
 - A. FLANGE MATERIAL SHALL BE CARBON STEEL OR STAINLESS STEEL AS SPECIFIED.
 - B. ONLY RAISED FACE ASME FLANGES SHALL BE USED IN ORDER TO PROVIDE A PROPER SEAL AT THE TORQUES SHOWN ON THE TABLE.
 - C. THE MATING IRON FLANGE SHALL ALSO BE CARBON STEEL OR STAINLESS STEEL. MATING TO CAST OR DUCTILE IRON FLANGES IS NOT PERMITTED.
 - D. NOTE THAT ASME FLANGES WERE PREVIOUSLY REFERRED TO AS ANSI FLANGES.
3. COAT FLANGE FACES WITH A RUST INHIBITOR OR OTHER REMOVABLE PROTECTIVE COATING AFTER WELDING PIPE TO FLANGE OR AFTER ANY FLANGE FACE MACHINING. SEE SPEC SECTION 33.11.06 FOR ACCEPTABLE PRODUCTS. REMOVE PROTECTIVE COATING PRIOR TO FINAL ASSEMBLY OF FLANGES.
4. PROVIDE A PIPE SECTION (SKIRT) ON FLANGES WHEN SPECIFIED.
5. IN ACCORDANCE WITH ANSA C207, THE FLANGE LAYBACK, AFTER WELDING THE SKIRT TO THE FLANGE AND BEFORE BOLTING THE FLANGE, SHALL NOT EXCEED 1A FOR A SINGLE FLANGE OR 1.5A FOR TWO MATING SURFACES. THE LAYBACK "G" FOR A SINGLE FLANGE IS SHOWN IN INCHES IN THE TABLE FOR 0.75A.
6. THE OVERALL SKIRT LENGTH "L" SHALL BE 12" FOR FLANGES UP TO 20" DIAMETER AND 18" FOR FLANGES 24" AND LARGER.
7. FILLET WELD MINIMUM SIZE SHALL MATCH THE PIPE THICKNESS. GROOVE WELDS SHALL BE FULL PENETRATION.
8. BOLTS SHALL HAVE HEAVY HEXAGONAL HEADS IN ACCORDANCE WITH ANSI/ASME B18.2.1.
 - A. STEEL BOLTS SHALL CONFORM TO ASTM A193 GRADE B7.
 - B. STAINLESS STEEL BOLTS (3/4") SHALL BE USED ON 4" AND 6" STAINLESS STEEL FLANGES. BOLTS SHALL CONFORM TO ASTM A193, CLASS 2, TYPE B8, (TYPE 304) OR TYPE B8N (TYPE 304N), CARBIDE SOLUTION TREATED AND STRAIN HARDENED. NUTS SHALL BE ASTM A194, GRADE 1 STD HEX OR GRADE 8-S1 HEAVY HEX AND STRAIN HARDENED. WASHERS SHALL MATCH.
9. NUTS SHALL HAVE HEAVY HEXAGONAL HEADS IN ACCORDANCE WITH ANSI/ASME B18.2.2. NUTS SHALL CONFORM TO ASTM A194 GRADE 2H, OR ASTM A563 GRADE DH.
10. ALL BOLTS AND NUTS SHALL BE THREADED IN ACCORDANCE WITH ANSI B1.1 FOR SCREW THREADS. BOLTS 1-INCH AND SMALLER SHALL BE UNIFIED COARSE THREAD SERIES (UNC), CLASS 2B FIT. BOLTS LARGER THAN 1-INCH, SHALL BE UNC CLASS 2B, OR UN-8 SERIES THREADS WITH 8 THREADS/INCH.
11. BOLTING SHALL BE COATED TO MINIMIZE CORROSION:
 - A. BURIED FLANGE SETS SHALL BE COMPLETELY COATED WITH PETROLEUM (WAX) TAPE.
 - B. EXPOSED FLANGE SETS SHALL HAVE THE BOLTING FINISH COATED WITH HIGH-BUILD EPOXY WITH COLOR TO MATCH PIPING.
12. THREAD ANTI-SEIZE COMPOUND OF HIGH-PURITY MINERAL OIL AND ALUMINUM SHALL BE USED ON ALL BOLT THREADS. SEE SPEC SECTION 05.05.26 FOR ACCEPTABLE PRODUCTS. FAILURE TO LUBRICATE THE BOLTING THREADS PRIOR TO NUT INSTALLATION AND TORQUING WILL RESULT IN LOWER PRESSURE CAPABILITIES AND POSSIBLE LEAKAGE.
13. GASKETS SHALL BE 1/16-INCH THICK NON-ASBESTOS FIBER IN EPDM BINDER COMPOSITION GASKETS MEETING THE REQUIREMENTS OF ANSA C207. DO NOT USE A THICKER GASKET AS IT REQUIRES A HIGHER TORQUE THAN THAT SHOWN IN THE TABLE AND MAY RESULT IN LEAKAGE. RUBBER GASKETS ARE NOT ACCEPTABLE.
14. ALL FLANGES SHALL USE RING TYPE GASKETS THAT EXTEND TO THE INSIDE EDGE OF THE BOLTS. FULL-FACE GASKETS ARE NOT PERMITTED.
15. GASKETS SHALL BE LUBRICATED ON BOTH SIDES WITH FOOD GRADE ANTI-SEIZE COMPOUND.
16. INSULATING GASKETS REQUIRE DIFFERENT TORQUE VALUES. USE THE GASKET MANUFACTURER'S TORQUE RECOMMENDATIONS.
17. FLANGE DIMENSION SHALL BE PER ASME B16.5 OR ASME B16.47. DIMENSIONS GIVEN IN THE TABLE ARE FROM THESE STANDARDS.
18. THE PIPING OD SHALL ADHERE TO ASME B36.10. THE DISTRICT STANDARD PIPING DIMENSIONS ARE NOT ACCEPTABLE FOR THIS PRESSURE SERVICE.
 BOLTING PROCEDURES
19. TORQUE VALUES SHOWN PROVIDE THE MINIMUM REQUIRED GASKET COMPRESSION. IF NECESSARY, TORQUE MAY BE INCREASED BY UP TO 100% FOR 4"-24" AND 50% FOR 30"-60".
20. INITIAL BOLTING: HAND TIGHTEN, THEN "SNUG" TO 10% OF FINAL TORQUE VALUE AND CHECK GAP AROUND CIRCUMFERENCE FOR UNIFORMITY. SELECTIVELY TIGHTEN WHERE GAP IS LARGER.
21. FLANGE BOLTS FOR NON-ASBESTOS FIBER COMPOSITION GASKETS SHALL BE TIGHTENED WITH A MINIMUM OF SIX PASSES AS FOLLOWS:

PASS	PERCENT OF FINAL TORQUE	PATTERN
1	20 TO 30	CROSS
2	50 TO 70	CROSS
3	100	CROSS
4	100	CIRCULAR CLOCKWISE

 ALLOW MINIMUM 24 HR FOR GASKET TO UNDERGO RELAXATION

5	100	CROSS
6	100	CIRCULAR CLOCKWISE
22. BOLTS SHALL IN ALL PASSES BE TIGHTENED IN DIAMETRICAL PAIRS AND IN A CROSS PATTERN RECOMMENDED BY THE GASKET MANUFACTURER OR ASME PCC-1, TABLES 4 OR 4.1.
23. A CALIBRATED TORQUE WRENCH SHALL BE USED ON ALL PASSES TO ENSURE UNIFORM BOLTING.



XHP FLANGE & PIPE SECTION ASSEMBLY
 NTS

ASME STANDARD	PIPE SIZE	MIN. FLANGE THICKNESS C	SLIP-ON AND VWF	BOLTS		LUBRICATED BOLT TORQUE, MINIMUM NOTES 18, 19	MAXIMUM FLANGE LAYBACK G
				#	DIAM		
B16.47	4	1.25		8	3/4	95	0.029
	6	1.44		12	3/4	100	0.028
	8	1.62		12	7/8	160	0.031
	10	1.88		16	1	185	0.034
	12	2		16	1 1/8	270	0.040
	16	2.25		20	1 1/4	330	0.048
B16.5	20	2.5		24	1 1/4	410	0.048
	24	2.75		24	1 1/2	590	0.051
	30	3.62		28	1 3/4	1150	0.056
	36	4.12		32	2	1500	0.064
	42	4.89		32	1 5/8	1250	0.071
	48	5.25		32	1 7/8	2150	0.074
B16.47	54	6.00		28	2 1/4	3350	0.079
	60	6.44		32	2 1/4	3550	0.084

TABLE DIMENSIONS ARE IN INCHES, TORQUE IS FT-LBS

<p>DESIGNED BY <i>[Signature]</i></p> <p>DESIGN CHECKED BY <i>[Signature]</i></p> <p>DRAWN BY K. ENG</p>	<p>EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA</p> <p>STEEL PIPE FLANGES, EXTRA-HIGH PRESSURE (XHP) SLIP-ON, WELDING-NECK, & SKIRTED STANDARD DRAWING</p>												
<p>RECOMMENDED DESIGN R.P.E. NO. C 39851</p> <p>APPROVED, DIRECTOR OF ENGINEERING & CONST. R.P.E. NO. C 44782</p>	<p>PROJECT NO. SCALE NONE</p> <p>DATE 18MAY2009</p>												
<p>REVISION</p> <table border="1" style="width: 100%;"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>REVISION</th> <th>BY</th> <th>REC.</th> <th>APP.</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20DEC2016</td> <td>REVISED NOTE 8, ETC</td> <td><i>[Signature]</i></td> <td></td> <td></td> </tr> </tbody> </table>	NO.	DATE	REVISION	BY	REC.	APP.	1	20DEC2016	REVISED NOTE 8, ETC	<i>[Signature]</i>			<p>325-EA</p>
NO.	DATE	REVISION	BY	REC.	APP.								
1	20DEC2016	REVISED NOTE 8, ETC	<i>[Signature]</i>										

1. THIS DRAWING IS APPLICABLE FOR HIGH PRESSURE SERVICES UP TO: 275 PSI.
 SEE DRAWING 323-EA FOR LOWER PRESSURES.

2. FLANGES SHALL BE IN ACCORDANCE WITH AWMA C207 CLASS E FLAT FACED RING OR HUB FLANGES. REQUIREMENTS FROM AWMA C207 ARE REPEATED BELOW FOR CONVENIENCE. IN CASE OF CONFLICT BETWEEN THIS DRAWING AND AWMA C207, AWMA C207 SHALL GOVERN.

3. ASME B16.5 CLASS 150 SLIP-ON AND WELDING NECK TYPE OR B16.47 SERIES A CLASS 150 FLANGES ACCEPTABLE ALTERNATIVES. USE TYPE AS CALLED OUT ON REFERRING DRAWING.

A. RAISED FACE ASME FLANGES MAY BE USED ONLY IF THE MATING FLANGE IS STEEL, STAINLESS STEEL OR DUCTILE IRON.

B. ASME FLANGES THAT ARE FLAT FACED WITHOUT PROJECTION MAY BE USED IN ALL INSTALLATIONS.

C. ASME FLANGES SHALL BE FLAT FACED IF THE MATING FLANGE IS CAST IRON OR IF THE MATERIAL OF THE MATING FLANGE IS UNCERTAIN.

D. 304L & 316L SST FLANGES, ASME CLASS 150, ARE LIMITED TO 230 PSI MAXIMUM. USE 304 OR 316 (NOT "L") FOR FULL PRESSURE RATING.

E. NOTE THAT ASME FLANGES WERE PREVIOUSLY REFERRED TO AS ANSI FLANGES.

4. IN ACCORDANCE WITH AWMA C207, THE FLANGE LAYBACK, AFTER WELDING PIPE SECTION TO THE FLANGE AND BEFORE BOLTING THE FLANGE, SHALL NOT EXCEED 1° FOR A SINGLE FLANGE OR 1.5° FOR TWO MATING SURFACES. THE LAYBACK "G" FOR A SINGLE FLANGE IS SHOWN IN INCHES IN THE TABLE FOR Ø.75°.

5. ALL FLAT FACED FLANGES SHALL HAVE EITHER A SERRATED CONCENTRIC OR SPIRAL FINISH HAVING FROM 24 GROOVES/IN TO 40 GROOVES/IN SHALL BE USED. THE CUTTING TOOL SHALL HAVE AN APPROXIMATE 0.06 IN OR LARGER RADIUS. THE RESULTING SURFACE SHALL HAVE A 125 TO 500 MICRO-INCH ROUGHNESS.

6. COAT FLANGE FACES WITH A RUST INHIBITOR OR OTHER REMOVABLE PROTECTIVE COATING AFTER WELDING PIPE TO FLANGE OR AFTER FLANGE FACE MACHINING. REMOVE PROTECTIVE COATING PRIOR TO FINAL ASSEMBLY OF FLANGES.

7. BOLTS SHALL HAVE REGULAR HEXAGONAL HEADS IN ACCORDANCE WITH ASME B18.2.1. NUTS SHALL HAVE HEAVY HEXAGONAL HEADS IN ACCORDANCE WITH ASME B18.2.2.

8. ALL BOLTS AND NUTS SHALL BE THREADED IN ACCORDANCE WITH ASME B1.1 FOR SCREW THREADS, COARSE THREAD SERIES (UNC), CLASS 2A OR 2B FIT. FOR BOLTS LARGER THAN 1", UN-8 SERIES THREADS WITH 8 THREADS/INCH ARE ALSO ACCEPTABLE.

9. BOLTING SHALL MEET ONE OF THE FOLLOWING AS REQUIRED BY THE PROJECT DRAWINGS AND SPECIFICATIONS.

A. CARBON STEEL: BOLTS SHALL CONFORM TO SAE J429, GRADE 5, ASTM A449, TYPE 1 OR ASTM A193 GRADE B7. NUTS UP TO 1-1/2" SHALL BE ASTM A563, GRADE B OR SAE J995, GRADE 5, HEXAGONAL FLAT NUTS. NUTS GREATER THAN 1-1/2" SHALL BE ASTM A563, GRADE A HEAVY HEXAGONAL FLAT NUTS.

B. STAINLESS STEEL: BOLTS SHALL BE HIGH STRENGTH AND CONFORM TO ASTM A193, CLASS 2, TYPE B8 (TYPE 304) OR TYPE B8N (TYPE 304N), CARBIDE SOLUTION TREATED AND STRAIN HARDENED. NUTS SHALL BE ASTM A194, GRADE 1 STD HEX OR GRADE 8-S1 HEAVY HEX AND STRAIN HARDENED. WASHERS SHALL MATCH.

ANTI-SEIZE COMPOUND

10. THREAD ANTI-SEIZE COMPOUND SHALL BE USED ON ALL BOLT THREADS. SEE SECTION 05 05 26 FOR ACCEPTABLE PRODUCTS. FAILURE TO LUBRICATE THE BOLTING THREADS WITH ANTI-SEIZE COMPOUND PRIOR TO NUT INSTALLATION WILL RESULT IN LOW BOLT TENSION AND INSUFFICIENT GASKET PRESSURE.

GASKETS

11. GASKETS SHALL BE NON-ASBESTOS FIBER COMPOSITION GASKETS MEETING THE REQUIREMENTS OF AWMA C207.

12. ALL STEEL FLANGE SETS SHALL USE RING GASKETS. USE FULL FACE GASKETS ONLY WHEN MATING TO A VALVE OR APPURTENANCE WITH CAST IRON FLANGES.

13. GASKETS SHALL BE LUBRICATED ON BOTH SIDES WITH FOOD GRADE ANTI-SEIZE COMPOUND.

DIMENSIONS

14. NOTE THAT FLANGE DRILLING FOR AWMA C207, CLASS E FLANGES, ASME B16.5 CLASS 150 FLANGES, AND ASME B16.47 SERIES A CLASS 150 FLANGES ARE IDENTICAL.

15. THE OVERALL LENGTH "L" SHALL BE 12" FOR FLANGES UP TO 20" DIAMETER AND 18" FOR FLANGES 24" AND LARGER.

16. THE BOLT HOLE DIAMETER "H" SHALL BE 1#8" LARGER THAN THE BOLT DIAMETER.

17. THE FLANGE ID "B" SHALL BE 1#8" LARGER THAN THE PIPE OUTSIDE DIAMETER FOR PIPES UP TO 16" AND 3#16" LARGER FOR PIPES 20" AND LARGER. NOTE THAT DISTINCT STANDARD PIPELINE PIPE DIAMETERS ARE DIFFERENT FROM ASME B36.10 AND B36.19 PIPE. VERIFY ACTUAL PIPE DIAMETER BEFORE FABRICATING FLANGES. SEE APPLICABLE PIPE DRAWINGS (SUCH AS 1884-A, 7830-0B-1 AND 9499-0B) FOR PIPE OUTSIDE DIAMETER.

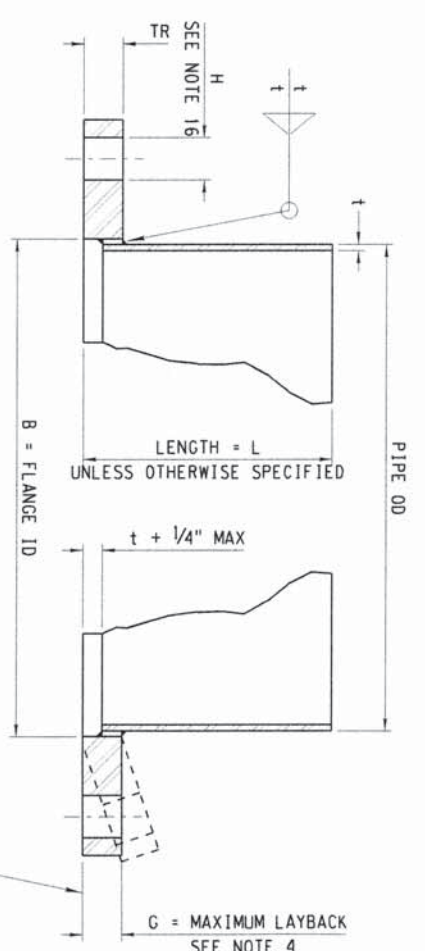
BOLTING PROCEDURES

18. INITIAL BOLTING: HAND TIGHTEN EACH, THEN "SNUG" EACH TO 10% OF FINAL TORQUE AND CHECK GAP AROUND CIRCUMFERENCE FOR UNIFORMITY. SELECTIVELY TIGHTEN WHERE GAP IS LARGER.

19. FLANGE BOLTS FOR NON-ASBESTOS COMPOSITION GASKETS SHALL BE TIGHTENED WITH A MINIMUM OF SIX PASSES AS FOLLOWS:

PASS	PERCENT OF FINAL TORQUE	PATTERN
1	20 TO 30	CROSS
2	50 TO 70	CROSS
3	100	CROSS
4	100	CIRCULAR CLOCKWISE
5	100	CIRCULAR CLOCKWISE
6	100	CIRCULAR CLOCKWISE

20. BOLTS SHALL IN ALL PASSES BE TIGHTENED IN DIAMETRICAL PAIRS AND IN A CROSS PATTERN RECOMMENDED BY THE GASKET MANUFACTURER OR ASME PCC-1, TABLES 4 OR 4.1.



HP FLANGE & PIPE SECTION ASSEMBLY

PIPE SIZE	MIN. FLANGE THICKNESS TR		#	BOLTS DIAM	BOLT TORQUE	MAXIMUM FLANGE LAYBACK G
	RING	HUB				
4	1.125	0.938	8	5/8	120	0.029
6	1.313	1.000	8	3/4	200	0.028
8	1.500	1.125	8	3/4	220	0.031
10	1.563	1.188	12	7/8	300	0.034
12	1.750	1.250	12	7/8	350	0.040
16	2.000	1.438	16	1	450	0.048
20	2.375	1.688	20	1 1/8	600	0.048
24	2.625	1.875	20	1 1/4	800	0.051
30	2.875	2.125	28	1 1/4	700	0.056
36	3.125	2.375	32	1 1/2	1000	0.064
42	3.375	2.625	36	1 1/2	1000	0.071
48	3.500	2.750	44	1 1/2	1000	0.074
54	3.750	3.000	44	1 3/4	1500	0.079
60	3.875	3.125	52	1 3/4	1500	0.084
66	4.250	3.375	52	1 3/4	1500	0.090
72	4.375	3.500	60	1 3/4	1500	0.094
78	4.750	3.875	64	2	2000	0.097
84	4.750	3.875	64	2	2000	0.102
90	5.125	4.250	68	2 1/4	3000	0.107
96	5.125	4.250	68	2 1/4	3000	0.112
102	5.500	-	72	2 1/2	4000	0.117
108	5.500	-	72	2 1/2	4000	0.121

TABLE DIMENSIONS ARE IN INCHES, TORQUE IS FT-LBS

21. A CALIBRATED TORQUE WRENCH SHALL BE USED ON ALL PASSES TO ENSURE UNIFORM BOLTING. TORQUE MULTIPLIERS ARE REQUIRED FOR HIGHER TORQUE VALUES.

DESIGN	DESIGNED BY: ROBERT DAVIS	REVIEW	CONSTRUCTION CHECK BY: 3R, MECH ENG, R.P.E. NO. W-29694	DAVID BAILEY
	DESIGN CHECKED BY: NATHAN GRONLUND		RECOMMENDED MGR. OF DESIGN R.P.E. NO. C-39859	DAVID PRATT
	DRAWN BY: EDMUD		APPROVED, DIRECTOR OF ENGINEERING R.P.E. NO. C-4782	XAVIER IRIAS
EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA		WITH ATTACHED PIPE SECTION		
STANDARD DRAWING		STEEL PIPE FLANGES HIGH PRESSURE		
STRUCTURE OR ZONE DESIGNATION SCALE: NONE		DATE: 22 DEC. 2006		
324-EA				

NO.	DATE	REVISION	BY	REC.	APP.
3	02-01-07	REVISED NOTES	JHA	DTJ	CAV
2	06-30-08	REVISED NOTES	JH	ST	AST